U.S. Department of Energy
Office of Environmental Management

Final Waste Management Programmatic Environmental Impact Statement

For Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste

DOE/EIS-0200-F-Summ.

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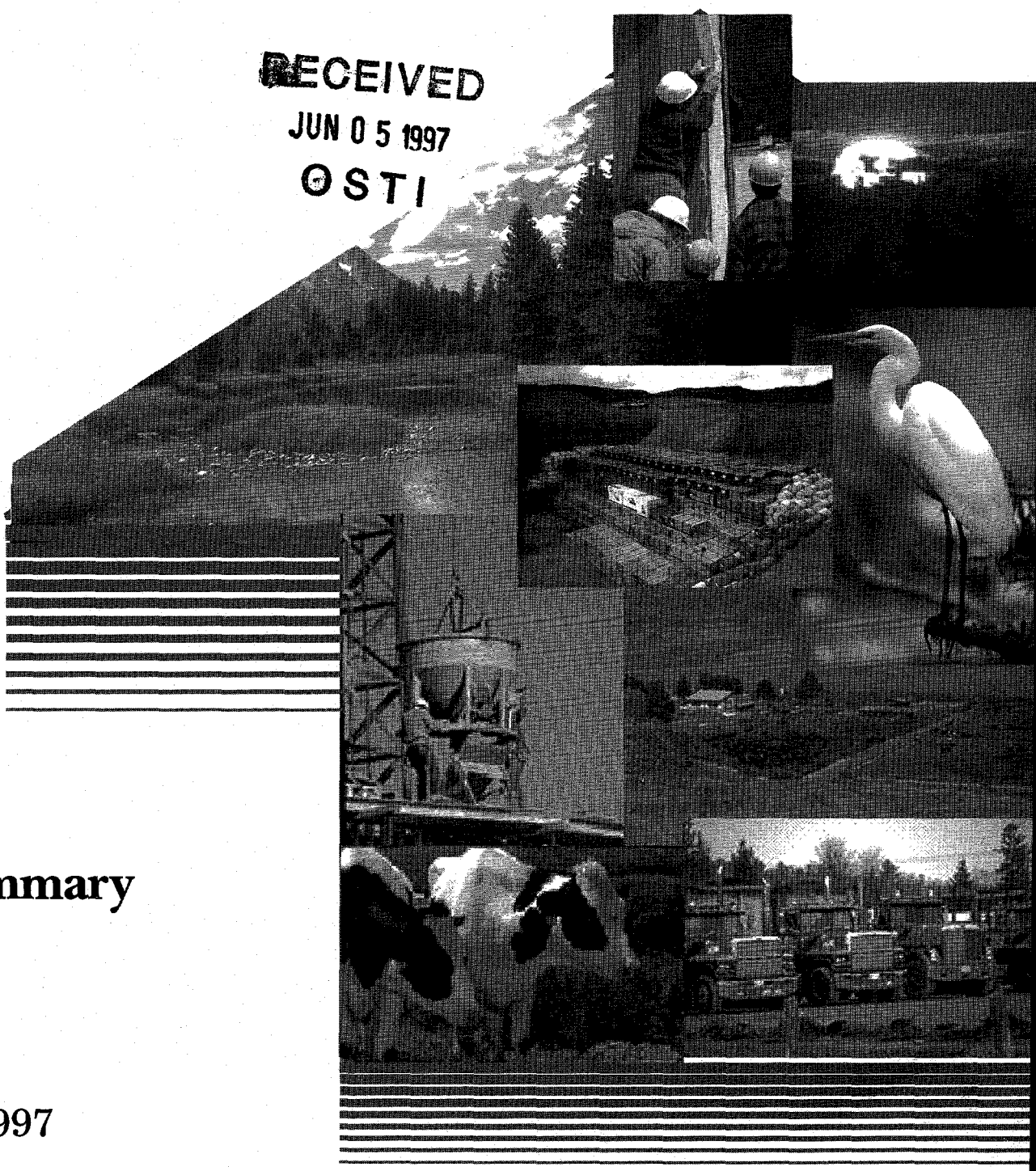

Summary

May 1997

Department of Energy
Washington, DC 20585

May 1997 DOE/EIS--0200-F-Summ.

Dear Citizen:

This is a summary of the *Final Waste Management Programmatic Environmental Impact Statement.* The Department of Energy has prepared the final environmental impact statement in accordance with the National Environmental Policy Act, to evaluate management and siting alternatives for the treatment, storage and disposal of five types of radioactive and hazardous wastes. These waste types are: low-level radioactive waste; low-level mixed (with hazardous components) waste; transuranic waste; high-level radioactive waste; and hazardous waste. The alternatives were evaluated for waste stored, buried or to be generated from future operations over the next 20 years at 54 sites.

The study is contained in 5 volumes. Volume 1, the main body of the document, contains the analyses for each waste type and the potential health, environmental and cumulative impacts of the 36 waste management program alternatives that were considered. Volume 2 contains the detailed data for each of the Department's sites included in the study. Volumes 3 and 4 contain the supporting appendices. Volume 5 contains an indexed summary of the comments received during the 5-month public comment period on the draft environmental impact statement, along with the Department's responses to those comments.

A complete copy of the final environmental impact statement is available in public reading rooms which are located across the U.S. A list of the reading rooms, copies of this summary, the full 5-volume document, or its supporting technical reports can be obtained on request from the following address or telephone number. Information is also available on our Internet home page at http://www.em.doe.gov.

Center for Environmental Management Information
P.O. Box 23769
Washington, D.C. 20026-3769
1-800-736-3282 (in Washington, D.C.: 202-863-5084)

The Department of Energy will issue Records of Decision for each of the five waste types in a phased manner, commencing no sooner than 30 days after publication of the final environmental impact statement. While some waste treatment and storage decisions may be made soon, the Department intends to consult further with stakeholders before identifying low-level and mixed waste disposal site preferences. We will publicly announce these disposal site preferences at least 30 days prior to making disposal decisions.

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MASTER

Sincerely,

Alvin L. Alm
Assistant Secretary for
Environmental Management

Printed with soy ink on recycled paper

U.S. Department of Energy
Office of Environmental Management

Summary

Final Waste Management Programmatic Environmental Impact Statement

For Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste

DOE/EIS-0200-F

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SUMMARY

May 1997

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Acronyms and Abbreviations

AEA	Atomic Energy Act
Ames	Ames Laboratory
Am-241	americium-241
ANL-E	Argonne National Laboratory-East
ANL-W	Argonne National Laboratory-West
BCL	Battelle Columbus Laboratory
Bettis	Bettis Atomic Power Laboratory
BNL	Brookhaven National Laboratory
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH	contact-handled
Charleston	Charleston Naval Shipyard
CO	carbon monoxide
Colonie	Colonie Interim Storage Site
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ETEC	Energy Technology Engineering Center
FEMP	Fernald Environmental Management Project
Fermi	Fermi National Accelerator Laboratory
FFCAct	Federal Facility Compliance Act
FUSRAP	Formerly Utilized Sites Remedial Action Program
FY	fiscal year
GA	General Atomics
GE	General Electric Vallecitos Nuclear Center
GJPO	Grand Junction Projects Office
GTCC	greater-than-Class-C
Hanford	Hanford Site
HLW	high-level waste
HW	hazardous waste
INEL	Idaho National Engineering Laboratory
ITRI	Inhalation Toxicology Research Institute

K-25	Oak Ridge K-25 Site
KAPL	Knolls Atomic Power Laboratory
KAPL-K	Knolls Atomic Power Laboratory (Kesselring)
KAPL-N	Knolls Atomic Power Laboratory (Niskayuna)
KAPL-W	Knolls Atomic Power Laboratory (Windsor)
KCP	Kansas City Plant
LANL	Los Alamos National Laboratory
lb	pound
LBL	Lawrence Berkeley Laboratory
LDRs	land disposal restrictions
LEHR	Laboratory for Energy-Related Health Research
LLMW	low-level mixed waste
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste
m^3	cubic meters
Mare Is	Mare Island Naval Shipyard
MEI	maximally exposed individual
Middlesex	Middlesex Sampling Plant
Mound	Mound Plant
mrem	millirem
nCi/g	nanocuries per gram
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
Norfolk	Norfolk Naval Shipyard
NRF	Naval Reactors Facility
NTS	Nevada Test Site
O&M	operations and maintenance
O_3	ozone
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
Palos	Palos Forest
Pantex	Pantex Plant
Pb	lead
Pearl H	Pearl Harbor Naval Shipyard
PEIS	Programmatic Environmental Impact Statement
PGDP	Paducah Gaseous Diffusion Plant
Pinellas	Pinellas Plant

Acronyms and Abbreviations

PM_{10}	particulate matter of aerodynamic diameter less than or equal to 10 micrometers
PORTS	Portsmouth Gaseous Diffusion Plant
Ports Nav	Portsmouth Naval Shipyard
PPPL	Princeton Plasma Physics Laboratory
Pu-238	plutonium-238
Puget So	Puget Sound Naval Shipyard
RCRA	Resource Conservation and Recovery Act
RFETS	Rocky Flats Environmental Technology Site
RH	remote-handled
RMI	RMI Titanium Company
ROI	region of influence
SLAC	Stanford Linear Accelerator Center
SNL-CA	Sandia National Laboratories (California)
SNL-NM	Sandia National Laboratories (New Mexico)
SO_2	sulfur dioxide
SRS	Savannah River Site
TRUPACT-II	Transuranic Package Transporter-II
TRUW	transuranic waste
TSCA	Toxic Substances Control Act
USC	United States Code
UofMo	University of Missouri
WAC	waste acceptance criteria
WIPP	Waste Isolation Pilot Plant
WM	waste management
WM PEIS	Waste Management Programmatic Environmental Impact Statement
WSSR	Weldon Spring Remedial Action Project
WVDP	West Valley Demonstration Project
Y-12	Oak Ridge Y-12 Plant

1 Introduction*

This Waste Management Programmatic Environmental Impact Statement (WM PEIS) is a nationwide study examining the environmental impacts of managing five types of radioactive and hazardous wastes generated by past and future nuclear defense and research activities at a variety of sites located around the United States. The five waste types are low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), high-level waste (HLW), and hazardous waste (HW).

The U.S. Department of Energy (DOE) needs to enhance the management of its current and anticipated inventories of LLMW, LLW, TRUW, HLW, and HW in order to ensure safe and efficient control of these wastes, to comply with all applicable Federal and State laws, to protect public health and safety, and to protect the environment. Each waste type has unique physical characteristics and regulatory requirements and accordingly is managed separately. For each waste type, facilities are needed to treat, store, and dispose of the waste. For the first time, DOE has examined in an integrated fashion not only the impacts of complexwide (i.e., across the DOE complex) waste management alternatives for each waste type but also the specific cumulative impacts from all the waste facilities at a given site. In this context, management of these wastes includes:

- Pollution prevention
- Identifying/contracting with private vendors to manage waste
- Modifying existing waste management facilities or constructing new facilities at particular sites
- Operating existing, modified, or new waste management facilities at those sites
- Transporting waste among waste management facilities, as necessary
- Handling, surveillance, and maintenance

Definitions of Wastes Analyzed in the WM PEIS

Low-level mixed waste: *Low-level waste that contains hazardous waste under the Resource Conservation and Recovery Act.*

Low-level waste: *Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranics is less than 100 nanocuries per gram of waste. Low-level waste is subject to provisions of the Atomic Energy Act.*

Transuranic waste: *Transuranic waste is waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, per gram of waste, with half-lives greater than 20 years, except for (a) high-level radioactive waste; (b) waste that the Secretary has determined, with concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or (c) waste that the U.S. Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR 61.*

High-level waste: *The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly from reprocessing and any solid waste derived from the liquid that contains a combination of transuranic and fission product nuclides in quantities that require permanent isolation. High-level waste may include other highly radioactive material that the U.S. Nuclear Regulatory Commission, consistent with existing law, determines requires permanent isolation.*

Hazardous waste: *Under the Resource Conservation and Recovery Act, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Source, special nuclear material, and by-product material, as defined by the Atomic Energy Act, are specifically excluded from the definition of solid waste.*

* Vertical lines in margins and shading in tables indicate changes made since the publication of the Draft WM PEIS in August 1995.

This study provides information on the impacts of various alternatives, which DOE will use to decide at which sites to locate additional treatment, storage, and disposal capacity for each waste type. However, the location of a facility at a selected site will not be decided until completion of a sitewide or project-specific National Environmental Policy Act (NEPA) review.

To help DOE decide at which sites it should locate waste management facilities, this WM PEIS considers four categories of alternatives for each waste type: (1) a No Action Alternative that is generally consistent with current practice but with no management improvements; (2) a Decentralized Alternative that would, in general, result in wastes being managed where they are currently generated or stored; (3) a Regionalized Alternative that would consolidate waste management at fewer sites throughout the nation than under the Decentralized Alternative; and (4) a Centralized Alternative that would consolidate waste management at only one or two sites. For certain waste types, DOE considers more than one Regionalized or Centralized Alternative to present a wide variety of options on the number and location of sites that could manage wastes.

1.1 Sources of DOE Waste

At its peak, the nuclear defense complex consisted of 16 "major" sites, including large reservations in Nevada, Idaho, Washington, and South Carolina. National laboratories in New Mexico and California designed weapons that were produced in Colorado, Florida, Missouri, Ohio, Tennessee, and Washington. Like most industrial and manufacturing operations, the production of nuclear weapons generated waste. However, many problems posed by DOE's nuclear operations are unlike those associated with most other industries. Among these problems are radiation hazards; structures with radioactive contamination, such as nuclear reactors; and chemical plants that processed nuclear materials.

Nuclear weapons have played an important role in national security, and the nation continues to maintain an arsenal of nuclear weapons and some production capability. Continued support of the nation's Naval Nuclear Propulsion Program is also needed. However, since the end of the Cold War and the nuclear arms race, national priorities have shifted. Today, waste management and environmental restoration activities have become central to DOE's mission. DOE must provide for the proper management of its wastes within a complex and dynamic regulatory environment. DOE is not responsible, in general, for the management of wastes produced from commercial applications of radiation and atomic energy, and management of such wastes is not addressed in this WM PEIS.

1.2 Environmental Management Accelerating Cleanup: Focus on 2006

The DOE Environmental Management (EM) Program is continually working to accelerate cleanup schedules, increase efficiency, and foster cooperative relationships with its regulators and other stakeholders. However, there is concern whether support can be sustained for a program that may stretch beyond 70 years with an estimated cost of more than $200 billion. DOE wants to accelerate reduction of this "cleanup mortgage" of the Cold War to reduce long-term economic and environmental liabilities. DOE is working on a 2006 Plan (previously known as the Ten Year Plan) to meet this challenge. The vision of this plan is that, within the next decade, most DOE facilities will be able to treat and dispose of their backlog of nuclear materials and wastes safely and to clean up the land and buildings on site. These steps would dramatically reduce long-term costs and open a large portion of the lands and other resources controlled by DOE for other purposes.

However, some aspects of the EM Program will demand additional time and resources. For example, DOE will not be able to complete the treatment and disposal of certain wastes, such as high-level radioactive waste stored in tanks at Hanford or TRUW stored throughout the complex, within the next 10 years. In addition, there will be ongoing groundwater cleanup projects, decontamination of buildings, and

surveillance and maintenance activities. At a small number of sites, DOE will continue treatment of a few remaining waste streams beyond the next 10 years.

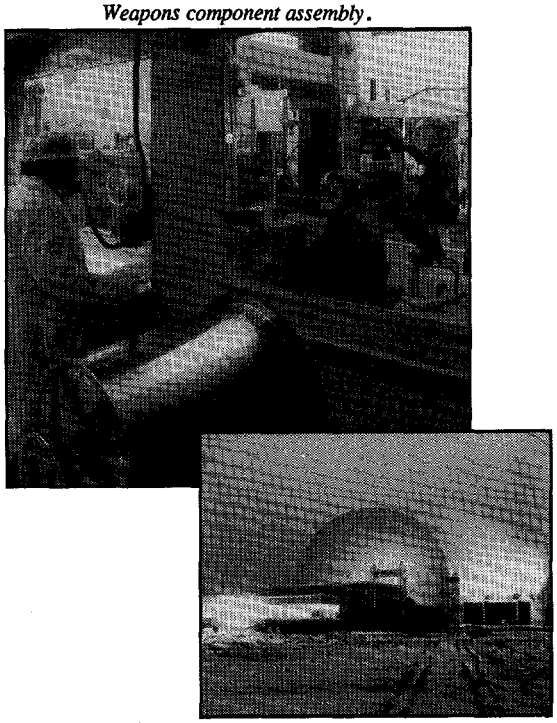
DOE will use the 2006 Plan to inform budget decisions and to sequence projects and actions to meet program objectives. EM will implement this vision in collaboration with regulators and the public. Development of the 2006 Plan will be guided by the following seven principles:

- Eliminate urgent risks
- Reduce mortgage and support costs to free up funds for further risk reduction
- Protect worker health and safety
- Reduce the generation of waste
- Create a collaborative relationship between DOE and its regulators and stakeholders
- Focus technology development on cost and risk reduction
- Integrate waste treatment and disposal within the complex

DOE's sites have already prepared initial draft site plans, and DOE is now developing a national discussion draft based upon these principles. The discussion draft will be distributed for public comment to elicit feedback on the strategic approaches for accomplishing compliance and completion goals, and on DOE's management strategies to accomplish these goals. This approach will ensure that DOE has a broad perspective when developing a draft National 2006 Plan later this year. The 2006 Plan will be a living document, evolving to reflect revised assumptions, stakeholder viewpoints, and newly obtained information.

The Final WM PEIS evaluates many waste management activities that may become components of the 2006 Plan.

Weapons component assembly.



Experimental Boiling Water Reactor at ANL-E, December 31, 1956.

1.3 Focus of the WM PEIS

DOE issued an Implementation Plan for this WM PEIS in January 1994. In that document, DOE identified the proposed action as the formulation and implementation of "an integrated environmental restoration and waste management program in a safe and environmentally sound manner and in compliance with applicable laws, regulations, and standards." However, since issuing the Implementation Plan, DOE has decided to shift the focus of the WM PEIS.

Specifically, DOE has determined that its original plan to integrate waste management and environmental restoration decisions is not appropriate, primarily because of the site-specific nature of environmental restoration decisions. These decisions, including the level of site remediation, should reflect site-specific conditions and involve local communities.

In a *Federal Register* notice issued on January 24, 1995, DOE proposed to modify the scope of the WM PEIS to eliminate the analysis of environmental restoration alternatives. Appendix A of this WM PEIS summarizes the comments received in response to the proposed change in scope and DOE's responses to those comments. Appendix A also describes various means for public involvement in planning and decision making for the Department's environmental restoration activities.

On September 22, 1995, DOE published a *Federal Register* notice announcing the release of the Draft WM PEIS and invited the public to comment on the document during the 90-day public comment period (September 22 through December 21, 1995). Opportunities to comment were provided in 13 video conference hearings held from October 17, 1995, through January 24, 1996. Several of these video conferences linked sites together with DOE Headquarters; altogether, 18 locations were involved in the hearings.

The video conference format was used to provide a wider opportunity for Headquarters' participation, support an interactive approach, and reduce costs. The public hearings were advertised through local newspapers, morning and evening drive-time radio announcements, and other DOE site-specific mechanisms, such as direct mailings to interested members of the public, meeting announcements to active groups or advisory boards, and additional advertising as deemed necessary by the DOE representatives. The specific notification approach varied by site depending on the needs of the local population. Public comments collected at the hearings were summarized in the *Draft WM PEIS Hearing Summary Report: A Compilation of Public Hearing Summaries* and placed in DOE public reading rooms in early February 1996. Comments were also received from the public and other interested parties directly through the mail.

On December 19, 1995, in response to requests from the public, congressional representatives, and major environmental groups, DOE announced an extension of the WM PEIS public comment period through February 19, 1996. Comments received throughout the comment period have been analyzed and considered in developing the Final WM PEIS, and are summarized in the Final WM PEIS Comment Response Document (Volume V of the Final WM PEIS). Documents relating to the WM PEIS are available in public reading rooms, listed in Chapter 1 (Section 1.9) of the Final WM PEIS.

During the public comment period for the Draft WM PEIS, more than 1,200 individuals, states, tribal nations, agencies, and organizations provided DOE with comments. Comments were received from virtually all of the communities near the DOE sites identified as "major" sites in the WM PEIS, and from many other interested members of the public. Many citizens and organizations submitted questions, comments, or objections regarding proposed waste management activities at particular DOE sites. Some suggested alternatives for waste management activities; others expressed their preferences for the alternatives described in the WM PEIS. A few commenters thought that DOE should prepare one comprehensive environmental impact statement on all of its activities; some expressed their support for DOE's current efforts.

Specific concerns raised during the comment period included the risk assessment methodologies (e.g., models and assumptions) used in the analysis, risks to densely populated areas and minority and low-income populations, risks associated with subsistence fishing in some communities, transportation risks, impacts on future generations, and additional exposures to populations affected by other DOE activities.

Commenters challenged DOE's designation of particular sites as major sites in the WM PEIS and requested that these sites be removed from consideration. Related to this issue were comments regarding the accuracy of current waste loads at particular sites.

DOE also received comments and questions on the relationship of the WM PEIS to other DOE programs or projects; purported inconsistencies between the

WM PEIS and other DOE documents; waste types or radioactive materials not analyzed in the WM PEIS; waste management technologies, particularly for waste treatment; the decision criteria DOE will use in making its waste management decisions; the future availability of geologic repositories at Yucca Mountain, Nevada, and the Waste Isolation Pilot Plant in New Mexico; and DOE credibility. Many commenters questioned DOE's February 1995 decision to remove environmental restoration alternatives from the scope of the WM PEIS.

Several commenters used this opportunity to raise budget concerns, especially the need to ensure the availability of funding to implement DOE's waste management activities. Some offered comments on policies or Federal programs not related to this WM PEIS, including suggestions to eliminate the production of radioactive and hazardous waste by eliminating certain DOE defense- and energy-related programs.

All comments were carefully considered by DOE. DOE made appropriate changes to the Draft WM PEIS as a result of the comments and prepared the Comment Response Document, Volume V of this Final WM PEIS, to respond to the specific comments received. In general, public comments, coupled with consultations with commenting agencies and State and tribal governments, resulted in additional analyses, clarification or correction of facts, and expanded discussion in several technical areas. The Comment Response Document provides an explanation of why certain comments did not warrant change to the WM PEIS.

In response to the comments received and in defining the preferred alternatives, the most significant changes to the WM PEIS are the following:

- DOE's preferred alternatives are identified.
- DOE modified the Decentralized Alternative for HW to replace Los Alamos National Laboratory (LANL) with Idaho National Engineering Laboratory (INEL) as a candidate site for onsite treatment of hazardous waste. This change recognizes the HW treatment capacity that exists at INEL and does not currently exist at LANL.
- With respect to revised information on waste loads, DOE prepared a new appendix, Appendix I, which presents updated waste volume inventories and projections for all waste types. Further, Appendix I allows site-specific comparisons with earlier estimates of inventories

Major Sites Analyzed in the WM PEIS

"Major" sites are those that are the focus of the WM PEIS because they meet one or more of the following criteria: (1) they are candidates to receive waste generated off site; (2) they are candidates to host disposal facilities; (3) they manage HLW; or (4) they were included to be consistent with the Federal Facility Compliance Act process. The 17 major sites are:

Argonne National Laboratory-East
Brookhaven National Laboratory
Fernald Environmental Management Project
Hanford Site
Idaho National Engineering Laboratory

Lawrence Livermore National Laboratory
Los Alamos National Laboratory
Nevada Test Site
Oak Ridge Reservation
Paducah Gaseous Diffusion Plant
Pantex Plant

Portsmouth Gaseous Diffusion Plant
Rocky Flats Environmental Technology Site
Sandia National Laboratories-New Mexico
Savannah River Site
Waste Isolation Pilot Plant
West Valley Demonstration Project

and projections upon which the analysis in the Draft WM PEIS was based to determine whether the more recent data would substantially change any of the impacts described in the Draft WM PEIS. DOE performed new analyses using updated waste inventory data at selected sites for LLMW and for LLW and TRUW under several alternatives. The results of these additional analyses are contained in the relevant waste-type chapters of the WM PEIS.

- DOE modified its analysis of environmental justice concerns to better determine whether disproportionately high and adverse health impacts to minority or low-income populations could occur. The maps illustrating the proximity of these populations around the major DOE sites have been improved and moved from the former Appendix I (as found in the Draft WM PEIS) to Appendix C of the Final WM PEIS. DOE performed additional analyses of the potential for offsite general population risk as a result of the disposal of LLMW and LLW. With respect to transportation impacts, DOE clarified the comparison of radiological risks in truck and rail transportation and included the potential number of shipments that would enter and exit each site. DOE also emphasized that the intersite routes used in the analysis are representative of possible routes, not selections.

- DOE revised Chapter 11, "Cumulative Impacts," to provide a more comprehensive evaluation of other DOE actions (e.g., tritium supply and recycling, weapons material stockpile stewardship and management, and storage and disposition of excess fissile materials) that may affect the sites.

- With respect to environmental restoration wastes, DOE substantially modified Appendix B to include updated waste volume estimates for all sites and provided more detailed discussion about how environmental restoration wastes are generated, which of these wastes may be transferred to the Waste Management Program, and how the transferred wastes may affect the WM PEIS alternatives. Appendix B also discusses the uncertainties in estimating the volumes of environmental restoration wastes and the potential effects on waste management facilities. Section 1.7.1 of Volume I was revised and now discusses how the environmental restoration program is considered in the WM PEIS and why, given current uncertainties, a full impact analysis of environmental restoration wastes cannot be done in the WM PEIS. This section also sets forth the Department's reasons for proceeding with impact analyses using only waste management wastes. A qualitative analysis of how environmental restoration transferred wastes may affect the WM PEIS alternatives is also given in each waste-type chapter (Sections 6.15, 7.15, and 8.15 of Volume I).

Other changes to the WM PEIS include: a more detailed description of the decisions to be made by DOE (Section 1.7.3 of Volume I, which also includes a discussion of decision criteria from former Section 1.8); a statement clarifying DOE's compliance with applicable State and local laws and a narrative on relevant DOE orders (Section 1.4 of Volume I); a more comprehensive discussion of site treatment plans, pollution prevention, and other DOE actions and programs (Section 1.8.2 of Volume I); a discussion of privatization (Section 1.7.4 of Volume I); a discussion of safeguards and security (Section 4.3.12 of Volume I); and information which explains why the No Action alternatives for some waste types may appear to have smaller potential impacts than other alternatives (Sections 6.2.3, 6.16, and 8.3.1 of Volume I). DOE has also made other changes suggested by commenters to improve readability, including a short Readers' Guide at the beginning of Volume I, well-known examples to demonstrate waste volumes, and a table for converting waste volumes to both cubic feet and cubic yards. The Final WM PEIS includes an updated list of preparers in Chapter 13.

As modified, the WM PEIS focuses on waste management sites (those required to treat, store, or dispose of existing wastes and wastes that will be generated in the future as a result of DOE nuclear weapons stockpile stewardship and research programs). While this document does not analyze environmental restoration alternatives, Appendix B of the WM PEIS does contain information on the anticipated waste loads generated as a result of environmental restoration

activities (see Section 1.7) and a qualitative discussion of the extent to which those waste loads may affect waste management alternatives.

1.4 Waste Types Considered in the WM PEIS

DOE is responsible for managing large inventories of LLMW, LLW, TRUW, HLW, and HW. DOE manages each of these waste types separately because they contain different components, have different levels of radioactivity, and must meet different regulatory requirements. Updated information on waste volumes for LLW, LLMW, and TRUW at DOE's sites is included in Appendix I of this WM PEIS. DOE addressed the management of spent nuclear fuel in a separate programmatic environmental impact statement and its subsequent Records of Decision (see text box on page 12).

DOE defines its radioactive wastes based partially on how they are derived. Thus, waste types may share certain characteristics; for example, transuranic elements can be found in LLMW, LLW, TRUW, and HLW.

In addition, the wastes within each category come from diverse sources and can have different characteristics. Thus, some wastes within a waste type may need to be managed much differently from other wastes within that same waste type. For example, LLMW and LLW are categorized as either alpha or non-alpha waste, depending on whether the waste contains transuranic radionuclides with half-lives greater than 20 years and with alpha particle activity of between 10 and 100 nanocuries per gram. Because of the long-term health risks associated with the long-lived transuranic radionuclides, regulatory requirements mandate different treatment or disposal processes for alpha and for non-alpha waste. TRUW is an alpha waste with activity greater than 100 nanocuries per gram. There are typically two categories of LLMW, LLW, and TRUW—"contact-handled" (CH) and "remote-handled" (RH). The difference between the two categories is due to the concentration of radioactive materials. RH waste typically requires additional shielding and containment to protect workers and the public. Most LLMW, LLW, and HW can be disposed of by shallow burial provided that they are first treated and then placed in a properly regulated disposal facility. LLMW, HLW, HW, and some TRUW are all subject to the requirements of the Resource Conservation and Recovery Act (RCRA).

Types of Radioactivity

There are four principal types of radiation: alpha particles, beta particles, gamma rays, and neutrons. Alpha particles can be stopped by a sheet of paper and will not penetrate skin; but materials that emit alpha particles are harmful if inhaled or ingested. Beta radiation can pass through skin or an inch of water but not through a thin sheet of aluminum, plywood, or steel. Gamma rays and neutrons are the most penetrating radiation and can pass through many materials, including the human body. In passing through the human body, gamma rays generally deposit less of their energy than alpha or beta particles, which are stopped in the body. Dense materials like lead are effective for absorbing gamma rays, while hydrogenous materials like water are effective in slowing down and stopping neutrons.

The following introductory sections define and discuss each of the waste types considered in this WM PEIS, current waste volumes, and the four categories of alternatives. Figure 1.4–1 and Table 1.4–1 identify sites where wastes are generated or stored for each waste type under the alternatives evaluated in the WM PEIS.

1.4.1 Low-Level Mixed Waste

Low-level mixed waste (LLMW) contains both hazardous and low-level radioactive components. The hazardous components in LLMW are subject to RCRA, whereas the radioactive components are subject to the Atomic Energy Act (AEA). LLMW is characterized as either CH or RH and as alpha or non-alpha.

Figure 1.4–1. Waste Management Sites.

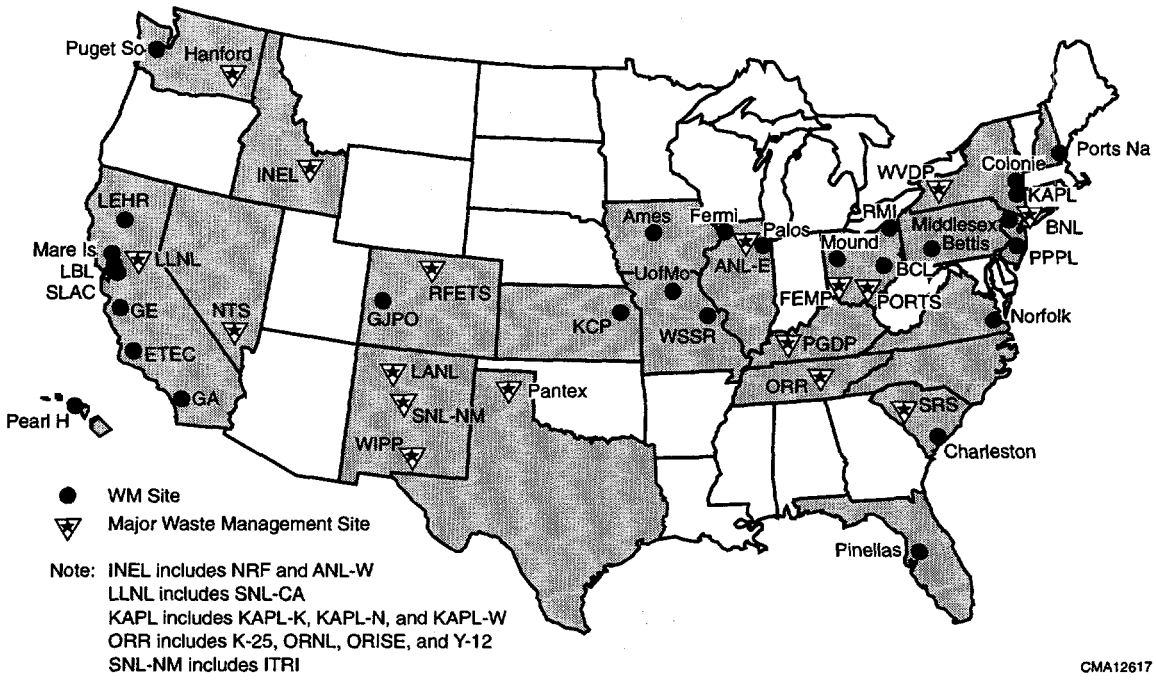


Table 1.4–1. Waste Management Sites

Sites	State	Symbol	Major Site[a]	Waste Type Managed				
				LLMW	LLW	TRUW	HLW	HW[b]
1 Ames Laboratory	IA	Ames		✓	✓			
2 Argonne National Laboratory-East	IL	ANL-E	✓	✓	✓	✓		✓
3 Battelle Columbus Laboratories	OH	BCL		✓				
4 Bettis Atomic Power Laboratory	PA	Bettis		✓	✓			
5 Brookhaven National Laboratory	NY	BNL	✓ c	✓	✓			
6 Charleston Naval Shipyard	SC	Charleston		✓	g			
7 Colonie	NY	Colonie		d				
8 Energy Technology Engineering Center	CA	ETEC		✓		✓		
9 Fermi National Accelerator Laboratory	IL	Fermi			✓			✓
10 Fernald Environmental Management Project	OH	FEMP	✓	✓	✓			
11 General Atomics	CA	GA		✓				
12 General Electric Vallecitos Nuclear Center	CA	GE		d	d			
13 Grand Junction Projects Office	CO	GJPO		✓				
14 Hanford Site	WA	Hanford	✓	✓	✓	✓	✓	✓
Idaho National Engineering Laboratory	ID	INEL	✓	✓	✓	✓	✓	✓
15 Idaho National Engineering Laboratory	ID	INEL		e	e	e	e	e
16 Argonne National Laboratory-West	ID	ANL-W		e	e	e		
17 Naval Reactor Facility	ID	NRF			e			
18 Kansas City Plant	MO	KCP		✓	✓			✓
Knolls Atomic Power Laboratory	NY	KAPL		✓	✓			
19 Knolls Atomic Power Laboratory (Kesselring)	NY	KAPL-K		e	e			
20 Knolls Atomic Power Laboratory (Niskayuna)	NY	KAPL-N		e	e			
21 Knolls Atomic Power Laboratory (Windsor)	CT	KAPL-W		e	e			
22 Laboratory for Energy-Related Health Research	CA	LEHR		✓				
23 Lawrence Berkeley Laboratory	CA	LBL		✓	✓	✓		
Lawrence Livermore National Laboratory	CA	LLNL	✓	✓	✓	✓		✓
24 Lawrence Livermore National Laboratory	CA	LLNL		e	e	e		c
25 Sandia National Laboratories (California)	CA	SNL-CA		e	e			
26 Los Alamos National Laboratory	NM	LANL	✓	✓	✓	✓		✓
27 Mare Island Naval Shipyard	CA	Mare Is		✓	g			
28 Middlesex Sampling Plant	NJ	Middlesex		d				
29 Mound Plant	OH	Mound		✓	✓	✓		
30 Nevada Test Site	NV	NTS	✓	✓	✓	✓		
31 Norfolk Naval Shipyard	VA	Norfolk		✓	g			

Table 1.4–1. Waste Management Sites—Continued

Sites	State	Symbol	Major Site[a]	Waste Type Managed				
				LLMW	LLW	TRUW	HLW	HW[b]
Oak Ridge Reservation	TN	ORR	✓	✓	✓	✓		✓
32 K-25 Site	TN	K-25		e	e			e
33 Oak Ridge Institute for Science and Education	TN	ORISE			e			
34 Oak Ridge National Laboratory	TN	ORNL		e	e	e		e
35 Y-12 Plant	TN	Y-12		e	e			e
36 Paducah Gaseous Diffusion Plant	KY	PGDP	✓	✓	✓	✓		
37 Palos Forest (Site A/Plot M)	IL	Palos		d	d			
38 Pantex Plant	TX	Pantex	✓c	✓	✓			✓
39 Pearl Harbor Naval Shipyard	HI	Pearl H		✓	g			
40 Pinellas Plant	FL	Pinellas		✓	✓			
41 Portsmouth Gaseous Diffusion Plant	OH	PORTS	✓	✓	✓			
42 Portsmouth Naval Shipyard	ME	Ports Nav		✓	g			
43 Princeton Plasma Physics Laboratory	NJ	PPPL		✓	✓			
44 Puget Sound Naval Shipyard	WA	Puget So		✓	g			
45 RMI Titanium Company	OH	RMI		✓	✓			
46 Rocky Flats Environmental Technology Site	CO	RFETS	✓	✓	✓	✓		
Sandia National Laboratories	NM	SNL-NM	✓c	✓	✓	✓		✓
47 Sandia National Laboratories (New Mex)	NM	SNL-NM		e	e	e		e
48 Inhalation Toxicology Research Institute	NM	ITRI		e	e			
49 Savannah River Site	SC	SRS	✓	✓	✓	✓	✓	✓
50 Stanford Linear Accelerator Center	CA	SLAC			✓			
51 University of Missouri	MO	UofMO		✓		✓		
52 Waste Isolation Pilot Plant	NM	WIPP	✓			f		
53 Weldon Spring Site Remedial Action Project	MO	WSSR		d	d			
54 West Valley Demonstration Project	NY	WVDP	✓c	✓	✓	✓	✓	
Total sites			17	37	27	16	4	11

Notes: ✓ = the facility is included in the indicated group. A site is listed under a waste type if it currently manages or is expected to manage that type of waste in the future. Joint DOE/Navy Nuclear Propulsion Program sites are: Bettis, Charleston, KAPL-K, KAPL-N, KAPL-W, Mare Is, Norfolk, NRF, Pearl H, Ports Nav, and Puget So. Former FUSRAP (Formerly Utilized Sites Remedial Action Program) sites are Colonie and Middlesex.

[a] "Major" sites are those that are the focus of the WM PEIS because they meet one or more of the following criteria: (1) they are candidates to receive wastes generated offsite; (2) they are candidates to host disposal facilities; (3) they manage HLW; or (4) they were included to be consistent with the Federal Facility Compliance Act process.

[b] Sites analyzed in the WM PEIS are those 11 sites that generated more than 90% of DOE's HW for the year 1992. Other DOE sites also manage HW but were not evaluated. Naval Nuclear Propulsion Program sites were not considered in the WM PEIS analysis for HW.

[c] Although this site is designated as a major site, none of the alternatives would result in wastes from other sites being shipped to this site for treatment or disposal.

[d] The site is included in the table because it is listed in data sources for LLMW; however, no programmatic waste management decision would be applicable to the site. Since it is managed as an environmental restoration site, it is excluded from the WM PEIS alternatives and waste totals.

[e] For evaluating candidate sites for waste management facilities in this WM PEIS: ANL-W and NRF have been combined with INEL; ITRI has been combined with SNL-NM; K-25, ORISE, ORNL, and Y-12 have been combined under ORR; SNL-CA has been combined with LLNL; and KAPL-K, KAPL-N, and KAPL-W have been combined under KAPL.

[f] TRUW is not currently stored or managed at WIPP. WIPP is a planned disposal site and is included because of its potential to treat TRUW.

[g] Naval shipyards may generate small quantities of LLW; however, they are not reported in the WM PEIS.

LLMW results from a variety of activities, including the processing of nuclear materials used in nuclear weapons production and energy research and development activities. The WM PEIS evaluates management of approximately 82,000 cubic meters (m^3) of LLMW that are currently stored and an estimated 137,000 cubic meters that are expected to be generated over the next 20 years (excluding LLMW that could be generated as a result of environmental restoration activities; see Table 1.7-1), for a total of approximately 219,000 cubic meters. While commercial and DOE facilities are currently insufficient to treat DOE's entire inventory of LLMW, some commercial treatment capacity does exist, and with sufficient incentives, it is assumed that commercial capacity could increase to meet demand. This WM PEIS addresses the treatment and disposal of LLMW; storage of LLMW is not addressed because RCRA prohibits storage of untreated waste except to facilitate proper recovery, treatment, or disposal. The WM PEIS addresses the transportation impacts associated with moving LLMW to treatment, storage, and disposal sites.

1.4.2 Low-Level Waste

Low-level waste (LLW) includes all radioactive waste that is not classified as HLW, spent nuclear fuel (fuel discharged from nuclear reactors), TRUW, uranium and thorium mill tailings or waste from processed ore. It does not contain HW constituents. Most LLW consists of relatively large amounts of waste materials contaminated with small amounts of radionuclides, such as contaminated equipment (e.g., gloveboxes, ventilation ducts, shielding, and laboratory equipment), protective clothing, paper, rags, packing material, and solidified sludges. LLW is further categorized as CH or RH and as alpha or non-alpha on the basis of the types and levels of radioactive emissions. However, most LLW contains short-lived radionuclides and generally can be handled without additional shielding or remote handling equipment. DOE has an inventory of approximately 67,500 cubic meters of LLW in storage, and approximately 1,440,000 cubic meters are expected to be generated during the next 20 years (excluding LLW that could be generated as a result of environmental restoration

Contact- and Remote-Handled Wastes

Radioactive waste is classified as either "contact-handled" (CH) or "remote-handled" (RH). LLMW, LLW, and TRUW can be composed of either CH or RH waste. All HLW is RH waste.

***Contact-handled** wastes are those with radiation levels less than or equal to 200 millirem per hour at the surface of a waste container and can be safely handled by direct contact.*

***Remote-handled** wastes are those with radiation levels exceeding 200 millirem per hour at the surface of a container. Such material must be handled remotely, by using such means as robots, and must have special shielding in treatment, storage, and disposal facilities.*

A millirem (one-thousandth of a rem) is a unit of measure of absorbed ionizing radiation used to assess the biological effects of a given dose of any type of radiation.

Various low-level, mixed, and hazardous waste.

activities), for a total of approximately 1,500,000 cubic meters. This WM PEIS also addresses the transportation impacts associated with moving LLW to treatment, storage, and disposal sites.

1.4.3 TRANSURANIC WASTE

TRUW is waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years (atomic number greater than 92), except for (a) HLW, (b) waste that DOE has determined, with the concurrence of the Administrator of the EPA, does not need the degree of isolation required by 40 CFR 191, or (c) waste that the U.S. Nuclear Regulatory Commission (NRC) has approved for disposal on a case-by-case basis in accordance with 10 CFR 61.[1] TRUW is generated during research, development, nuclear weapons production, and spent nuclear fuel reprocessing.

Metric Units

Volumes in this document are given in the metric unit of cubic meters (m^3). One cubic meter is equal to approximately 35 cubic feet, or 264 gallons.

TRUW, some of which also contains hazardous chemicals, has radioactive elements such as plutonium, with lesser amounts of neptunium, americium, curium, and californium. These radionuclides generally decay by emitting alpha particles. Like LLMW and LLW, TRUW also contains radionuclides that emit gamma radiation, requiring TRUW to be managed as either CH or RH. Approximately half of the TRUW analyzed is mixed waste containing both radioactive elements and hazardous chemicals regulated under RCRA.

Spent Nuclear Fuel

"Spent nuclear fuel" is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated.

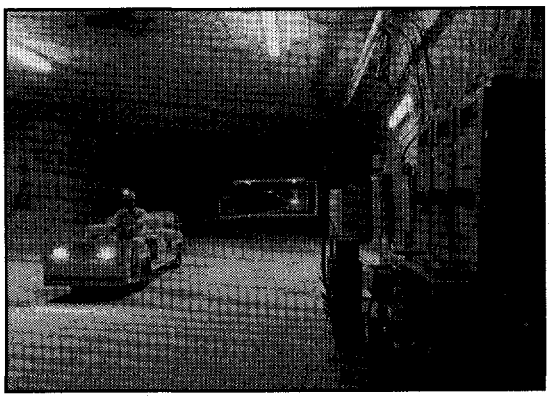
Initially, the management of spent nuclear fuel was to be analyzed in this WM PEIS. However, spent nuclear fuel has been analyzed in a separate PEIS—"Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement"—published in April 1995. The impacts of managing spent nuclear fuel are included in the cumulative impacts of this WM PEIS.

DOE has approximately 68,000 cubic meters of stored TRUW that can be retrieved and expects to generate about 64,000 cubic meters over the next 20 years (excluding TRUW that could be generated as a result of environmental restoration activities), for a total of about 132,000 cubic meters. DOE is currently proceeding with plans for TRUW disposal at a proposed geologic repository called the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. To evaluate whether to dispose of TRUW at WIPP and what level of treatment is needed for WIPP to perform as designed, DOE is preparing the WIPP Disposal Phase Supplemental EIS (SEIS-II) (draft issued Nov. 1996). Therefore, this WM PEIS addresses only the selection of DOE sites for treatment and storage facilities for TRUW. It also addresses the transportation impacts associated with moving TRUW to treatment, storage, and disposal sites.

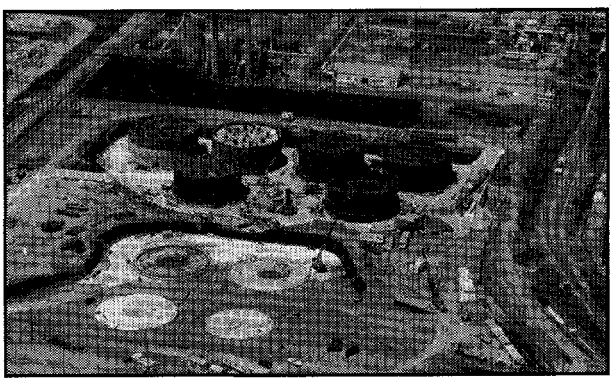
[1] LLW and LLMW may also contain these transuranic isotopes, but with concentrations less than 100 nanocuries per gram of waste.

1.4.4 High-Level Waste

High-level waste (HLW) is the highly radioactive waste resulting from reprocessing spent nuclear fuel and irradiated targets from reactors. HLW is liquid before it is treated and solidified. Some of its elements will remain radioactive for thousands of years. HLW is also a mixed waste if it contains hazardous components that are regulated under RCRA. DOE has or will have generated about 378,000 cubic meters of HLW stored in large tanks.



Access to waste panel 1 in WIPP's underground facility. Continuous air monitors in foreground.



High-level waste tanks at SRS.

DOE is proceeding with plans to treat HLW by processing it into a solid form that would not be readily dispersible into air or leachable into groundwater or surface water. This treatment process is called vitrification. The environmental impacts of vitrifying HLW have been analyzed in previous DOE environmental impact statements. Vitrification would generate approximately 21,600 canisters from the current inventory of HLW. Canisters are assumed to vary in volume between 0.85 cubic meter and 1.26 cubic meters. DOE plans to dispose of the HLW canisters in a geologic repository. This WM PEIS addresses only the storage of treated HLW prior to its ultimate disposal in such a repository. It also addresses the transportation impacts associated with moving HLW to storage sites.

1.4.5 Hazardous Waste

Hazardous waste (HW) is defined under RCRA as a solid waste, or a combination of solid wastes, that may (a) significantly contribute to an increase in mortality because of its quantity, concentration, or physical, chemical, or infectious characteristics or (b) pose a potential hazard to human health or the environment when improperly treated, stored, or disposed of. RCRA defines a "solid" waste to include solid, liquid, semisolid, or contained gaseous material.

The quantities and types of HW generated by DOE's activities vary considerably and include acids, metals, solvents, paints, oils, rags contaminated with hazardous cleaning compounds, and other hazardous materials that are byproducts of routine maintenance, degreasing, and machine shop operations. Almost 99% of DOE's HW is wastewater and is treated at DOE sites. The remaining 1%, predominantly solvents and cleaning agents, is treated at commercial facilities. The WM PEIS evaluates the treatment of the 1% of HW that is not wastewater (Chapter 10, Volume I).

*Quantities of Waste**

Low-Level Mixed Waste. *The WM PEIS addresses approximately 82,000 cubic meters of LLMW that are currently stored and an estimated 137,000 cubic meters that are expected to be generated over the next 20 years (100,000 cubic meters has about the same volume as a seven-story building the size of a football field).*

Low-Level Waste. *Approximately 67,500 cubic meters of LLW are stored, and an estimated 1,440,000 cubic meters are expected to be generated over the next 20 years.*

Transuranic Waste. *Approximately 68,000 cubic meters are retrievably stored, and an estimated 64,000 cubic meters are expected to be generated over the next 20 years.*

High-Level Waste. *Approximately 378,000 cubic meters of HLW are stored and, when treated through vitrification, will generate approximately 21,600 HLW canisters.*

Hazardous Waste. *Approximately 69,000 cubic meters of nonwastewater HW are expected to be generated in the next 20 years.*

* *Volumes do not include environmental restoration wastes.*

Over the next 20 years, DOE expects to generate approximately 69,000 cubic meters of nonwastewater HW. The WM PEIS addresses only the impacts of treating HW and the impacts associated with moving HW to treatment sites.

1.5 Decisions

Table 1.5–1 summarizes decisions DOE needs to make with respect to the treatment, storage, or disposal of these five types of waste. The alternatives describe the roles of the different sites where waste management facilities could be located.

1.6 Decision Criteria

Table 1.6–1 lists factors and criteria DOE used to evaluate alternatives in order to select a preferred alternative for each waste type considered in the WM PEIS. DOE also considered public comments in evaluating each of the alternatives.

1.7 Environmental Restoration Wastes

The term "environmental restoration" (ER) refers to the remediation of contaminated media and facilities at DOE sites. Contaminated media consist of contaminated soils, water, debris, and buildings; the volumes of such materials can be large at some sites. DOE continues to pursue environmental restoration at its sites; however, environmental restoration is not included in the scope of the WM PEIS. The decisions DOE must make about environmental restoration generally are not programmatic but instead are site specific.

Certain wastes generated during environmental restoration activities will be transferred to the waste management program for further treatment or

Table 1.5–1. Decisions DOE Will Make Based on Evaluations in the WM PEIS

Decisions	Type of Waste and Whether DOE Will Decide on Basis of WM PEIS (Yes or No)				
	Low-Level Mixed Waste	**Low-Level Waste**	**Transuranic Waste**	**High-Level Waste**	**Hazardous Waste**
Where to treat?	**YES** LLMW could be treated at 1 to 37 DOE sites.	**YES** LLW volume reduction and treatment could be conducted at 1 to 11 DOE sites. Minimum treatment could occur at all sites.	**YES** TRUW could be treated at 3 to 16 DOE sites.	**NO** HLW will be treated at 4 DOE sites where it was generated.	**YES** HW could be treated at DOE sites, or DOE could rely on commercial treatment.
Where to store?	**NO** LLMW will be stored at sites where generated until treatment and disposal.	**NO** LLW will be stored at sites where generated until treatment and disposal.	**YES** TRUW could be stored at 3 to 16 sites, pending final disposition.	**YES** HLW canisters containing treated HLW could be placed into storage at 1 to 4 DOE sites.	**NO** HW sent to commercial facilities will be stored for less than 90 days unless there is a permitted storage facility.
Where to dispose of?	**YES** LLMW could be disposed of at 1 to 16 DOE sites.	**YES** LLW could be disposed of at 1 to 16 DOE sites.	**NO** Separate evaluation of Waste Isolation Pilot Plant (WIPP) Disposal Phase is being prepared.	**NO** Separate evaluations to be prepared pursuant to the Nuclear Waste Policy Act as amended.	**NO** Commercial HW disposal facilities will continue to be used.

disposal. These wastes are referred to as ER transferred wastes. The volume of ER transferred waste depends on the extent of environmental restoration at a site, which then depends on several factors, including decisions regarding the use of the site in the future and the amount of cleanup necessary to permit that use; the balance between containment and removal strategies at a site; and the availability of commercial or DOE facilities to treat or dispose of waste. Current ER waste estimates are derived from a base-case scenario for environmental response actions at DOE sites.

Of the total volume of contaminated material from more than 10,000 contaminated areas at DOE sites (estimated to be approximately 58 million cubic meters), approximately 90% is contaminated soils. *In situ* remediation activities—such as capping contaminated soils in a landfill or entombing processing facilities, buildings, and reactors—would generate relatively small volumes of waste requiring further management.

However, environmental restoration activities that involve removing contaminants from environmental media can produce HW, LLW, LLMW, and TRUW. Although DOE has made preliminary estimates about how much of each of these wastes environmental restoration may generate at a particular site, it has almost no information on how chemical or radiological contaminants vary within each of these broad types of environmental restoration wastes. Without this basic information on the nature and composition of these wastes, DOE cannot determine the facilities needed to manage them or the impacts that the operation of those facilities might have on the environment.

Potential impacts of the addition of ER transferred waste on the WM PEIS alternatives are determined by such factors as waste management facility capacity, operational costs, and risks to workers and offsite populations. At most DOE sites, the treatment of ER transferred wastes is not expected to affect comparisons regarding the WM PEIS alternatives. Management of ER transferred

Table 1.6–1. Factors and Criteria DOE Uses in WM PEIS Decision Making

Factor	Criterion
• Consistency	Favors alternatives that are consistent with other complexwide studies using methodologies that allow valid comparisons across sites.
• Cost	Favors alternatives that have the potential to minimize overall cost for implementation of selected waste management strategies.
• Cumulative impact	Favors selection of alternatives and sites that minimize adverse cumulative environmental impacts.
• DOE mission	Favors alternatives that further the Department's mission to safely and efficiently treat, store, and ultimately dispose of wastes.
• Economic dislocation	Favors alternatives that tend to minimize economic dislocation, such as job losses.
• Environmental impact	Favors selection of alternatives and sites that would minimize adverse environmental impacts.
• Equity	Favors alternatives that distribute waste management facilities in ways that are considered equitable.
• Human health risk	Favors alternatives that reduce human health risk to both workers and the public. Human health risks depend not only on the magnitude of releases of radionuclides and hazardous chemicals but also on parameters such as population surrounding the sites, the hydrogeology of disposal sites, and the number of vehicle accidents that are expected to occur during transportation of waste.
• Implementation flexibility	Favors alternatives that maximize DOE's ability to modify activities at selected sites as circumstances change (e.g., to potentially manage large volumes of ER waste).
• Mitigation	Favors alternatives that increase DOE's ability to mitigate adverse impacts and that reduce the cost of mitigation.
• Regulatory compliance	Favors alternatives that comply with regulatory requirements, DOE Orders, and commitments made under the Federal Facility Compliance Act or with States and other regulators.
• Regulatory risk	Considers the potential for changes in statutes and regulations when evaluating alternatives and siting options.
• Site mission	Favors alternatives that are consistent with site capabilities and feasible for each waste type, particularly capacities and availability of technologies for treatment, storage, and disposal.
• Transportation	Favors alternatives that balance the amount of transportation needed to transport wastes to the sites considered in the alternatives with potential environmental risks, health risks, vehicle accidents, public concerns, mission needs, and costs.

waste could be accomplished by using available operational capacity for up to 30 years at waste management facilities, providing additional waste management facilities, or upgrading the planned facilities to accept increased amounts of wastes. Table 1.7-1 provides estimates of the volumes of transferred wastes that would be treated at waste management facilities. Because DOE does not have sufficient information about the ER transferred wastes, it cannot evaluate their impacts in the same manner as the impacts of wastes evaluated in the WM PEIS. DOE does not have enough information on the volume or contaminant composition of these wastes to perform an analysis of the impacts of treating, storing, or disposing of these wastes.

Appendix B and the cumulative impact analysis describe the DOE Environmental Restoration Program, provide estimates of waste volumes, and identify the potential effects of the addition of ER transferred waste on the WM PEIS analysis. Assumptions and uncertainties involved in the analysis are also provided.

1.8 Pollution Prevention Program Plan

Pollution prevention is defined as the use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and wastes into land, water, and air. To demonstrate DOE's commitment to pollution prevention, the Secretary of Energy has established goals, to be achieved by December 31, 1999, that will reduce DOE's routine generation of radioactive, mixed, and hazardous wastes and will reduce total releases and transfers of toxic chemicals by at least 50%.

Table 1.7-1. Estimated Waste Volumes Requiring Treatment or Disposal at Waste Management Facilities[a]

Waste Type and Activity	Environmental Restoration Transferred Waste (m^3)	Waste Management Waste (m^3)
LLMW	200,000	219,000
LLW	1,900,000	1,500,000
TRUW	80,000	132,000

[a] No HLW or HW requiring treatment or disposal in waste management facilities will be generated as a result of environmental restoration activities.

To provide a conservative analysis of DOE's future waste management program, the projections of waste volumes given in Chapters 6-10 did not assume that pollution prevention practices would significantly reduce current waste generation. However, Appendix G estimates how DOE's departmentwide reduction of 50% in annual generation of waste from DOE's pollution prevention practices may affect waste loads, costs, and human health impacts.

2 Alternatives

In this WM PEIS, the term "alternative" refers to a configuration of sites for treating, storing, or disposing of a specific waste type. Analysis of the range of reasonable configurations provides information on their potential environmental impacts that can be compared by decision makers. The alternatives analyzed in this WM PEIS for each waste type fall within four broad categories: the no action alternative and the decentralized, regionalized, and centralized alternatives.

2.1 Four Categories of Alternatives

No Action Alternative: This alternative involves using only currently existing or, in the case of HW, planned waste management facilities at DOE sites, or commercial vendors. In the NEPA process a no action alternative, or "status quo" alternative, may not necessarily comply with applicable laws and regulations, but it provides an environmental baseline against which the impacts of other alternatives can be compared.

Decentralized Alternatives: These alternatives involve managing waste where it is or will be generated. Unlike the no action alternative, the decentralized alternatives may require the siting, construction, and operation of new facilities or the modification of existing facilities. Under the decentralized alternatives, waste management facilities would be located at a larger number of sites than under the regionalized or centralized alternatives.

Regionalized Alternatives: These alternatives involve transporting wastes to a number of sites (fewer than the number of sites considered for the decentralized alternatives but greater than the number of sites considered for the centralized alternatives). In general, sites with the largest volumes of a given waste were considered as regional sites for treatment, storage, or disposal. DOE evaluated two or more regionalized alternatives for all waste types.

Centralized Alternatives: These alternatives involve transporting wastes to one or two sites for treatment, storage, or disposal. As was the case for the regionalized alternatives, those sites that have the largest volumes of a given waste were generally considered as sites for centralized management.

These four broad categories of alternatives encompass the range of reasonable alternatives available to DOE for siting facilities to manage the five waste types considered in this WM PEIS. Commercial or private facilities could potentially be used within each

NEPA Regulations

The Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR Parts 1500–1508) require Federal agencies to evaluate all reasonable alternatives to the proposed action in an environmental impact statement (EIS). An agency must provide sufficient information for each alternative so that reviewers may evaluate the comparative merits of those alternatives.

For alternatives that were eliminated from detailed study, the agency must briefly discuss the reasons for their elimination. Further, the agency must identify its preferred alternative or alternatives, if one exists, in the draft EIS, and the agency must identify the preferred alternative in the final EIS unless another law prohibits the expression of such a preference. After completing the final EIS, the agency prepares a Record of Decision that announces the decision it made and identifies the alternative it considered to be environmentally preferable.

What Is Privatization?

For purposes of this WM PEIS, privatization refers to having a private entity operate, maintain, and decommission a waste management facility on a DOE site for the exclusive use of DOE. The private entity is reimbursed by DOE on a competitive basis. Privatization also includes the construction and subsequent operation of a waste management facility (including financing and obtaining necessary permits) by a private entity on a DOE site.

What Is Commercialization?

For purposes of this WM PEIS, a "commercial" waste management facility is defined as one that is owned or operated by a private entity (or a state) and that treats, stores, or disposes of waste from a variety of sources for a fee. DOE routinely uses commercial facilities for disposal of some of its LLMW and LLW.

alternative. The programmatic decisions that DOE ultimately makes are not necessarily limited to one of the four categories of alternatives. For example, DOE could select a hybrid alternative that would incorporate actions from one or more of the four categories of alternatives analyzed. Furthermore, under each category of alternatives, there are many possible combinations for the number and location of sites for management facilities. To narrow these combinations to a reasonable range for meaningful analyses, DOE selected representative alternatives under each category. Table 2.1–1 presents the alternatives that are analyzed for each of the waste types considered in the WM PEIS.

2.2 Developing the WM PEIS Alternatives

To determine those sites that would be reasonable locations for waste management facilities, DOE identified the sites with the largest waste volumes and the ones where transportation requirements would be minimized. The impacts of waste management facilities were then analyzed at those sites.

Other criteria were used to select additional sites. Waste characteristics, specialized treatment requirements, and existing facilities were taken into consideration. Some wastes that require special treatment were analyzed separately, and treatment sites were selected for analysis on the basis of volumes requiring special treatment rather than on total volumes.

Table 2.1–1. Number of Alternatives Analyzed by Waste Type

Alternatives	LLMW	LLW	TRUW	HLW*	HW	Total
No Action	1	1	1	1	1	**5**
Decentralized	1	1	1	1	1	**5**
Regionalized	4	7	3	2	2	**18**
Centralized	1	5	1	1	0	**8**
Total	**7**	**14**	**6**	**5**	**4**	**36**

* HLW alternatives are analyzed both in terms of final disposal beginning in 2015 and final disposal beginning at some later date. However, the decision of when HLW disposal will begin is not part of the WM PEIS. A separate NEPA document will be prepared for the HLW geologic repository.

2.3 WM PEIS Preferred Alternatives

The site profiles at the end of this Summary briefly describe the roles each site may play in the national waste management programs for each waste type under the preferred alternatives. No decisions will be made until at least 30 days after publication of the WM PEIS. DOE will make separate decisions on each waste type beginning early in calendar year 1997.

DOE selected its preferred alternatives after considering the analyses presented in the WM PEIS, the decision criteria presented in Table 1.6-1 and all of the comments submitted on the Draft WM PEIS. Table 2.3-1 summarizes the preferred alternatives for all of the major sites analyzed in the WM PEIS, and Tables 2.3-2 through 2.3-6 identify the waste management activities that each of the major sites would conduct under the preferred alternative. The preferred alternatives for each waste type are as follows.

Treatment of LLMW: A number of the Department's sites (generally sites with small amounts of LLMW) would send their LLMW to other sites for treatment. The sites that would receive these wastes and treat them under the DOE's preferred alternative are Hanford, INEL, ORR, and SRS. ANL-E, FEMP, LLNL, LANL, Pantex, PORTS, RFETS, and SNL-NM would treat LLMW onsite.

DOE's preferred alternative is a combination of parts of the Decentralized Alternative and several Regionalized Alternatives as shown in Table 2.3-1. The potential environmental impacts of all alternatives for treatment of LLMW evaluated in the WM PEIS are small. DOE's preferred alternative is generally consistent with the Site Treatment Plans prepared under the FFCAct; these plans include the use of commercial facilities to treat some LLMW. DOE realizes that the compliance orders issued by State and Federal regulators on the basis of these Site Treatment Plans establish the requirements for treatment of DOE's LLMW.

Disposal of LLMW: The Department's preferred alternative at this time is to send its LLMW to regional disposal sites after it is treated. After consultations with stakeholders, the Department intends to select two or three sites from the following six: Hanford, INEL, LANL, NTS, ORR, and SRS.

The six sites named above are those at which DOE already has established LLW or LLMW disposal operations and, except for NTS and LANL, each has relatively large LLMW volumes for disposal. Because these six sites would have more than adequate capacity for the amounts of LLMW the Department will need to dispose of, there is no need for additional candidate sites. Fewer than the six sites would provide adequate capacity at a substantially lower overall cost. Relying on only one disposal site, however, would require the most transportation of the waste, and would be operationally inflexible if disposal activities were interrupted.

While all six current disposal sites remain candidates for future disposal operations and the potential health and environmental impacts of regionalized disposal are small, further consideration of various factors may affect the DOE's site preferences. For example, hydrological characteristics indicate that disposal at sites with high rainfall, such as ORR and SRS, would require mitigation costs that would not be needed at more arid sites. Preliminary cost analyses indicate that regional disposal at ORR, LANL, and INEL may not be as cost effective as disposal at SRS, NTS, and Hanford.

Because of these sometimes contravening factors and the permanence associated with disposal decisions, it is prudent to further evaluate costs and discuss all pertinent aspects of potential configurations with stakeholders before identifying two or three preferred sites for disposal. The Department will notify the public which specific sites it prefers for disposal of LLMW by publishing a notice in the *Federal Register* and by other means. DOE will not issue a Record of Decision selecting any regional disposal sites for LLMW sooner than 30 days after publication of its preferred sites in the *Federal Register*.

Table 2.3–1. Summary of Preferred Alternatives

Waste Type	Decision	ANL	BNL	FEMP	Hanford	INEL	LLNL	LANL	NTS	ORR
LLMW	Treatment	D	R1[a]	D	R1	R4	D	D	R1[a]	R2
	Disposal[b]	R	R	R	R	R	R	R	R	R
LLW	Treatment	R3	R3	R3	R3	R3	R3	R3	R3	R3
	Disposal[b]	R	R	R	R	R	R	R	R	R
TRUW	Treatment	D			D	R3	D	D	D	R1
HLW	Storage				D	D				
HW	Treatment	N	-	-	N	N	N	N	-	N

Waste Type	Decision	PGDP	Pantex	PORTS	RFETS	SNL–NM	SRS	WVDP	WIPP
LLMW	Treatment	R2	D	D	D	D	R1	R1[a]	
	Disposal[b]	R	R	R	R	R	R	R	
LLW	Treatment	R3	R3	R3	R3	R3	R3	R3	
	Disposal[b]	R	R	R	R	R	R	R	
TRUW	Treatment	D	**		D	R1	R1	D	*
HLW	Storage						D	D	
HW	Treatment	-	N	-	-	N	N	-	

Notes: N = No Action; D = Decentralized; R1, R2, R3, R4 = Regionalized; - = site not analyzed as a major generating site; * = no impacts from treatment or storage; ** = the very small amount of TRUW at Pantex would be shipped to LANL for treatment and storage. A blank cell indicates that the waste type is not found at the site.
[a] Wastes from these sites (BNL, NTS, and WVDP) are shipped offsite to regional treatment centers.
[b] DOE prefers to further narrow its configuration of LLMW and LLW disposal sites to two to three sites. The selection of sites would be made following consultation with regulatory authorities, State and Tribal governments, and other interested stakeholders.

Table 2.3–2. Waste Management Activities Under the Preferred Alternative for Treatment and Disposal of LLMW

Generating Site[a]	Activity	Location	Receives Waste	Ships Waste to
Ames	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
ANL-E	Treatment	Onsite		Some waste may be shipped to regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
BCL	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]

Table 2.3-2. Waste Management Activities Under the Preferred Alternative for Treatment and Disposal of LLMW—Continued

Generating Site[a]	Activity	Location	Receives Waste	Ships Waste to
Bettis	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
BNL	Treatment	Offsite[d]		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
Charleston	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
ETEC	Treatment	Offsite[d]		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
FEMP	Treatment	Onsite[d]		Some waste may be shipped to regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
GA	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[c]
GJPO	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[c]
Hanford	Treatment	Onsite	Regional treatment site[b]	
	Disposal	Onsite/offsite	Potential regional disposal site	Regional disposal site[c]
INEL	Treatment	Onsite	Regional treatment site[b]	Some INEL waste may be shipped to another regional treatment site[b]
	Disposal	Onsite/offsite	Potential regional disposal site	Regional disposal site[c]
KCP	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
KAPL	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
LEHR	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
LBL	Treatment	Offsite[d]		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
LLNL	Treatment	Onsite		Some waste may be shipped to regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
LANL	Treatment	Onsite		
	Disposal	Onsite/offsite	Potential regional disposal site	Regional disposal site[c]
Mare Island	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
Mound	Treatment	Onsite[e]		Regional treatment site[b,e]
	Disposal	Offsite		Regional disposal site[c]
NTS	Treatment	Offsite		Regional treatment site[b]
	Disposal	Onsite/offsite	Potential regional disposal site	Regional disposal site[c]
Norfolk	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]

Table 2.3-2. Waste Management Activities Under the Preferred Alternative for Treatment and Disposal of LLMW—Continued

Generating Site[a]	Activity	Location	Receives Waste	Ships Waste to
ORR	Treatment	Onsite	Regional treatment site[b]	
	Disposal	Onsite/offsite	Potential regional disposal site	Regional disposal site[c]
PGDP	Treatment	Offsite[d]		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
Pantex	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[c]
Pearl Harbor	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
Pinellas	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
PORTS	Treatment	Onsite[f]		Regional treatment site[b,f]
	Disposal	Offsite		Regional disposal site[c]
Ports Nav	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
PPPL	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
Puget So	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
RMI	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
RFETS	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[c]
SNL-NM	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[c]
SRS	Treatment	Onsite	Regional treatment site[b]	Some SRS waste may be shipped to another regional treatment site
	Disposal	Onsite/offsite	Potential regional disposal site	Regional disposal site[c]
UofMO	Treatment	Offsite		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]
WVDP	Treatment	Offsite[d]		Regional treatment site[b]
	Disposal	Offsite		Regional disposal site[c]

Note: A blank cell indicates that a site either does not receive LLMW from other sites or does not ship LLMW to other sites.

[a] A site is listed if it currently manages LLMW or is expected to manage it in the future.

[b] The regional treatment sites would be Hanford, INEL, ORR, or SRS, depending upon which site is shipping waste. The configuration analyzed in the WM PEIS for Hanford, INEL, ORR, and SRS is not exactly the same as those in the Site Treatment Plans; under the Site Treatment Plans:

- Hanford receives LLMW from BCL;
- INEL receives LLMW from Bettis, Charleston, ETEC, KAPL, LBL, LLNL, Mare Island, NTS, Norfolk, Pearl Harbor, PORTS, Puget So, SRS, and UofMO;
- ORR receives LLMW from ANL-E, BNL, FEMP, INEL, LBL, Mound, NTS, PGDP, PORTS, RMI, and WVDP; and
- SRS receives LLMW from Bettis, Charleston, KAPL, and Norfolk.

The evaluation of impacts at each of the major sites under the Preferred Alternative provides similar results as the configurations specified in the Site Treatment Plans. DOE realizes that the Site Treatment Plans, unless modified by the appropriate regulatory agency, establish the requirements for treatment of DOE's LLMW.

[c] The selection of two or three regional disposal sites will be made following further consultation with regulatory agencies, State and Tribal Governments, and other interested stakeholders.

[d] Site Treatment Plan indicates some waste may be treated onsite.

[e] Site Treatment Plan indicates some waste may be treated offsite at ORR.

[f] Site Treatment Plan indicates some waste may be treated offsite at INEL and ORR.

Table 2.3–3. Waste Management Activities Under the Preferred Alternative for Treatment and Disposal of LLW

Generating Site[a]	Activity	Location	Receives Waste	Ships Waste to
Ames	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
ANL-E	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
Bettis	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
BNL	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
Fermi	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
FEMP	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
Hanford	Treatment	Onsite		
	Disposal	Onsite or offsite	Potential regional disposal site	Regional disposal site[b]
INEL	Treatment	Onsite		
	Disposal	Onsite or offsite	Potential regional disposal site	Regional disposal site[b]
KCP	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
KAPL	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
LBL	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
LLNL	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
LANL	Treatment	Onsite		
	Disposal	Onsite or offsite	Potential regional disposal site	Regional disposal site[b]
Mound	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
NTS	Treatment	Onsite		
	Disposal	Onsite or offsite	Potential regional disposal site	Regional disposal site[b]
ORR	Treatment	Onsite		
	Disposal	Onsite or offsite	Potential regional disposal site	Regional disposal site[b]
PGDP	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
Pantex	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
Pinellas	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]

Table 2.3–3. Waste Management Activities Under the Preferred Alternative for Treatment and Disposal of LLW—Continued

Generating Site[a]	Activity	Location	Receives Waste	Ships Waste to
PORTS	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
PPPL	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
RFETS	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
RMI	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
SNL-NM	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
SRS	Treatment	Onsite		
	Disposal	Onsite or offsite	Potential regional disposal site	Regional disposal site[b]
SLAC	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]
WVDP	Treatment	Onsite		
	Disposal	Offsite		Regional disposal site[b]

Note: A blank cell indicates that a site either does not receive LLW from other sites or does not ship LLW to other sites.
[a] A site is listed if it currently manages LLW or is expected to manage it in the future.
[b] The selection of two or three regional disposal sites will be made following further consultation with regulatory agencies, State and Tribal governments, and other interested stakeholders.

Table 2.3–4. Waste Management Activities Under the Preferred Alternative for Treatment and Storage of TRUW

Generating Site[a]	Activity	Location	Receives Waste	Ships Waste to[c]
ANL-E	Treatment	Onsite		
	Storage	Onsite		
ETEC	Treatment	Onsite		
	Storage	Onsite		
Hanford	Treatment	Onsite		
	Storage	Onsite		
INEL	Treatment	Onsite	RFETS	
	Storage	Onsite	RFETS	
LANL	Treatment	Onsite	Pantex, SNL-NM	
	Storage	Onsite	Pantex, SNL-NM	
LBL	Treatment	Onsite		
	Storage	Onsite		

Table 2.3–4. Waste Management Activities Under the Preferred Alternative for Treatment and Storage of TRUW—Continued

Generating Site[a]	Activity	Location	Receives Waste	Ships Waste to[c]
LLNL	Treatment	Onsite		
	Storage	Onsite		
Mound	Treatment	Onsite		
	Storage	Onsite		
NTS	Treatment	Onsite		
	Storage	Onsite		
ORR[b]	Treatment	Onsite/offsite	SRS	CH-TRUW to SRS
	Storage	Onsite/offsite	SRS	CH-TRUW to SRS
Pantex	Treatment	Offsite		LANL
	Storage	Offsite		LANL
PGDP	Treatment	Onsite		
	Storage	Onsite		
RFETS	Treatment	Onsite/offsite		INEL
	Storage	Onsite/offsite		INEL
SNL-NM	Treatment	Offsite		LANL
	Storage	Offsite		LANL
SRS[b]	Treatment	Onsite/offsite	ORR	RH-TRUW to ORR
	Storage	Onsite/offsite	ORR	RH-TRUW to ORR
UofMO	Treatment	Onsite		
	Storage	Onsite		
WVDP	Treatment	Onsite		
	Storage	Onsite		

Notes: CH-TRUW = contact-handled TRUW; RH-TRUW = remote-handled TRUW. A blank cell indicates that a site either does not receive TRUW from other sites or does not ship TRUW to other sites.
[a] A site is listed if it currently manages TRUW or is expected to manage it in the future.
[b] Under the Preferred Alternative, ORR is a regional treatment center for RH-TRUW, and SRS is a regional treatment center for CH-TRUW.
[c] Storage of treated TRUW pending final disposition.

Table 2.3–5. Waste Management Activities Under the Preferred Alternative for Storage of Treated HLW

Generating Site[a]	Stores Waste at	Receives Waste	Ships Waste to[b]
Hanford	Hanford		
INEL	INEL		
SRS	SRS		
WVDP	WVDP		

Note: A blank cell indicates that a site either does not receive HLW from other sites or does not ship HLW to other sites.
[a] A site is listed if it currently manages HLW or is expected to manage it in the future.
[b] Storage pending ultimate disposition.

Table 2.3–6. Waste Management Activities Under the Preferred Alternative for Treatment of HW

Generating Site[a]	Treats Waste at	Receives Waste	Ships Waste to
ANL-E	Offsite commercial facility		Offsite commercial treatment facility
Fermi	Offsite commercial facility		Offsite commercial treatment facility
Hanford	Offsite commercial facility		Offsite commercial treatment facility
INEL	Organic HW onsite, other HW at offsite commercial facility		Offsite commercial treatment facility
KCP	Offsite commercial facility		Offsite commercial treatment facility
LANL	Offsite commercial facility		Offsite commercial treatment facility
LLNL	Offsite commercial facility		Offsite commercial treatment facility
ORR	Organic HW onsite, other HW at offsite commercial facility		Offsite commercial treatment facility
Pantex	Offsite commercial facility		Offsite commercial treatment facility
SNL-NM	Offsite commercial facility		Offsite commercial treatment facility
SRS	Offsite commercial facility		Offsite commercial treatment facility

Note: A blank cell indicates that a site either does not receive HW from other sites or does not ship HW to other sites.
[a] Sites analyzed in the WM PEIS are those 11 sites that generated more than 90% of DOE's HW in 1991.

Treatment of LLW: Each site with LLW would treat its waste onsite. Each site would perform minimum treatment on its wastes to prepare them for disposal, although DOE would allow each of its sites the flexibility to perform additional treatment if it would decrease costs and requirements for transportation by significantly reducing the volume of LLW requiring disposal. The potential environmental impacts of all alternatives for treatment of LLW evaluated in the WM PEIS are small. The impacts of DOE's preferred alternative for LLW are identified in Regionalized Alternative 3 as shown in Table 2.3–1, under which the potential impacts associated with minimum treatment of LLW at each site were analyzed, assuming regionalized disposal, as discussed below.

Disposal of LLW: The Department's preferred alternative at this time is to send its LLW to regional disposal sites after it is treated. After consultations with stakeholders, the Department intends to select two or three sites from the following six: Hanford, INEL, LANL, NTS, ORR, and SRS.

The six sites named above are those at which DOE already has established LLW disposal operations and, except for NTS, each has large waste volumes for disposal. Because these six sites would have more than adequate capacity for the amounts of LLW the Department will need to dispose of, there is no need to establish additional sites. Fewer than the six sites would provide adequate capacity at a substantially lower overall cost. Relying on only one disposal site, however, would require the most transportation of the waste, with correspondingly higher traffic accident fatalities, and would be operationally inflexible if disposal activities were interrupted.

While all six current disposal sites remain candidates for future disposal operations and the potential health and environmental impacts of regionalized disposal are small, further consideration of various factors may affect the DOE's site preferences. For example, hydrological characteristics indicate that disposal at sites with high rainfall, such as ORR and SRS, would require mitigation

costs that would not be needed at more arid sites. However, a disposal configuration that included at least one eastern site and one western site would require less transportation and produce fewer fatalities from traffic accidents than an eastern-only or western-only configuration. Preliminary cost analyses indicate that regional disposal at ORR, LANL, and INEL may not be as cost effective as disposal at SRS, NTS, and Hanford.

Because of these sometimes contravening factors and the permanence associated with disposal decisions, it is prudent to further evaluate costs and discuss all pertinent aspects of potential configurations with stakeholders before identifying two or three preferred sites for disposal. The Department will notify the public which specific sites it prefers for disposal of LLW by publishing a notice in the *Federal Register* and by other means. DOE will not issue a Record of Decision selecting any regional disposal sites for LLW sooner than 30 days after publication of its preferred sites in the *Federal Register*.

Treatment and Storage of TRUW: Most of the DOE's sites with TRUW would treat and store it onsite. Five sites would ship TRUW to other sites for treatment under the preferred alternative: Pantex would ship its very small amount of TRUW to LANL for treatment; RFETS would ship some of its TRUW to INEL for treatment; ORR would send its CH-TRUW to SRS for treatment; SRS would send its RH-TRUW to ORR for treatment; and SNL-NM would send its small amount of TRUW to LANL for treatment. This preference assumes that WIPP will require treatment to the waste acceptance criteria the Department has proposed to EPA for this geologic repository. DOE's preference could change if WIPP requires a different level of treatment. The Department would store its TRUW where it is treated pending a decision on its disposal or other disposition.

DOE's preferred alternative is a combination of parts of the Decentralized Alternative and several of the Regionalized Alternatives as shown in Table 2.3-1. It provides for cost-effective management of TRUW, poses low potential risks to the public, and has relatively small environmental impacts. DOE's preference is consistent with the preferred alternative identified in the *Waste Isolation Pilot Plant Disposal Phase Draft Supplemental Environmental Impact Statement* (WIPP SEIS-II).

Storage of HLW: The Department's preferred alternative at this time is to store its HLW where the waste is treated pending a decision on its disposal or other disposition. Because it is impractical to ship liquid HLW for treatment, DOE had previously decided that each of the four sites with HLW (Hanford, INEL, SRS, and WVDP) will treat its own waste onsite.

The potential impacts of DOE's preferred alternative are presented under the Decentralized Alternative for HLW. This alternative minimizes the transportation of treated HLW, makes use of existing storage capacity at WVDP and SRS, and would cost less than regionalized or centralized storage. The potential environmental impacts of all alternatives for HLW evaluated in the WM PEIS are small.

Treatment of HW: DOE's preferred alternative for HW is the No Action Alternative, which means the Department would continue to use commercial facilities to treat most of its non-wastewater HW. The transportation and environmental impacts are low for all of the alternatives for HW evaluated in the WM PEIS; however, the No Action Alternative costs less than the Decentralized or Regionalized Alternatives for HW treatment.

3 *Analysis*

To evaluate the potential environmental impacts of the alternatives, DOE first identified the characteristics, quantity, and special requirements (e.g., handling requirements) of each waste type. To frame the analysis within reasonable bounds and to make the analytical process more manageable, DOE developed and applied specific assumptions to the alternatives. DOE then determined the health risks, environmental impacts, and costs of implementing each alternative for each waste type. Figure 3.1–1 depicts this framework.

3.1 *The Analytical Process*

The management impacts of the five waste types were evaluated using an analytical process with three phases, as shown in Figure 3.1–2, for each of the alternatives. This three-phase approach was applied in the analysis of treatment, transportation, storage, and disposal activities.

In Phase I, DOE made certain assumptions concerning the physical, chemical, and radiological characteristics of the waste streams and the volume of each waste type. The physical, chemical, and radiological characteristics of the thousands of inventoried waste streams were aggregated into a smaller number of waste treatability groups for each waste type (e.g., 9 treatability groups for LLW, 23 for LLMW, and 19 for TRUW). Generic treatment system designs were developed for each of the treatability groups by using currently accepted treatment technologies.

Conceptual treatment facilities were then modeled that could process the volume of waste.

Figure 3.1–1. Waste Management System.

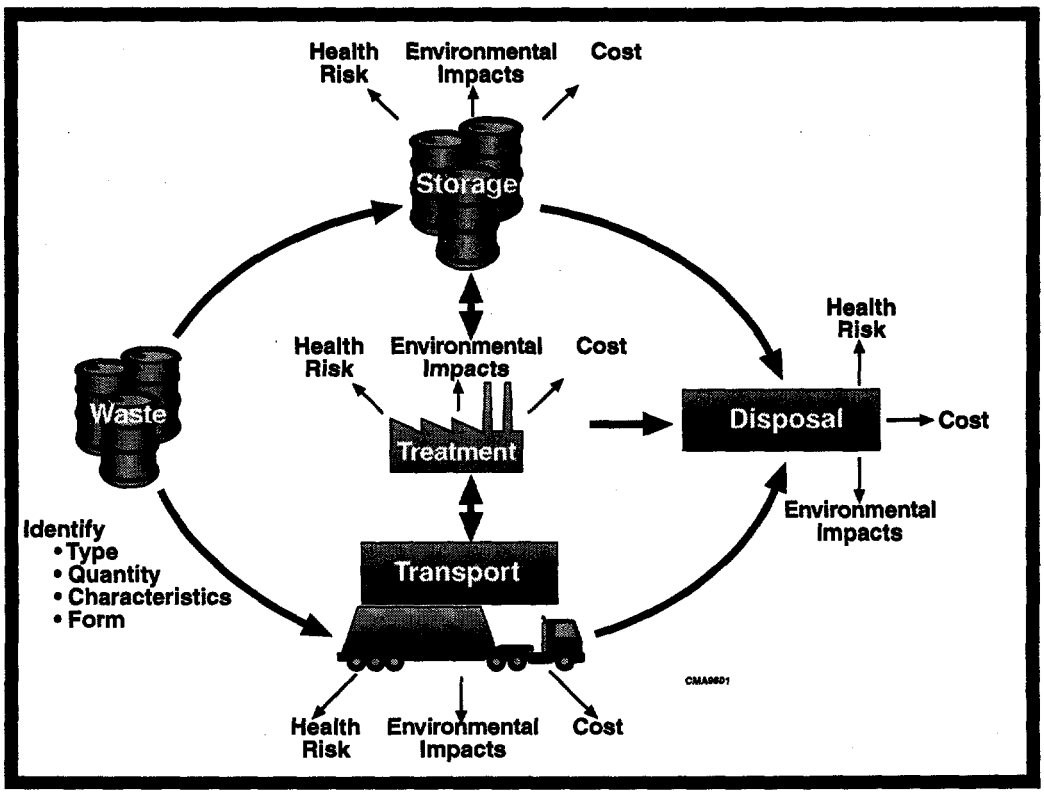
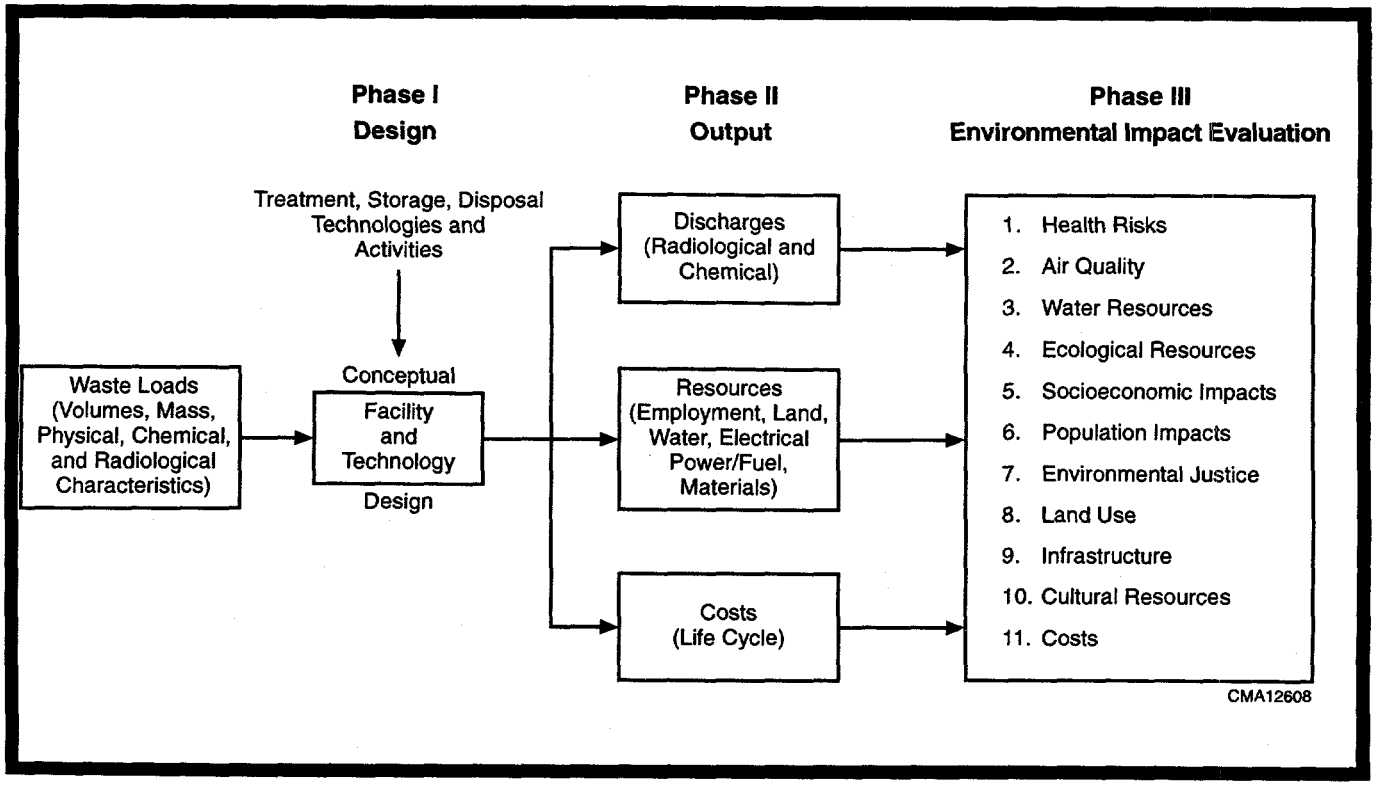


Figure 3.1-2. WM PEIS Analytical Process.



Initially the waste types were grouped into six physical categories on the basis of common engineering criteria. DOE then used standard radiological profiles for each site and made assumptions about the concentrations of contaminants in each treatability group on the basis of available data. Hazardous constituents were assigned to the treatability groups by using an average composition for all DOE sites. The assumptions for both radioactive and hazardous constituents vary by waste type assigned.

To develop conceptual facilities for the analysis, DOE considered all types of waste management facilities needed to process and transport each waste type and also examined the various technologies available for managing the specific type of waste.

The generic waste management facilities were assumed to be placed at selected locations on a DOE site—an existing waste management location or the geographic center of the DOE site—so that actual environmental data could be used in the analysis (e.g., data regarding distance to receptors and prevailing winds). The use of a specific location permitted the analysis of impacts by providing actual environmental settings for a facility; placement of facilities at sites was done only for analysis purposes. Decisions regarding the actual location of waste management facilities at DOE sites will not be made on the basis of this WM PEIS, but will be the subject of site-specific NEPA reviews.

In Phase II, the engineering features of the conceptual facility and the waste volumes "processed" through the facility formed the basis for the estimates of resources required, effluents released, and cost. In Phase III, Environmental Impact Evaluation, the releases, resources, and costs became the input for evaluating health risks, environmental impacts, and socioeconomic impacts.

To conduct the analysis, DOE had to define the "affected environment." The affected environment is "interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment." DOE described the affected environment to establish the baseline conditions at each of the major sites before evaluating the components of the WM PEIS alternatives. The baseline can then be compared with the level of impacts directly related to a given alternative. Because of the national scope of this WM PEIS, DOE not only examined specific site characteristics but also examined broad regions of influence surrounding the sites, as well as the interconnecting roadway and rail corridors between sites. The WM PEIS analyzes the environmental impacts of operating waste management facilities for 10 years. Although the facilities could operate for up to 30 years, DOE expects that most of the annual impacts after 10 years of operation would be similar to or less than those predicted by the WM PEIS. The remainder of this section highlights the analysis performed for each of the impact areas considered.

3.2 *Types of Impacts*

Ten types of environmental impacts were evaluated in the WM PEIS: Health Risk, Air Quality, Water Resources, Ecological, Economic, Population, Environmental Justice, Land Use, Infrastructure, and Cultural Resources. Costs were also evaluated.

3.2.1 Health Risks

Health risk impacts can result from exposure to radiation and chemicals and from physical trauma (i.e., accidents) associated with constructing and operating treatment and disposal facilities or transporting waste. The WM PEIS evaluates risks associated with activities that occur over a 20-year period (10 years of construction followed by 10 years of operations).

Waste Treatability Groups

- ***Aqueous liquids.*** *Primarily water with organic content less than 1% (such as wastewater)*
- ***Organic liquids.*** *Liquids and slurries with organic content greater than 1% (such as solvents)*
- ***Organic and inorganic sludge and particulates.*** *Solid and semisolid material other than debris (such as sludge from treatment plants, resins, and solids less than 1-centimeter-diameter particle size)*
- ***Soils.*** *Contaminated soils (such as contaminated earth requiring remediation)*
- ***Debris.*** *Solid material exceeding 1-centimeter-diameter particle size that is either (1) manufactured, (2) plant or animal matter, or (3) discarded natural or geologic material*
- ***Other.*** *Special waste streams (such as batteries, laboratory packs, reactive metals, and toxic metals, which include mercury, lead, and beryllium)*

This basic framework analysis was used for four waste types: LLMW, LLW, TRUW, and HW. For purposes of the WM PEIS analysis, HLW is assumed to have been treated (vitrified) before it would be stored. The WM PEIS only addresses the environmental consequences of storing and transporting vitrified HLW.

For routine operations involving treatment, health effects were evaluated for the offsite population, the onsite worker population not involved in treatment, and waste management workers directly involved in treatment. Risks were quantified using two approaches: analysis of *population* health risk impacts and analysis of *individual* health risk impacts.

Population health risks focus on the *total number* of people in each population who would experience adverse health impacts if a particular alternative is implemented. These impacts include fatalities from physical hazards, cancer fatalities, cancer incidences, and genetic effects.

Individual impacts focus on the *probability* that the "maximally exposed individual" (MEI) within each receptor population would experience an adverse health impact. These impacts include the probabilities of a cancer fatality, cancer incidence, and genetic effects. Because the focus is on the MEI, the risk is presented as a probability (e.g., one-in-one-million chance) of that individual experiencing an adverse health impact, rather than the total number of impacts for an affected population.

Health risks resulting from disposal were evaluated for LLMW and LLW. The analysis considered risk to workers handling the treated waste, risk to an onsite "hypothetical farm family" living 300 meters from the center of the disposal facility, and risk to a hypothetical "intruder" into the disposal facility after the facility has been closed. The risks to the hypothetical farm family were estimated over a 10,000-year period because the maximum exposure would occur in the future after the disposal unit breaks down and potential contaminants leak into groundwater. The 10,000-year period was selected for the analysis to maintain consistency with the "Guidelines for Radiological Performance Assessment of DOE Low-Level Radioactive Waste Disposal Sites" that existed at the time the WM PEIS analysis was initiated. The guidance for performance assessments has since been changed; current guidance suggests that a 1,000-year time period should be used in the performance

Maximally Exposed Individual

In keeping with standard risk assessment methodology, DOE analyzed the impacts to a "maximally exposed individual." The MEI is the hypothetical person within the receptor group who has the highest exposure. This individual is assumed to be located at the point of maximum concentration of contaminants 24 hours per day, 7 days per week, for the 10-year period of treatment operations analyzed in the WM PEIS.

Hypothetical Farm Family and Intruder

The "hypothetical farm family" is an imaginary family assumed to live 300 meters downgradient of the center of a waste disposal unit. The family engages in farming activities, such as growing and consuming its own crops and livestock, and uses groundwater for watering the crops and animals. This is an estimated maximum exposure scenario taking place in the future at a time when institutional controls no longer exist. The scenario is analyzed to determine potential maximum exposures from ingestion of contaminated groundwater.

The hypothetical "intruder" is an imaginary adult who drills a well directly through a disposal unit to the groundwater. As a result of the drilling, contaminated soil from within the unit is brought to the surface, where it mixes with the top layers of the surface soil. The individual farms the land and eats the crops. The intruder scenario occurs after the failure of institutional control over the disposal facility. This scenario is consistent with the analysis required for disposal facilities under DOE Order 5820.2A.

assessments for waste disposal conducted to satisfy the requirements of DOE Order 5820.2A.

In addition to risks from construction and routine operations, health impacts from potential treatment and storage facility accidents were also evaluated. Data in safety analysis reports and site EISs were used as indicators of the consequences for a range of storage facility accidents of varying probabilities. For LLMW, LLW, TRUW, and HW treatment, the accident analysis focused on thermal treatment (specifically, incineration), because there is a significant amount of incineration data available, impacts of accidents associated with incineration are thought to be representative of and to encompass those accidents associated with other treatment technologies, and the public is very interested in incineration technology.

Transporting the wastes for treatment, storage, and disposal may affect the health of the public along the transportation route and the truck drivers or rail crew. Impacts evaluated included radiation exposure during normal operations, accidents in which the waste containers are assumed to open, exposure to vehicle exhaust during transport, and physical injury from vehicle accidents.

3.2.2 Air Quality Impacts

DOE evaluated air quality impacts at each proposed management site on the basis of estimated increases in emissions of the six criteria air pollutants, hazardous air pollutants (which include radionuclides), and toxic air pollutants when applicable. Pollutant emission estimates were made for construction and for operations and maintenance (O&M) activities of the waste facilities.

Criteria air pollutants can be emitted from construction equipment or from vehicles that workers use to drive to waste management facility construction sites. Both are considered to be "mobile sources" and thus subject to certain regulations. Criteria air pollutants can also be emitted during operation and management of LLMW, LLW, HW, and TRUW facilities (considered "stationary sources") and by vehicles that are driven by workers to the waste management facility or used to transport waste (mobile sources). DOE evaluated air quality impacts for these pollutants at each site by comparing estimated releases for each alternative with the allowable emission limits.

For all wastes except HLW and HW, DOE also evaluated impacts from radionuclide emissions by comparing the dose to the offsite MEI with the 10-millirem-per-year standard under the National Emission Standards for Hazardous Air Pollutants. Concentrations of hazardous or toxic air pollutants were compared with Federal, State, or local air quality standards and guidelines.

3.2.3 Water Resources Impacts

DOE analyzed the impacts on onsite water resources from management activities. DOE evaluated the effects on water availability from constructing and operating waste management facilities. Increases of greater than 1% over the current water use were identified and the impacts analyzed.

DOE also evaluated the impacts to groundwater quality caused by the migration of radionuclides and chemicals that leach from disposal facilities over time. DOE calculated concentrations of radionuclides and hazardous components at a hypothetical well located

Major Types of Air Pollutants

Criteria Air Pollutants: *carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxide (NO_2), lead (Pb), ozone (O_3), and particulate matter less than or equal to 10 microns in diameter (PM_{10})*

Hazardous Air Pollutants: *189 hazardous substances (including radionuclides) whose emissions are regulated by the Clean Air Act*

Toxic Air Pollutants: *Other toxic compounds regulated by EPA and State or local governments*

300 meters from the center of the disposal facility and compared these to drinking water standards.

3.2.4 Ecological Resources Impacts

DOE analyzed the effects of both construction site clearing (to build waste management facilities) and of airborne releases of contaminants from these facilities on ecological resources. DOE also considered the effects of accidental spills of waste during transportation. Sites where proposed construction would disturb more than 1% of the available management area were identified.

Although DOE intends to use the WM PEIS as a tool to help select sites for waste management, it will not select the specific location for a waste management facility at a site on the basis of this WM PEIS. Specific locations will be selected on the basis of subsequent sitewide or project-specific NEPA reviews. Potential impacts to sensitive species or habitats at particular locations within a site would be analyzed in those reviews.

3.2.5 Economic Impacts

DOE estimated the effects of expenditures for waste management activities on the local and national economies. Local economic effects were determined on the basis of direct expenditures at each site for construction, O&M, and decontamination of waste management facilities. The region of influence (ROI), where local effects were evaluated, consists essentially of the counties of residence of site employees. The local economy at each site was represented by employment, personal income, and industry data for the ROI counties. Local increases in jobs and personal income were considered to be substantial benefits in cases where the increases were 1% or more above the 1990 baseline. Transportation expenditures were considered at the national level only.

3.2.6 Population Impacts

The analysis also examined the potential for the waste management alternatives to cause the types of social impacts that could result when any large industrial or public works project attracts workers and their families to an area. Potential population changes in the ROI were estimated by using the direct labor requirement to calculate potential worker migration into the region.

3.2.7 Environmental Justice

Federal agencies have been directed by Executive Order to incorporate considerations of environmental justice into their missions. As such, Federal agencies are specifically directed to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority and low-income populations.

To perform this assessment for the WM PEIS, DOE used a geographic information system and Census Bureau data at the tract level to identify minority and low-income populations within 50 miles of the 17 major sites. Native American lands within 50 miles of any site were also identified and mapped. DOE then reviewed the potential health risks and environmental impacts associated with alternatives for the five waste types. The potential inequities from the waste management alternatives were analyzed in terms of the proportion of minority and low-income populations that reside within the 50-mile zone of impact at each site. Only in cases where a specific impact was high near a particular site would there be a potential for disproportionately high and adverse impacts to minority or low-income groups. Sites where risks or environmental impacts were estimated to be potentially high or adverse are identified.

3.2.8 Land Use Impacts

DOE examined the impacts on land use that could result from the alternatives for each waste type by comparing the acreage required for new management facilities with the acreage either designated for waste operations or suitable for development at a site. Suitable land is the total site acreage, minus the acreage required for existing structures, known cultural resource areas, sensitive habitats (including

wetlands and wildlife management areas), prohibitive topographic (surface) features, and surface waters. Where the acreage comparison showed a 1% or greater land requirement (of the designated or suitable land area) for new facilities, further evaluation of impacts was conducted. Available site development plans were also used to identify potential conflicts among the proposed facilities required under each alternative and plans for future site uses.

INEL central facilities area.

3.2.9 Infrastructure Impacts

DOE evaluated the impacts on site infrastructure by comparing requirements for water, wastewater treatment, and electrical power that result from implementing the WM PEIS alternatives with existing onsite capacities. Site transportation infrastructure and offsite infrastructure impacts were evaluated by using estimates of increased population resulting from the proposed activities as an indicator of increased demand on the community infrastructure.

ORR Y-12 Plant looking west.

Impacts were considered possible where increases in onsite infrastructure requirements were 5% or greater. Major impacts were considered possible where new requirements caused system capacity to be approached or exceeded. Therefore, any increase of 5% or greater that caused the total site use rate to exceed 90% of available capacity, was considered to have the potential to cause a major infrastructure impact.

Site transportation infrastructure impacts and offsite community infrastructure impacts were evaluated indirectly by comparing new site employment to existing site employment as an indicator of increased stress on site transportation systems and offsite infrastructure. New site employment of less than 5% of current employment was considered likely to have negligible or minor impacts. Site employment increases from 5% to less than 15% were considered to have the potential to cause moderate impacts, and increases of 15% or greater were considered to have the potential to cause major impacts.

Savannah River Site.

3.2.10 Cultural Resources Impacts

Cultural resources, including prehistoric, historic, Native American, and paleontological resources, may be affected at sites where waste management facilities are proposed to be built. However, the impacts of the construction of waste management facilities on cultural resources cannot be effectively analyzed at the programmatic level because the extent of those impacts depends upon their specific location at a site. These impacts will be examined in sitewide or project-specific NEPA reviews.

3.2.11 Geology and Soils Impacts

As indicated in Chapter 4, Affected Environment, DOE's review of the geology and soils at the 17 major sites indicated that it is unlikely that impacts to these resources would affect the selection of alternatives for any waste type. While geology and soils are important determinants of where on a particular site a facility could be located, such determinations are not being made at the programmatic (i.e., Departmentwide) level. Exact locations of facilities and impacts to geology and soils will be addressed in sitewide or project-level NEPA reviews.

3.2.12 Noise Impacts

Noise from construction and operation of waste management facilities and increased vehicle traffic may cause adverse impacts. Noise impacts, however, are especially dependent on the technology employed and the siting, which the WM PEIS does not specify. Therefore, noise impacts cannot be evaluated. Exact locations of facilities and related noise levels will be addressed in sitewide or project-level NEPA reviews.

3.2.13 Costs

DOE evaluated estimated costs for building and operating waste management facilities and for transportation from both a life-cycle and process perspective, using 1994 dollars.

DOE evaluated facility costs for four phases representing the life cycle of a facility and its operations over a 20-year period: construction, preoperations, O&M, and decontamination and decommissioning.

The only exception was HLW, which was costed by using a two-phased life-cycle approach (construction and O&M) for the storage facilities.

Examples of life-cycle costs include:

- Costs for preoperation activities: technology and site adaptation, permitting, plant setup, and related conceptual design
- Facility construction costs: building construction, equipment purchase and installation, construction and project management
- Operations and maintenance costs: annual operations costs for labor and materials, equipment, utilities, and overhead
- Decontamination and decommissioning costs: facility decontamination and demolition, postclosure, and environmental monitoring

For process costs, DOE also analyzed costs for treatment, storage, and disposal activities. Treatment costs include costs to build and operate treatment facilities and common support facilities. For most waste types, current storage capacity was assumed to be sufficient, except for the No Action Alternative, where DOE estimated the costs to build and operate sufficient storage capacity. Disposal costs include costs to build and operate front-end administration and receiving facilities and the actual disposal units. Transportation costs include the costs associated with the movement of the waste among sites. Transportation costs were evaluated for both truck and rail shipments.

Low-Level Mixed Waste

At a Glance:
Low-Level Mixed Waste

No Action Alternative:

- Continue treatment at existing facilities with indefinite storage.
- Does not include disposal and does not comply with RCRA.

Decentralized Alternative:

- Treatment at all 37 sites and disposal at 16.

Four Regionalized Alternatives:

- Treatment at 11, 7, or 4 sites with disposal at 12, 6, or 1 site(s).

Centralized Alternative:

- Treatment and disposal at one site.

Preferred Alternative:

- Sites with small amounts would send their waste to Hanford, INEL, ORR, or SRS for treatment. Eight major sites would treat onsite.
- Regionalized disposal at two or three sites to be selected after consultation with stakeholders from among the following six sites: Hanford, INEL, NTS, LANL, ORR, and SRS.

LLMW Data and Major Assumptions:

- 37 sites generate or store LLMW.
- DOE will need to manage an estimated 219,000 cubic meters of LLMW over the next 20 years.
- All LLMW treatment facilities would be designed to treat waste to meet RCRA requirements.
- New facilities would be constructed during a 10-year period; LLMW currently in inventory and newly generated would be treated during the 10-year period following construction of facilities.
- Wastewater treatment would continue at every site.
- No waste acceptance criteria were imposed on disposal sites.

What Did We Learn From the Results?

- Risks from LLMW action alternatives are generally low, with the greatest risks occurring for workers from physical accidents normally expected in any industrial activity.
- Costs range from $5.2 billion for the No Action Alternative to $12.3 billion for the Decentralized Alternative.
- Limits on radionuclides and hazardous constituents as well as other waste acceptance criteria would be required for disposal at most sites.

4 Low-Level Mixed Waste

- *LLMW contains both radioactive and hazardous components.*
- *LLMW is generated, projected to be generated, or stored at 37 DOE sites as a result of research, development, production, testing, and dismantlement of nuclear weapons.*
- *DOE will need to manage an estimated 219,000 cubic meters of LLMW over the next 20 years.*
- *DOE must select treatment and disposal sites for LLMW.*

4.1 Analysis

The challenge in managing LLMW arises from its dual nature—it contains RCRA-classified hazardous components (or characteristics) and is radioactive. Because of the complex regulatory requirements governing the management of LLMW, DOE must define a waste management system focused on treating and disposing of LLMW and minimizing the amount in storage.

LLMW is generated, projected to be generated, or stored at 37 DOE sites. According to DOE estimates, 219,000 cubic meters of LLMW will need to be managed over the next 20 years. Figure 4.1–1 presents the estimated total volume of LLMW from waste management activities at each of the 37 sites and illustrates its distribution across the country at the 16 major LLMW sites analyzed in the WM PEIS. WIPP, the 17th major site, will manage only TRUW.

In addition to analyzing the impacts from treatment and disposal, DOE analyzed the transportation impacts associated with each alternative. Both truck and rail transportation were analyzed by using routing models following the general principle of minimizing transportation time and shipping distance. The routes were selected to be consistent with existing routing practices and all applicable regulations and guidelines; however, because the routes were determined for the purposes of risk assessment, they do not necessarily represent actual routes that DOE would use to transport waste in the future.

4.2 Alternatives

DOE analyzed seven alternatives for CH LLMW within the four categories of alternatives: no action, decentralized, regionalized, and centralized. Treatment and disposal activities vary by alternative and by site. Table 4.2–1 illustrates by site where LLMW would be treated and disposed of under each alternative.

The LLMW analysis considered treatment and disposal separately, first focusing on treatment and then using treatment residues (waste remaining after treatment) as the input volumes for the disposal analysis. Each alternative was developed to assess environmental impacts, health risks, and costs associated with the range of LLMW treatment and disposal options, and to provide input for programmatic decisions about where to locate LLMW treatment and disposal facilities.

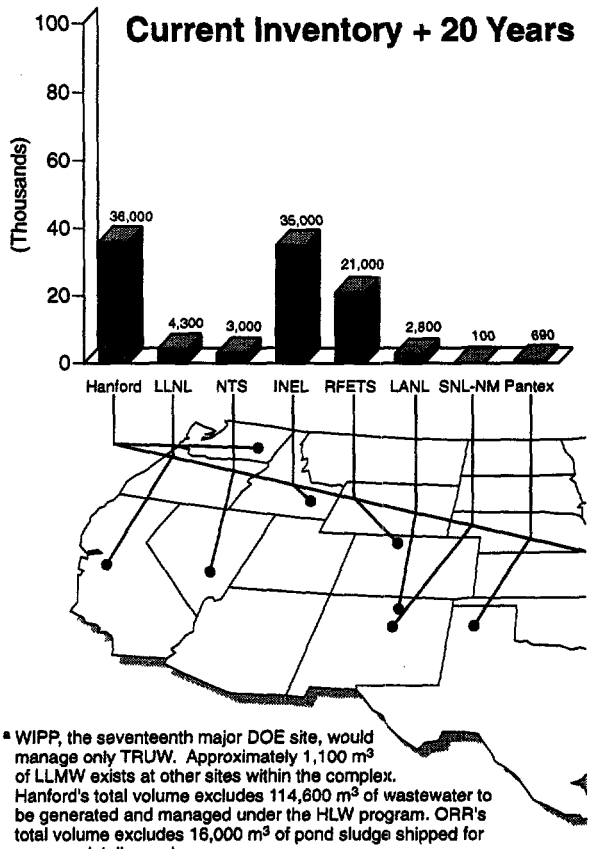
Although alpha LLMW is not a concern to workers or the public as a source of external radiation, precautions must be taken when treating alpha LLMW in order to minimize the likelihood of inhalation or ingestion of radionuclides that emit alpha particles. Alpha LLMW exists at 10 sites. Sites where alpha LLMW would be treated or disposed of are indicated in Table 4.2–1 by the alpha symbol (α).

Remote-handled waste requires special handling facilities for treatment and disposal. Under all alternatives, RH LLMW would be treated and disposed of at the same four sites where the majority of RH LLMW is located: Hanford, INEL, ORR, and SRS.

LLMW Volumes

DOE Sites	Total Volumes (m^3)
1. Ames	0.4
2. ANL-E	160
3. BCL	0.1
4. Bettis	48
5. BNL	190
6. Charleston	3
7. ETEC	17
8. FEMP	2,600
9. GA	43
10. GJPO	1.5
11. Hanford	36,000
12. INEL	35,000
13. KCP	0.8
14. KAPL	220
15. LEHR	7
16. LBL	280
17. LLNL	4,300
18. LANL	2,800
19. Mare Is	52

Figure 4.1-1 LLMW Total

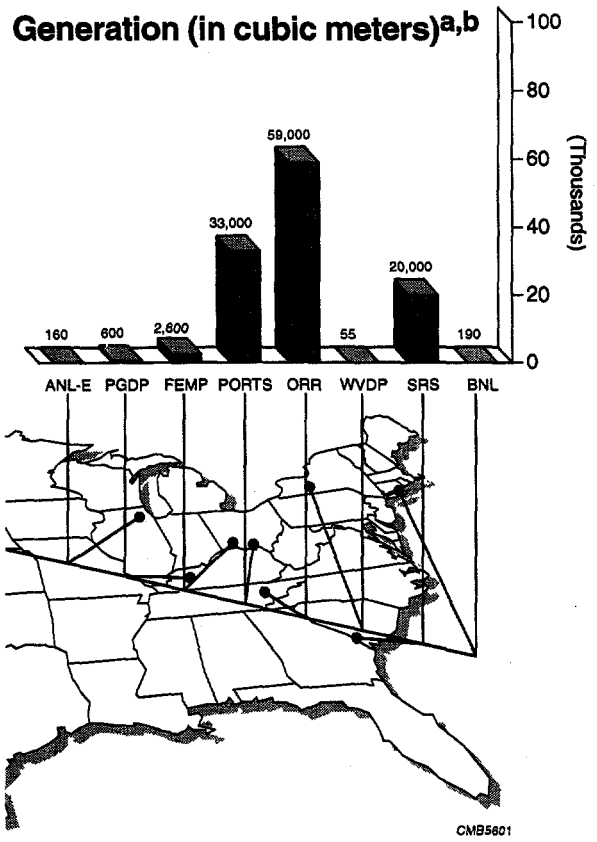


[a] WIPP, the seventeenth major DOE site, would manage only TRUW. Approximately 1,100 m^3 of LLMW exists at other sites within the complex. Hanford's total volume excludes 114,600 m^3 of wastewater to be generated and managed under the HLW program. ORR's total volume excludes 16,000 m^3 of pond sludge shipped for commercial disposal.

[b] Updated inventories and waste generation rates are summarized in Appendix I.

Source: DOE (1994).

Volumes at the 16 Major Sites.



LLMW Volumes—Continued*

DOE Sites	Total Volumes (m^3)
20. Mound	80
21. NTS	3,000
22. Norfolk	6
23. ORR	59,000
24. PGDP	600
25. Pantex	690
26. Pearl H	6
27. Pinellas	0.02
28. PORTS	33,000
29. Ports Nav	1
30. PPPL	0.02
31. Puget So	230
32. RMI	30
33. RFETS	21,000
34. SNL-NM	100
35. SRS	20,000
36. UofMO	2
37. WVDP	55
Total	219,000

*Estimated LLMW volumes from waste management activities include current inventory plus 20 years of anticipated generation. Waste volumes used for WM PEIS analysis may vary from latest estimates. Waste volumes at individual sites have been rounded to one or two significant figures. Updated inventories and waste generation rates are summarized in Appendix I, "Update of Site-Specific Waste Volumes for LLW, LLMW, and TRUW."

4.2.1 No Action Alternative

The No Action Alternative provides a baseline for the analysis by considering treatment of LLMW at sites with facilities that are currently capable of treating waste to meet the EPA's hazardous waste LDRs. The No Action Alternative also analyzes the indefinite storage of the waste on site at all LLMW sites. Three sites are currently capable of treating LLMW to meet LDRs: INEL, ORR, and SRS. Other sites may experience impacts from the construction of expanded storage, onsite shipping, or certification facilities (where the waste would be examined, characterized, and certified for shipment).

Under this alternative, no new treatment facilities would be built. The No Action Alternative would not comply with RCRA because all the waste would not be treated to meet LDRs and would be placed in storage for an indefinite period of time rather than in disposal facilities.

4.2.2 Decentralized Alternative

The Decentralized Alternative considers treatment of waste to meet RCRA requirements at all 37 LLMW sites. For purposes of this analysis, DOE examined the impacts from treatment at the 16 major LLMW sites. Two of these 16 sites (BNL and SNL-NM) have relatively small amounts of LLMW (less than 200 cubic meters). Most of the other 21 sites that are not major sites have less than 200 cubic meters of LLMW; therefore, DOE assumed that their health and environmental impacts would be similar to those seen at BNL and SNL-NM. However, costs were calculated by using data from all 37 sites.

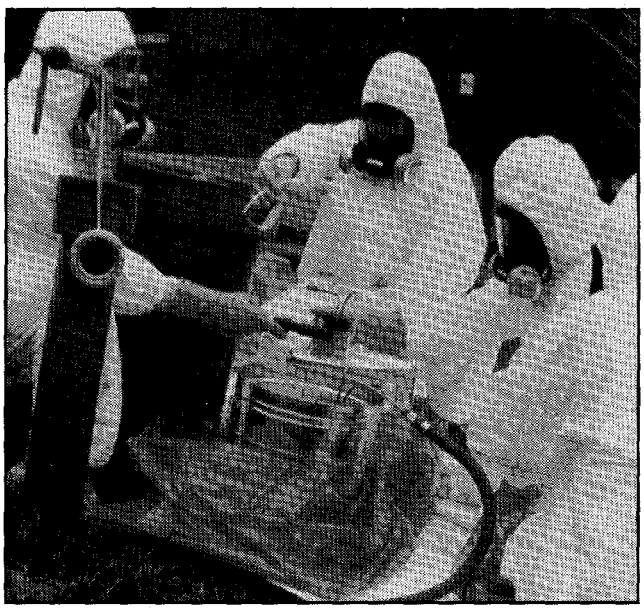
4.2.3 Regionalized Alternatives

Consolidation of LLMW for treatment and disposal was considered under the four LLMW regionalized alternatives. The regionalized alternatives were

Table 4.2-1. Low-Level Mixed Waste Alternatives

Alternatives	Number of Sites		ANL-E	BNL	FEMP	Hanford	INEL	LANL	LLNL	NTS	ORR	PGDP	Pantex	PORTS	RFETS	SNL-NM	SRS	WVDP
	T	D																
No Action	3	0	S	S	S	S	TS	S	S	S	TS	S	S	S	S	S	TS	S
Decentralized	37	16	TD	TD	TD	TD	TDα	TDα	TDα	TDα	TD	TD	TD	TD	TDα	TD	TDα	TD
Regionalized 1	11	12			TD	TD	TDα	TDα	TDα	Dα	TD	TD	TD	TD	TDα		TDα	
Regionalized 2	7	6				TD	TDα	TDα		Dα	TD			T	Tα		TDα	
Regionalized 3	7	1				T	Tα	T		Dα	T			T	Tα		Tα	
Regionalized 4	4	6				TD	TDα	Dα		Dα	TD						TDα	
Centralized	1	1				TDα												

Notes: T = treatment to meet land disposal restrictions; D = disposal; S = indefinite storage. A blank indicates that a site does not treat, store, or dispose of waste under the alternative specified. All sites have wastewater treatment capability as needed. Remote-handled (RH) wastes would be treated and disposed on site at Hanford, INEL, ORR, and SRS in all alternatives except No Action. RH waste is stored under No Action. Facilities with the α symbol treat or dispose of contact-handled (CH) alpha waste in addition to non-alpha waste.



LLMW sampling at ORR.

developed to include a reasonable range of intermediate levels of consolidation for treatment and disposal. Regionalized Alternative 1 considers treatment of wastes at 11 sites and disposal at 12 (the 11 treatment sites and NTS). Regionalized Alternative 2 analyzes the impacts of treatment at seven sites with disposal at six sites. Under this alternative, two of the treatment sites (RFETS and PORTS) are not considered for disposal, and NTS is considered for disposal only. Regionalized Alternative 3 analyzes the same seven treatment sites as Regionalized Alternative 2, but it considers disposal only at NTS. Regionalized Alternative 4 considers treatment at four sites—Hanford, INEL, ORR, and SRS—and disposal at six sites (the four treatment sites plus LANL and NTS).

4.2.4 Centralized Alternative

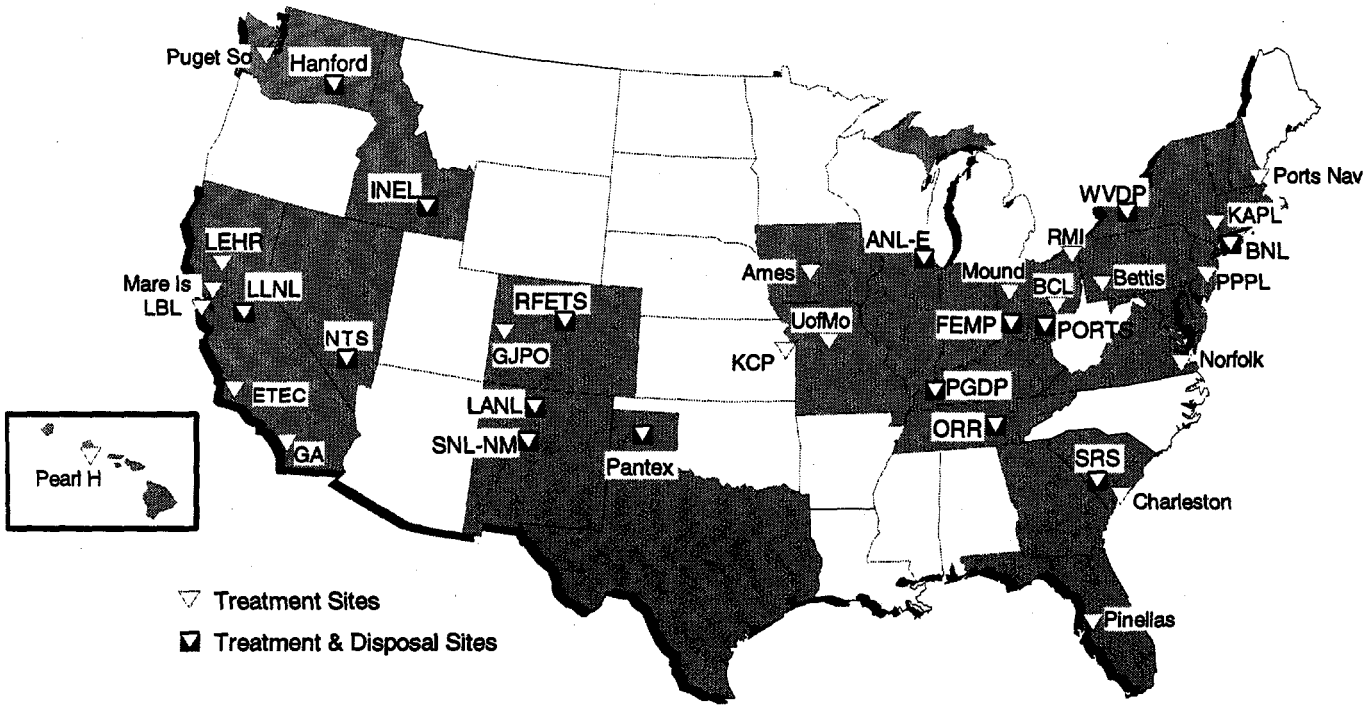
The Centralized Alternative considers LLMW treatment and disposal at a single site within the complex, the Hanford Site. However, other sites around the country may experience impacts from the construction of facilities where the waste would be examined, characterized, certified, and prepared for shipment. The impacts of centralizing disposal at NTS were also analyzed under Regionalized Alternative 3.

4.2.5 Rationale for Treatment and Disposal Alternatives

The seven LLMW treatment alternatives were developed to cover the range of reasonable alternatives. Up to 37 sites as illustrated in Figure 4.2–1 are available for treatment (the centralized and decentralized alternatives, respectively). DOE identified four intermediate alternatives for treating LLMW at 4 to 11 sites (the regionalized alternatives). To develop the variations of the regionalized alternatives, DOE focused on the sites where the largest volumes of LLMW are located. Alpha CH and all RH LLMW would be sent to the closest facility capable of treating those wastes. For all alternatives, DOE assumed that some treatment capabilities would be available at every site for initial treatment of onsite aqueous liquids by means of techniques such as evaporation, neutralization, precipitation, filtration, coagulation, or limited solidification.

The regionalized alternatives consider the impacts of consolidating treatment to meet LDRs at selected sites. Regionalized Alternative 1 considers treatment at 11 sites. This alternative was developed by identifying the location of most of DOE's LLMW and looking for optimal site groupings.

Figure 4.2-1. Locations of the 37 LLMW Sites.



Note: Maps display CH LLMW. RH LLMW is treated and disposed of onsite at the Hanford site, INEL, ORR, and SRS.

Under Regionalized Alternatives 2 and 3, seven sites are considered as potential treatment locations. DOE chose the six sites with the highest waste volumes, and then added LANL. Because a large volume of TRUW at LANL may be reanalyzed and subsequently reclassified as alpha LLMW on the basis of its radionuclide concentration, the volume of LLMW at LANL might significantly increase.

Regionalized Alternative 4 consists of the sites with the three highest volumes (Hanford, INEL, and ORR), as well as SRS, which is the sixth largest in terms of volume. SRS was chosen because it has large volumes of alpha LLMW and TRUW, some of which eventually may be reclassified as LLMW. In addition, an incinerator with an annual LLMW treatment capacity of 8,200 cubic meters of LLMW is scheduled for SRS.

In the Centralized Alternative, all LLMW would be shipped to Hanford for treatment. Hanford currently has the second largest volume of LLMW. However, as Hanford's HLW is treated, a substantial portion of the resulting waste would become LLMW, thereby making the Hanford Site the largest LLMW site.

Candidate disposal sites were selected to reflect the reasonable range of alternatives. However, unlike the treatment analysis, the disposal analysis did not evaluate every site for disposal. Instead, 16 candidate sites were selected as the reasonable upper limit on the basis of screening performed by DOE in coordination with the States under the Federal Facility Compliance Act (FFCAct). The screening applied three exclusionary criteria to the 37 sites with LLMW: (1) sites could not be within a designated 100-year floodplain, (2) sites could not be located

within 61 meters of a seismic fault, and (3) sites had to have sufficient area for a 100-meter buffer zone between the disposal facility and the site boundary. Sites were also removed for other technical and practical reasons.

The Decentralized Alternative looked at disposal at all 16 candidate sites, and the Centralized Alternative looked at disposal at one site—Hanford. Hanford was analyzed because it is expected to have the largest volume of LLMW.

DOE analyzed two of the intermediate alternatives—disposal at 12 sites and at 6 sites—as regionalized alternatives. To define these regionalized alternatives, DOE selected the 11 sites with the largest volume of LLMW and added NTS because it has an LLMW disposal facility with a pending permit. The alternative defined for LLMW disposal included the six sites with currently operating LLW disposal facilities—Hanford, INEL, LANL, NTS, ORR, and SRS. NTS was considered as the single disposal site in Regionalized Alternative 3 to provide a comparison and an alternative to the single disposal location selected under the Centralized Alternative.

4.3 Impacts of Managing LLMW

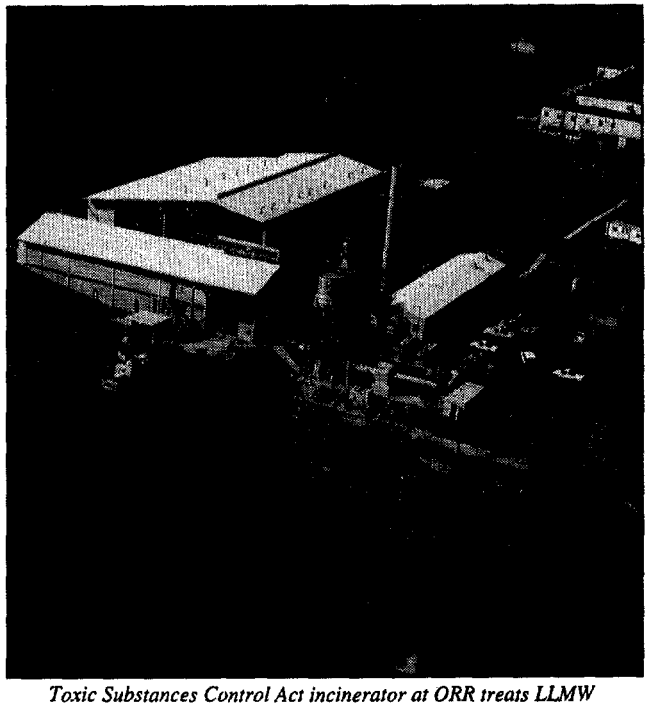
Although some factors, such as cost, exhibited clear trends across the LLMW alternatives, most did not. Rather, the analysis of the impacts revealed sensitivities at particular sites regardless of the alternative.

When reviewing the impacts and cost identified for the No Action Alternative, it is important to realize that the results for indefinite storage are based on the initial 20 years of that indefinite period. This is consistent with the period of analysis for the other alternatives; however, the analysis of the No Action Alternative does not present the expected impacts from storage beyond this 20-year time frame. The longer-term storage impacts and costs are likely to exceed those for the first 20 years, not only as a result of routine indefinite storage operations, but also from degradation of facilities and containers. This differs from the effects predicted for the action alternatives for management of the 20-year forecast of LLMW, where direct risks to workers and the offsite population, and other impacts and costs, are greatly reduced following disposal. The No Action Alternative does not reduce or avoid impacts and costs; rather, it extends impacts and costs for an indefinite period of time.

The following discussion focuses on the impact areas that would be affected by the management of LLMW under the WM PEIS alternatives, identifying trends when appropriate and highlighting noteworthy findings at particular sites.

4.3.1 Health Risks

Risks at sites treating or disposing of LLMW are principally to workers involved in managing LLMW, rather than to noninvolved workers or the public, primarily as a result of physical hazards associated with industrial operations (see Table 4.3–1). As the number of treatment and disposal sites decreases,



Toxic Substances Control Act incinerator at ORR treats LLMW and PCB-contaminated wastes.

Table 4.3–1. Some of the Projected Risks to Workers and the Public From Managing LLMW

Alternative	Number of Sites		Treatment Worker Physical Hazard Fatalities	Treatment Worker Cancer Fatalities	Offsite Population Cancer Fatalities	Disposal Worker Physical Hazard Fatalities	Disposal Worker Cancer Fatalities	Truck[a] Radiation Fatalities	Truck[b] Non-Radiation Fatalities	Rail Radiation Fatalities	Rail Non-Radiation Fatalities
	T	D									
No Action[c]	3	-	2	1	*	NA	NA	NA	NA	NA	NA
Decentralized	37	16	4	1	*	*	1	*	*	*	*
Regionalized 1	11	12	4	1	*	*	1	*	*	*	*
Regionalized 2	7	6	3	1	*	*	1	*	*	*	*
Regionalized 3	7	1	3	1	*	*	*	*	1	*	*
Regionalized 4	4	6	3	1	*	*	1	*	*	*	*
Centralized	1	1	3	1	*	*	*	*	1	*	*

Notes: T = treatment; D= disposal; * = greater than 0 but less than 0.5; NA = not applicable.
[a] Fatalities are from radiation-induced cancer.
[b] Greatest number of fatalities are from physical hazards such as traffic accidents that occur within a 10-year analysis period.
[c] Treatment results under the No Action Alternative include the risks from only the first 20 years of indefinite storage of LLMW.

facilities at the remaining sites become larger and the number of total physical injuries decreases, reflecting an economy of scale due to fewer total workers. There are no notable national trends for offsite population risks from treatment; however, some sites could require alternate organic treatment technologies to minimize risks from thermal treatment of LLMW containing tritium. Under the No Action Alternative, treated waste would be stored indefinitely, with relatively large, potentially adverse consequences.

For disposal, concentrations of some radionuclides and chemicals in the groundwater near disposal facilities could exceed applicable standards at several sites. This would occur in the absence of waste acceptance criteria and other controls, thereby demonstrating the need for performance-based waste acceptance criteria if the sites were selected to manage LLMW. Pretreatment of chemicals and careful management of radionuclide concentrations and waste forms may be required to assure acceptable water quality and to reduce possible human exposures. Intruder risks (see text box, page 32) are generally higher at sites where the waste would have both high radioactivity and long-lived radionuclides. Intruder radiation exposure risks generally decrease with time, reflecting the decay of short-lived radionuclides. Treatment facility accident risks were low under all alternatives, with no sites experiencing cancer fatalities equal to or greater than one in the exposed worker or offsite populations over the 10-year period analyzed. Transportation risks were also low under all alternatives, reflecting relatively low transportation requirements. Table 4.3–1 presents projections of some risks for the LLMW alternatives.

4.3.2 Air Quality Impacts

The management of LLMW would not cause air quality standards to be approached or exceeded at most sites. However, centralization of treatment at Hanford and disposal at NTS could cause adverse air quality impacts requiring special emission control measures for criteria air pollutants. Vehicular emissions during construction at RFETS could require additional control measures to reduce emissions to acceptable levels if waste at these sites were stored, treated, or disposed of on site. Emissions of hazardous air pollutants, including radionuclides, were estimated to be below the applicable standards at every site.

4.3.3 Water Resources Impacts

Impacts to water availability tend to decrease as the LLMW management facilities are centralized. Major impacts on water availability from increased use at the sites are unlikely, although there is the potential for adverse impacts at LLNL Site-300, under all alternatives analyzed.

4.3.4 Economic and Population Impacts

Nationwide, the largest economic benefits resulting from LLMW management would occur under the Decentralized Alternative and generally decrease as the alternatives become more centralized. The greatest economic benefit at any site occurs when LLMW is managed at that site. The greatest number of new jobs created by LLMW management would occur in the region containing Hanford under the Centralized Alternative and in the region containing INEL under Regionalized Alternative 4. The national economy would not be affected by total project expenditures for the construction, operation, or transportation associated with any of the LLMW alternatives. No region would experience a population increase of 1% or greater.

4.3.5 Infrastructure Impacts

Although no offsite infrastructure impacts are expected to occur, proposed LLMW activities would affect the onsite infrastructure at 14 sites. Nine sites would experience increased requirements for water, wastewater treatment, or electrical power of 5% or more of current system capacity. The greatest increases would occur at RFETS under the Decentralized Alternative and Regionalized Alternative 1 and at Hanford under the Centralized Alternative, when waste is consolidated for treatment and disposal at these sites. Construction of additional storage under the No Action Alternative would also impact RFETS and INEL. However, only the projected volume of wastewater at Hanford (under the Centralized Alternative) is estimated to exceed the existing treatment capacity. Onsite transportation infrastructure would be affected at 12 sites because of site employment increases of 5% or more above current levels.

4.3.6 Costs

Costs decrease as the number of treatment and disposal sites decreases, ranging from $12.3 billion under the Decentralized Alternative to $5.2 billion under the No Action Alternative. Transportation costs are much lower than facility costs, making shipment to facilities at another site generally less expensive than building a new facility at that site. Table 4.3–2 provides the estimated cost to manage LLMW for each of the LLMW alternatives over the next 20 years.

4.3.7 Ecological Resources, Environmental Justice, Land Use, and Cultural Resources Impacts

The WM PEIS analysis did not reveal significant differences among the alternatives in these four impact areas, nor did it reveal any major impacts under any alternative. However, impacts to ecological and cultural resources depend to some degree on the treatment and disposal technologies selected and their location at each site and would be evaluated in site- or project-specific NEPA reviews. An assessment of potential environmental justice concerns from management of LLMW indicated that minority and low-income populations near the LLMW sites would not experience disproportionately high and adverse health risks or environmental impacts under any of the LLMW alternatives. Land use is not a good criterion for differentiating among alternatives because the alternatives do not use much land when compared with the amount available at every site.

Table 4.3-2. LLMW Estimated Life-Cycle Costs (Billions of 1994 Dollars)

Alternative	Number of Sites		Total (Including Truck Transport)	Transportation Costs	
	T	D		Truck	Rail
No Action[a]	3	0	5.2	0	0
Decentralized	37	16	12.3	0.001	0.0007
Regionalized 1	11	12	11.0	0.004	0.002
Regionalized 2	7	6	9.5	0.02	0.005
Regionalized 3	7	1	8.4	0.06	0.02
Regionalized 4	4	6	8.4	0.006	0.005
Centralized	1	1	7.7	0.03	0.01

Notes: T = treatment; D = disposal.
[a] Costs under the No Action Alternative include those from only the first 20 years of indefinite storage.

At a Glance: Low-Level Waste

No Action Alternative:

- Disposal at six sites under current arrangements. Sites use existing treatment facilities.

Decentralized Alternative:

- Disposal at 16 sites. A minimum level of treatment at each site is assumed.

Seven Regionalized Alternatives:

- Disposal at 12, 6, or 2 sites. In three alternatives, treatment to reduce volumes is also assumed, with treatment at 11, 7, or 4 regional sites.

Five Centralized Alternatives:

- Disposal at one site (either Hanford or NTS). In three alternatives, treatment to reduce volumes is also assumed.

Preferred Alternative:

- Each site would conduct minimum treatment onsite.
- Regional disposal at two or three sites to be selected after consultations with stakeholders from among the following six sites: Hanford, INEL, LANL, NTS, ORR, and SRS.

LLW Data and Major Assumptions:

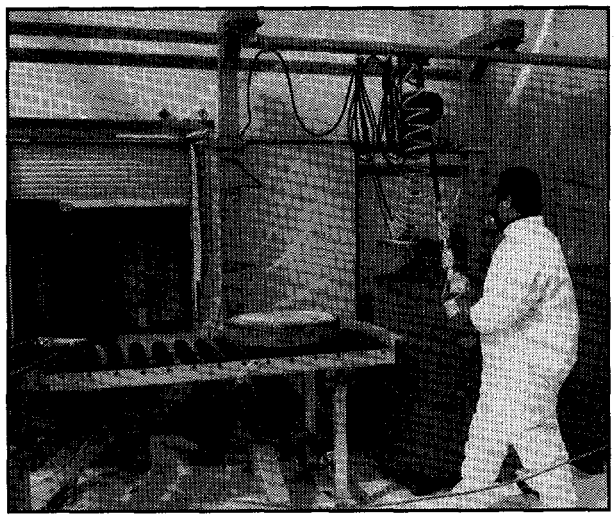
- LLW is currently generated, projected to be generated, or stored at 27 DOE sites.
- DOE will need to manage 1.5 million cubic meters of LLW over the next 20 years.
- New facilities would be constructed during a 10-year period; LLW currently in inventory and newly generated would be treated during the 10-year period following construction.
- Wastewater treatment would continue at every site.
- No waste acceptance criteria were imposed on disposal sites.

What Did We Learn from the Results?

- At a national level, costs, risks, and impacts would be greater for volume reduction than for minimum treatment.
- Centralized disposal would result in transportation of large amounts of waste with commensurately greater risk of both traffic accidents and radiation exposure. Rail transport has slightly lower risks than truck transport.
- Costs decrease as the number of treatment and disposal sites decreases.
- Radionuclide limits would be required for disposal at some sites.

5 Low-Level Waste

- *LLW is material that is not classified as high-level waste, transuranic waste, spent nuclear fuel, or byproduct tailings.*
- *DOE will need to manage an estimated 1.5 million cubic meters of LLW over the next 20 years.*
- *LLW is currently generated, anticipated to be generated, or stored at 27 DOE sites as a result of nuclear weapons production and dismantlement, reactor operations, and research.*
- *DOE must select treatment and disposal sites for LLW.*



Some LLW can be compacted to 1/5th of its original size.

5.1 Analysis

The character of the waste is as important as waste volume in determining the potential impacts resulting from LLW management. LLW can contain many different radionuclides in many combinations and can exist in many forms, ranging from dilute liquids to activated metal equipment.

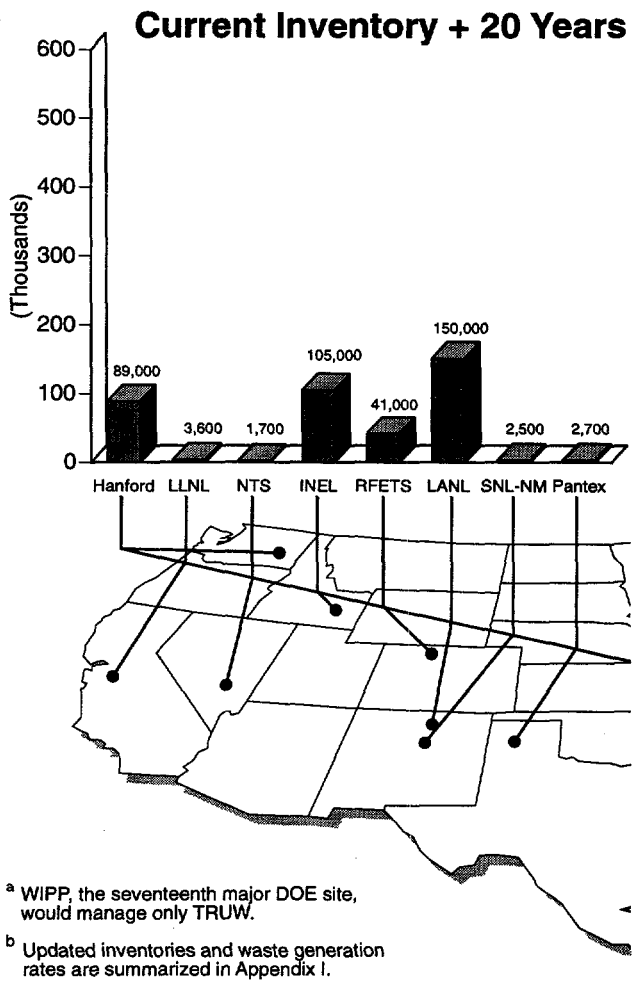
Approximately 1.5 million cubic meters of LLW is generated, anticipated to be generated, or stored at 27 DOE sites. Although 27 sites manage LLW, seven sites generate more than 80% of it—Hanford, INEL, LANL, ORR, PGDP, PORTS, and SRS. Figure 5.1-1 presents the total estimated volumes at all 27 sites. The distribution of LLW at the 16 major sites is illustrated by the bar chart and map.

DOE also has responsibility for two other types of LLW: commercially generated greater-than-Class-C (GTCC) waste and special-case waste. GTCC LLW is so named because it is more highly radioactive than Class C waste according to a classification system developed by the U.S. Nuclear Regulatory Commission; GTCC LLW is not suitable for near-surface disposal and will likely need to be disposed of in a geologic repository. Additionally, within the LLW (as well as LLMW and TRUW) category, there are wastes whose characteristics require special considerations and different management from that of most LLW. These wastes are special-case wastes. As detailed analyses are conducted, management plans for each waste stream would be established. These analyses could determine that some LLW streams currently managed as special cases meet the waste acceptance criteria for a disposal facility, and these waste streams would no longer be considered special case notwithstanding their earlier designation. Because programs for management of special-case and GTCC LLW have not been fully defined, these LLW groups are excluded from the WM PEIS analysis and will be addressed in separate NEPA reviews or in a supplement to the WM PEIS.

LLW Volumes

DOE Sites	Total Volumes (m^3)
1. Ames	110
2. ANL-E	6,700
3. Bettis	12,000
4. BNL	5,600**
5. Fermi	1,500
6. FEMP	0
7. Hanford	89,000
8. INEL	105,000
9. KCP	23
10. KAPL	19,000
11. LBL	1,300
12. LLNL	3,600
13. LANL	150,000

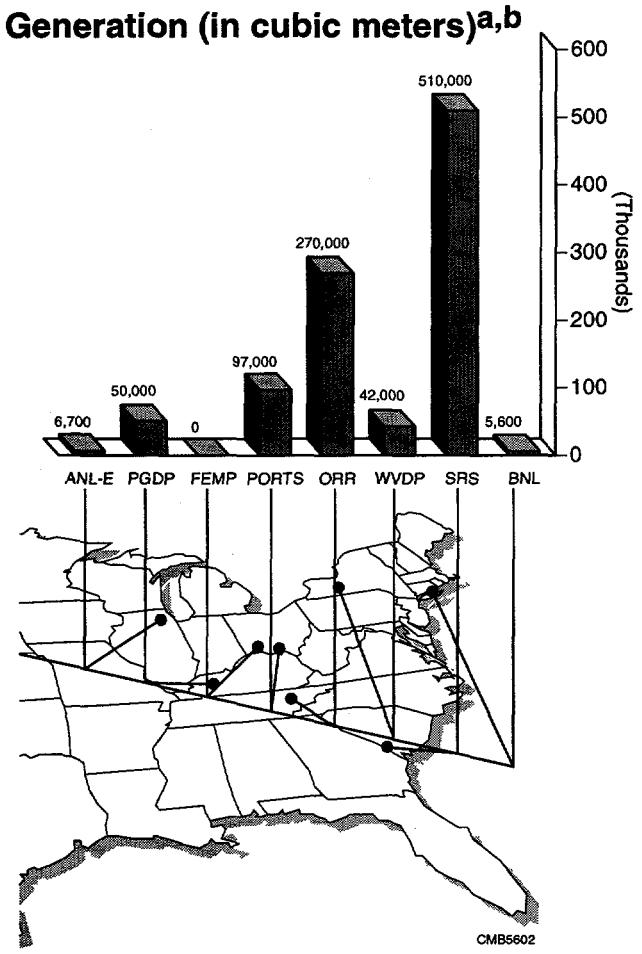
Figure 5.1–1. LLW Total



[a] WIPP, the seventeenth major DOE site, would manage only TRUW.

[b] Updated inventories and waste generation rates are summarized in Appendix I.

Volumes at the 16 Major Sites.



LLW Volumes (Continued)*

DOE Sites	Total Volumes (m^3)
14. Mound	38,000
15. NTS	1,700**
16. ORR	270,000**
17. PGDP	50,000
18. Pantex	2,700**
19. Pinellas	1,300
20. PORTS	97,000
21. PPPL	220
22. RMI	51,000
23. RFETS	41,000
24. SNL-NM	2,500
25. SRS	510,000
26. SLAC	2,500
27. WVDP	42,000**
Total	**1,500,000**

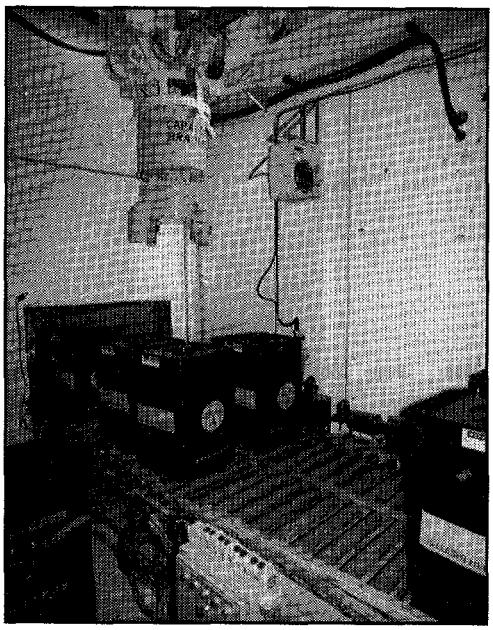
*Estimated LLW volumes from waste management activities include current inventory plus 20 years of anticipated generation. Waste volumes used in the WM PEIS analysis may vary from latest site estimates.
**Updated inventories and waste generation rates are summarized in Appendix I, "Update of Site-Specific Waste Volumes for LLW, LLMW, and TRUW."

DOE evaluated two treatment strategies for LLW:

- Minimum Treatment, defined as the least amount of treatment required prior to either onsite disposal or transport to another site for disposal. Minimum treatment includes solidification of liquids and fines (powdered material) and packaging.

- Volume Reduction, which reduces the overall volume of LLW by means of a variety of treatment techniques. Volume reduction can be achieved with several technologies, including thermal destruction, compaction or supercompaction, size reduction, evaporation and concentration. For disposal, DOE evaluated the impacts associated with both shallow land burial and engineered disposal facilities.

DOE analyzed transportation impacts associated with each alternative. Both truck and rail transportation were analyzed by using routing models that incorporate general principles of minimizing distance and transportation time. The routes were selected to be consistent with existing practices and all applicable regulations and guidelines; however, because the routes were determined for the purposes of risk assessment, they do not necessarily represent actual routes that DOE would use to transport waste in the future.



LLW in 270-liter, square cement-filled drums to be stored in specially designed aboveground vaults.

5.2 Alternatives

The WM PEIS considers 14 alternatives for treatment and disposal of LLW within the four categories of alternatives: No Action, Decentralized, Regionalized, and Centralized. Treatment and disposal activities vary by alternative and by site. Each of the 14 alternatives was developed in order to estimate health risks, environmental impacts, and costs associated with the range of treatment and disposal options available to DOE and to provide information for decisions about where to locate LLW treatment and disposal facilities. Table 5.2–1 shows the sites where LLW would be treated and disposed of under each alternative.

5.2.1 No Action Alternative

The No Action Alternative provides a baseline for the analysis that approximates the current DOE program. Under the No Action Alternative, LLW would be treated at existing facilities and shipped to one of six DOE disposal sites. Today, most DOE LLW disposal occurs at NTS and Hanford. The six sites now operating have sufficient designated area for the proposed LLW disposal; thus, no new sites would be necessary.

5.2.2 DECENTRALIZED ALTERNATIVE

The Decentralized Alternative considers disposal of LLW at 16 sites following its minimum treatment at all 27 sites with LLW.

5.2.3 REGIONALIZED ALTERNATIVES

Regionalized Alternative 1 considers disposal at 12 sites, after minimum treatment at all sites. Regionalized Alternative 2 analyzes the impacts resulting from disposal at the same 12 sites after volume reduction at 11 of these sites. In addition to the Decentralized Alternative, Regionalized Alternatives 1 and 2 are the only alternatives that propose disposal at FEMP, LLNL, Pantex, and PGDP.

The remainder of the regionalized alternatives (Regionalized Alternatives 3 through 7) consolidate most LLW treatment and disposal at eight sites: Hanford, INEL, LANL, NTS, ORR, PORTS, RFETS, and SRS. Although the sites are the same for

Table 5.2–1. Low-Level Waste Alternatives

Alternative	Number of Sites		ANL-E	BNL	FEMP	Hanford	INEL	LANL	LLNL	NTS	ORR	PGDP	Pantex	PORTS	RFETS	SNL-NM	SRS	WVDP
	T	D																
No Action	10*	6				TD	TD	D	T	D	TD	T			T		TD	
Decentralized		16	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Regionalized 1		12			D	D	D	D	D	D	D	D	D	D	D		D	
Regionalized 2	11	12			TD	TD	TD	TD	TD	D	TD	TD	TD	TD	TD		TD	
Regionalized 3		6				D	D	D		D	D						D	
Regionalized 4	7	6				TD	TD	TD		D	TD			T	T		TD	
Regionalized 5	4	6				TD	TD	D		D	TD						TD	
Regionalized 6		2				D											D	
Regionalized 7		2								D							D	
Centralized 1		1				D												
Centralized 2		1								D								
Centralized 3	7	1				TD	T	T			T			T	T		T	
Centralized 4	7	1				T	T	T		D	T			T	T		T	
Centralized 5	1	1				TD												

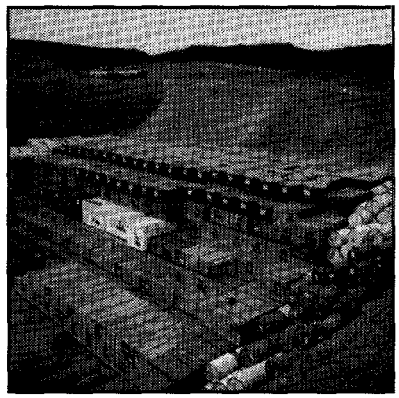
Notes: T = treat. "Treat" in the context of LLW means volume reduction by means of thermal organic destruction, size reduction, and compaction followed by solidification. Sites carry out "minimum treatment" under all alternatives, which consists of solidification of liquids and "fines" (powdered material), packaging, and shipment. D = Dispose. Each of the 6-site disposal cases uses the same sites; each of the 12-site disposal cases uses the same 12 sites. A blank indicates that neither treatment nor disposal is proposed for this site under the alternative specified.
*Ten sites use existing facilities for volume reduction. Three sites (LBL, RMI, and Mound) not listed as major sites above include volume reduction facilities.

most of the regionalized alternatives, impacts at the sites vary because of the use of different treatment technologies and volumes of waste received from other sites. For example, Regionalized Alternatives 3 and 4 would dispose of waste at the same six sites. However, under Regionalized Alternative 3, DOE would conduct only minimum treatment before disposal, whereas under Regionalized Alternative 4, DOE would use volume reduction techniques in addition to minimum treatment prior to disposal. Because PORTS and RFETS would become waste consolidation sites for volume reduction before disposal under Regionalized Alternative 4, they would have a greater potential to impact the environment than they would under the minimum treatment proposed in Regionalized Alternative 3, although both alternatives propose the same six sites for disposal.

Regionalized Alternative 5 considers volume reduction at four sites and disposal at six, compared with volume reduction at seven sites under Regionalized Alternative 4. Regionalized Alternatives 6 and 7 each consider disposal at two sites after minimum treatment: Hanford and SRS under Regionalized Alternative 6, and NTS and SRS under Regionalized Alternative 7.

5.2.4 Centralized Alternatives

DOE analyzed disposal at one site under the centralized alternatives. Five alternatives were considered. Centralized Alternatives 1 and 2 would dispose of LLW at Hanford and NTS, respectively, after minimum at all DOE sites. Centralized Alternative 3 evaluates disposal at Hanford after volume reduction treatment at seven sites. In Centralized Alternative 4, NTS would be the single disposal site after volume reduction at the same seven sites considered under Centralized Alternative 3. Centralized Alternative 5 considers both the consolidation of LLW for volume reduction and disposal at Hanford.



NTS disposal facility.

5.2.5 Rationale for Defining Treatment and Disposal Alternatives

DOE generally identified sites as candidates for locating LLW treatment facilities if the sites had large volumes of LLW. In addition, the alternatives were formulated to consolidate LLW for treatment and disposal at locations that minimized transportation by shipping to the closest available treatment or disposal site. DOE used the same treatment (volume reduction) and disposal locations for LLW as those identified for the LLMW alternatives in Chapter 6 of Volume I.

The number of disposal sites considered covers a reasonable range of sites—from 1 to 16. The 16 candidates are those also under consideration for LLMW.

5.3 Impacts of Managing LLW

Some impacts illustrated clear trends across the alternatives; others reveal sensitivities at particular sites regardless of the alternative. The following discussion focuses on the impacts that would be affected by the management of LLW under the alternatives, identifying trends when appropriate and highlighting noteworthy findings at particular sites.

5.3.1 Health Risks

The greatest risk posed by the management of LLW is to workers involved in management activities, primarily as a result of physical hazards. Radiation exposure risks to noninvolved workers and the public are a function of the treatment technology and site characteristics. The highest risks to the public are projected to occur as a result of volume reduction treatment of tritium-contaminated waste at FEMP, Hanford, LLNL, ORR, and PORTS. The greatest potential consequences for facility accidents would occur at sites treating waste with higher concentrations of radionuclides; only LLNL, LANL and Hanford, however, have estimates of potential fatalities exceeding one under any alternative. Concentrations of radionuclides in the groundwater near disposal facilities might exceed applicable standards at several sites in the absence of waste acceptance criteria and other controls; accordingly, DOE would need to implement performance-based waste acceptance criteria at those sites if they were selected. Management of radionuclide concentrations and waste forms could be required to assure acceptable water quality and acceptable human health risks. Transportation risks from both traffic accidents and radiation exposure are estimated to be greatest under the centralized alternatives, which involve the largest number of vehicle miles traveled. Travel by rail rather than truck for bulk shipments could reduce transportation risk. Table 5.3-1 presents selected estimates of the risks of LLW management.

Table 5.3-1. Some of the Projected Risks to Workers and the Public From Managing LLW

Alternative	Number of Sites		Treatment Worker Physical Hazard Fatalities	Treatment Worker Cancer Fatalities	Offsite Population Cancer Fatalities	Disposal Worker Physical Hazard Fatalities	Disposal Worker Cancer Fatalities	Truck[a] Radiation Fatalities	Truck[b] Non-Radiation Fatalities	Rail[a] Radiation Fatalities	Rail Non-Radiation Fatalities
	T	D									
No Action	10[c]	6	3	1	*	4	3	5	12	1	1
Decentralized		16	2	1	*	6	2	*	1	*	*
Regionalized 1		12	2	1	*	6	3	*	1	*	*
Regionalized 2	11	12	4	1	1	4	2	*	1	*	*
Regionalized 3		6	2	1	*	5	3	2	3	*	*
Regionalized 4	7	6	4	2	*	4	2	2	3	*	*
Regionalized 5	4	6	4	2	*	4	2	2	4	*	*
Regionalized 6		2	2	1	*	6	2	4	10	1	1
Regionalized 7		2	2	1	*	6	1	4	10	1	1
Centralized 1		1	2	1	*	1	3	16	37	2	3
Centralized 2		1	2	1	*	1	2	15	38	2	3
Centralized 3	7	1	4	1	*	1	2	15	35	2	3
Centralized 4	7	1	4	1	*	*	2	14	37	2	2
Centralized 5	1	1	4	2	*	1	2	15	37	2	3

Notes: T = treat; D = dispose; * = greater than 0 but less than 1. "Treat" in the context of LLW means volume reduction by means of thermal organic destruction, size reduction, and compaction followed by solidification. All sites do "minimum treatment" under all alternatives, which consists of solidification of liquids and "fines" (powdered material), packaging, and shipment.

[a] Fatalities are from radiation-induced cancer.

[b] Greatest number of fatalities are from physical hazards such as traffic accidents that occur within the 10-year analysis period (20-year analysis period for No Action).

[c] Ten sites use existing facilities for volume reduction. Three sites (LBL, Mound, and RMI) not listed as major sites above, also have volume reduction facilities.

5.3.2 Air Quality Impacts

The management of LLW would not cause the air quality standards to be approached or exceeded at most sites. However, decentralized treatment and disposal at BNL or centralized disposal at NTS could cause adverse air quality impacts (from construction equipment and vehicular emissions), thereby requiring additional control measures for criteria pollutants. Emissions of radionuclides were estimated to be below the applicable standards at every site.

5.3.3 Water Resources Impacts

Major impacts to water availability from increased water use at the sites are unlikely, although there is the potential for adverse impacts at LLNL Site-300 and the WVDP. Potential water quality effects from disposal are discussed in Section 5.3.1.

5.3.4 Economic and Population Impacts

Total jobs in the regional economies for waste management activities could exceed 1% of the regional baseline at six of the 16 major sites under one or more alternatives, with the largest proportion at Hanford (approximately 3.3%) under Centralized Alternative 5. None of the alternatives would affect the national economy. Regions surrounding five sites would experience population increases exceeding 1%, with the largest being the region surrounding INEL with a 3% increase under Regionalized Alternative 5.

5.3.5 Infrastructure Impacts

Although proposed activities would affect the onsite infrastructure at 13 of the major sites, no infrastructure impacts are expected offsite. New requirements for wastewater treatment or electrical power for proposed LLW facilities would equal or exceed 5% of current system capacity at seven sites. The most significant increases would be at the WVDP under the Decentralized Alternative, at INEL under Regionalized Alternative 5 when volume reduction and disposal are consolidated at that site, and at Hanford (centralized alternatives). However, only Hanford and the WVDP would approach or exceed system capacity. Twelve sites would have site employment increases of 5% or more of current site employment during construction, which could lead to traffic increases that would affect the onsite transportation infrastructure.

Integration of remote sensing and computer technology is used for nonintrusive characterization of waste sites.

5.3.6 Costs

Costs decrease as the numbers of treatment and disposal sites decrease, ranging from approximately $16.8 to $11.1 billion for minimum treatment, and $19.8 to $15.3 billion for volume reduction. The increased cost of volume reduction more than offsets the cost savings from reducing the volume of waste disposed of. Transportation costs are substantially lower than facility costs, making shipment to available facilities at another site generally less expensive than building new onsite facilities. Table 5.3–2 provides the estimated costs to manage LLW under each of the WM PEIS alternatives over the 20-year analysis period.

Table 5.3–2. LLW Estimated Life-Cycle Costs (Billions of 1994 Dollars)

Alternatives	Number of Sites		Total (Including Truck Transportation)	Transport Costs	
	T	D		Truck	Rail
No Action	10*	6	18.1	0.07	0.14
Decentralized		16	16.8	0.05	0.02
Regionalized 1		12	16.4	0.06	0.02
Regionalized 2	11	12	19.5	0.06	0.02
Regionalized 3		6	14.9	0.23	0.07
Regionalized 4	7	6	19.8	0.22	0.07
Regionalized 5	4	6	19.7	0.34	0.08
Regionalized 6		2	13.0	0.65	0.17
Regionalized 7		2	13.9	0.67	0.18
Centralized 1		1	12.2	2.46	0.44
Centralized 2		1	11.1	2.25	0.43
Centralized 3	7	1	18.2	2.34	0.43
Centralized 4	7	1	17.3	2.15	0.43
Centralized 5	1	1	15.3	2.45	0.43

Notes: T = treat; D = dispose. "Treat" in the context of LLW means volume reduction by means of thermal organic destruction, size reduction, or compaction followed by solidification. All sites do "minimum treatment" under all alternatives, which consists of solidification of liquids and "fines" (powdered material), packaging, and shipment. Each of the 6-site disposal alternatives uses the same sites; each of the 12-site disposal alternatives uses the same 12 sites.
* Ten sites use existing facilities for volume reduction. Three sites (LBL, Mound, and RMI) not listed as major sites above include volume reduction facilities.

5.3.7 Ecological Resources, Environmental Justice, Land Use, and Cultural Resources Impacts

The WM PEIS did not reveal significant differences among the alternatives in these four impact areas, nor did it reveal any major impacts under any alternative. However, impacts to ecological and cultural resources depend to a large degree on the technologies and the location of waste management activities at each site and would be evaluated after sites have been selected for LLW management. Assessment of potential environmental justice concerns from management of LLW indicated that, with the exception of low-income populations at PORTS, minority and low-income populations near the LLW sites would not experience disproportionately high and adverse health risks or environmental impacts under any of the LLW alternatives. Land use is not a good criterion for differentiating among alternatives because the alternatives do not use much land when compared with the amount available at each site.

At a Glance: Transuranic Waste

No Action Alternative:

- Continue storage in existing facilities.

Decentralized Alternative:

- Sites with small amounts would transport to 10 largest sites for storage until disposal at WIPP.

Three Regionalized Alternatives:

- Contact-handled TRUW would be treated at three or five sites and remote-handled TRUW would be treated at two sites, and then transported to WIPP for disposal.
- Two levels of treatment are evaluated. One alternative examines treatment to an intermediate level and two to more stringent levels to meet RCRA land disposal restrictions (LDRs).

Centralized Alternative:

- Contact-handled TRUW would be transported to WIPP for treatment to meet LDRs and for disposal. Remote-handled TRUW would be transported to ORR and Hanford for treatment to meet LDRs and then to WIPP for disposal.

Preferred Alternative:

- Nine major sites would treat and store their own waste onsite.
- Regional treatment and storage at INEL, ORR, and SRS.

TRUW Data and Major Assumptions:

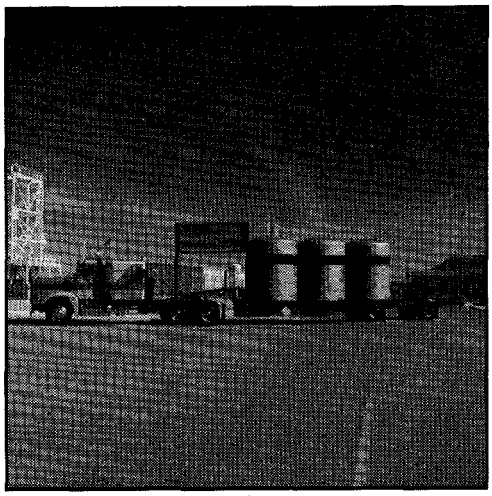
- TRUW is managed, or may be managed in the future, at 17 DOE sites, including WIPP.
- DOE will need to manage approximately 132,000 cubic meters of TRUW over the next 20 years.
- All TRUW is assumed to be mixed waste.
- For the transportation analysis, WIPP is assumed to be the geologic repository.
- Disposal impacts were not evaluated.
- New facilities would be constructed during a 10-year period; waste in storage and newly generated waste would be treated during the 10 years following construction.
- Characterization facilities would be constructed at each site before shipment.

What Did We Learn From the Results?

Transportation risks and costs were roughly equivalent for all alternatives involving shipment to WIPP.

6 Transuranic Waste

- *TRUW is generated during weapons and other research and development, nuclear weapons production and dismantlement, and fuel reprocessing. It contains elements with atomic numbers greater than that of uranium, which has an atomic number of 92.*
- *DOE will need to manage approximately 132,000 cubic meters of TRUW over the next 20 years.*
- *TRUW is managed, or may be managed in the future, at 13 of the major sites and at four other sites.*
- *Although approximately 60% of TRUW contains both radioactive and hazardous components, DOE assumes that all TRUW is mixed waste for purposes of the WM PEIS analysis.*
- *DOE must select sites for the treatment and storage of TRUW.*



TRUPACT-II demonstration containers show how transuranic wastes will be shipped.

6.1 Analysis

Transuranic waste is waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, per gram of waste, with half-lives greater than 20 years, except for (a) high-level radioactive waste; (b) waste that the Secretary has determined, with concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or (c) waste that NRC has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61. The radioactive nuclides in TRUW emit alpha radiation, which can be contained by minimal shielding but can severely damage lung tissue if inhaled. TRUW requires long-term isolation from the environment. It is produced during research and development, nuclear weapons production, and fuel reprocessing. TRUW contains traces of plutonium, neptunium, americium, curium, and californium. For the purpose of analysis, DOE assumed that all TRUW is mixed waste (containing both radioactive and hazardous components), subject to both radioactive and hazardous waste regulations.

The radiological profiles at each site were assigned uniformly to each waste stream on the basis of the volume of the waste stream at the site. These radiological profiles identify the radionuclides likely to be encountered on the basis of a knowledge of the process that generates the waste and some limited sampling of stored TRUW. These profiles ultimately determine risk and impacts. TRUW is also categorized as either CH or RH. DOE analyzed CH and RH TRUW separately in the WM PEIS to account for their different handling and treatment requirements.

DOE plans to dispose of its TRUW generated by defense activities (and retrievably stored since 1970) at a geologic repository called WIPP, located near Carlsbad, New Mexico. TRUW generated and managed before 1970 is being addressed as part of DOE's environmental restoration program. Disposal of TRUW cannot begin until DOE

meets a series of regulatory requirements imposed under the Waste Isolation Pilot Plant Land Withdrawal Act. Before shipment for disposal, all TRUW will be required to meet waste acceptance criteria (WAC) that will be established by DOE in consultation with EPA and the State of New Mexico. The WAC for WIPP are not yet final, and treatment (such as reducing the potential for gas generation in the repository) could be required to dispose of waste at WIPP.

Table 6.1–1 lists the 13 major sites that have or are expected to generate or manage TRUW. Four other sites, ETEC, LBL, Mound, and UofMo, also have TRUW. The environmental impacts and costs for each waste management alternative considered in the WM PEIS were fully evaluated for all TRUW sites except ETEC, LBL, Mound, SNL-NM, UofMO, and WVDP. For these six sites, the volumes of TRUW were included in the estimated waste volumes for treatment or storage at regionalized or centralized facilities, but impacts were not analyzed because volumes were small. Since publication of the Draft WM PEIS, DOE issued updated information on TRUW volumes. Appendix I of the Final WM PEIS addresses how more recent TRUW data may affect the alternatives in the WM PEIS. Part of this more recent information is the addition of "small-quantity" sites that have or are expected to generate or store TRUW. The TRUW volumes at these small-quantity sites constitute less than 1% of the total TRUW inventory and would not affect the evaluation of the TRUW alternatives.

Figure 6.1–1 presents the estimated total volume of TRUW from waste management activities at the 16 sites that have TRUW currently. TRUW is not currently present at WIPP.

6.2 *Alternatives*

The TRUW analysis considered six alternatives for both CH TRUW and RH TRUW. Treatment and storage activities vary by alternative and by site. Table 6.1–1 shows the sites where TRUW would be treated and stored under each alternative.

Each of the alternatives was developed to evaluate the health risk, environmental impacts, and costs associated with the range of treatment and storage alternatives available to DOE and to provide input for a decision about where to locate TRUW treatment and storage facilities.

The analysis includes alternatives where TRUW would be treated to LDR levels. Although the WIPP

Table 6.1–1. Transuranic Waste Alternatives

Alternative	CH Treat	RH Treat	Treat Stand	ANL-E	Hanford	INEL	LANL	LLNL	NTS	ORR	PGDP	RFETS	SNL-NM[d]	SRS	WIPP	WVDP[d]
No Action	11	5	WIPP-WAC	TS	TS	TS	TS	TS	S	TS	S	TS	S	TS		S
D	16	5	WIPP-WAC	TS	TS	TS	TS	TS	TS	TS	T	TS	T	TS		T
R-1	5	2	Reduced gas		TS[a]	TS	TS			TS[b]		TS		TS		
R-2	5	2	LDRs		TS[a]	TS	TS			TS[b]		TS		TS		
R-3	3	2	LDRs		TS[a]	TS				TS[b]				TS		
C	WIPP	2	LDRs		TS[c]					TS[b]					T	

Notes: D = Decentralized Alternative; R-1 = Regionalized Alternative 1; R-2 = Regionalized Alternative 2; R-3 = Regionalized Alternative 3; C = Centralized Alternative; T = treatment to one of three standards: process to current planning basis WIPP-WAC; shred and grout to reduce potential for gas generation in the repository (Reduced Gas); or treat to meet LDRs by means of thermal organic destruction and complete treatment train; S = storage after treatment under No Action and Decentralized Alternatives or storage of current inventory under No Action Alternative. A blank indicates that a site would not treat, store, or dispose of waste under the alternative specified.

[a] Hanford would treat both CH and RH waste.

[b] ORR would treat RH waste only.

[c] Hanford would treat RH waste only.

[d] Small waste volumes at SNL-NM and WVDP; impacts not analyzed.

Land Withdrawal Act amendments contained in the 1997 Defense Authorization Act render the RCRA LDRs inapplicable to waste to be disposed of at WIPP, LDR-treatment alternatives are reasonable alternatives for management activities and practices.

6.2.1 No Action Alternative

Under the No Action Alternative, DOE would continue to characterize, process, and package newly generated TRUW to meet current WIPP-WAC for storage at sites with existing or planned facilities. DOE would continue to store TRUW in existing storage facilities and would not ship TRUW for offsite storage or disposal. All sites are assumed to have adequate capabilities to package and store TRUW generated in the future. Eleven sites are projected to generate TRUW in the future, including five sites generating both CH and RH TRUW. The No Action Alternative does not assess the health risks, environmental impacts, or costs of removing TRUW from retrievable storage and repackaging it.

6.2.2 Decentralized Alternative

Under the Decentralized Alternative, DOE would, as needed, treat and package TRUW to meet the current planning basis WIPP-WAC at the 16 sites. After treatment, CH and RH TRUW would be shipped from the 6 sites with smallest amounts to the nearest of the 10 sites with the largest amounts of TRUW for storage prior to disposal. All TRUW would be shipped to WIPP for disposal.

6.2.3 Regionalized Alternatives

The regionalized alternatives consider the consolidation of TRUW for treatment and storage prior to its disposal at WIPP. Three regionalized alternatives were analyzed, with varying degrees of treatment at six and four sites and storage at those sites prior to disposal.

Under Regionalized Alternative 1, CH TRUW would be shipped from the 10 smallest generators to the 4 sites with the largest volumes of TRUW (Hanford, INEL, LANL, and SRS) for treatment and storage. In addition, RFETS would continue to treat its own waste, but would not receive waste from other sites. RH TRUW would be shipped from ANL-E, INEL, and LANL to Hanford or ORR for treatment and storage. At all six treatment sites, TRUW would be treated to an intermediate level to reduce its gas generation potential and shipped from those sites to WIPP for disposal. The six treatment sites proposed under this alternative have 95% of current and anticipated TRUW inventories.

Under Regionalized Alternative 2, DOE would use the same waste consolidation configuration as in Regionalized Alternative 1, except that TRUW would be treated to meet LDRs and then shipped to WIPP for disposal. With this alternative, DOE can compare the impacts of intermediate treatment under Regionalized Alternative 1 with the impacts of LDR treatment; the impacts from both Regionalized Alternatives 1 and 2 can be compared to the Decentralized Alternative to meet WIPP-WAC where 98% of the waste would be treated at the same six sites.

Regionalized Alternative 3 considers the consolidation of waste for treatment at four sites (Hanford, INEL, ORR, and SRS) where approximately 80% of the TRUW is already located or is expected to be generated. CH TRUW would be treated at Hanford, INEL, and SRS; RH TRUW would be treated at Hanford and ORR. Under this alternative, TRUW would be treated to meet LDRs and shipped to WIPP for disposal.

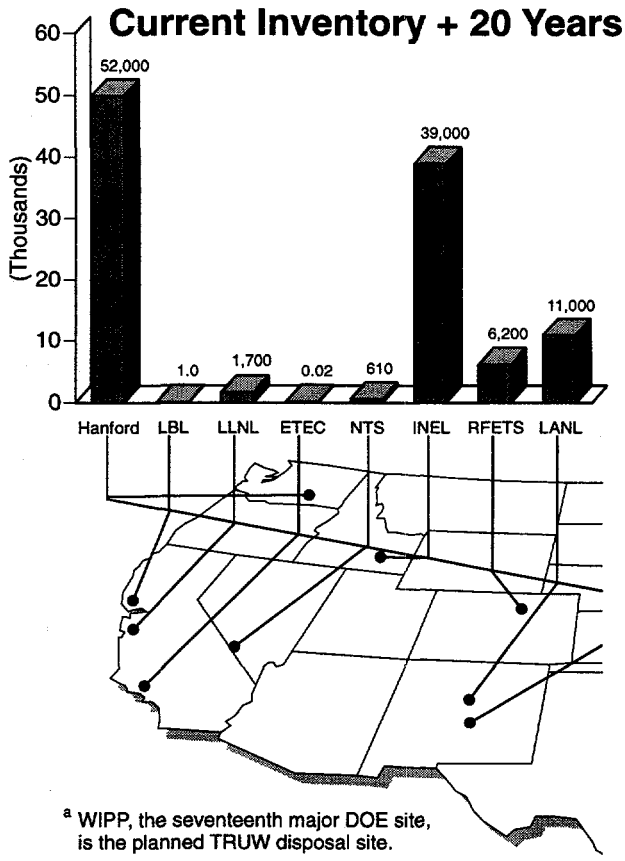
6.2.4 Centralized Alternative

Under the Centralized Alternative, DOE would ship all CH TRUW to WIPP for treatment to meet LDRs and for disposal. RH TRUW would be shipped to Hanford and ORR for treatment to meet LDRs and then shipped to WIPP for disposal.

TRUW Volumes

DOE Sites	Total Volumes (m^3)
1. ANL-E	1,300
2. ETEC	0.02
3. Hanford	52,000
4. INEL	39,000
5. LANL	11,000
6. LBL	1
7. LLNL	1,700
8. Mound	1,500
9. NTS	610

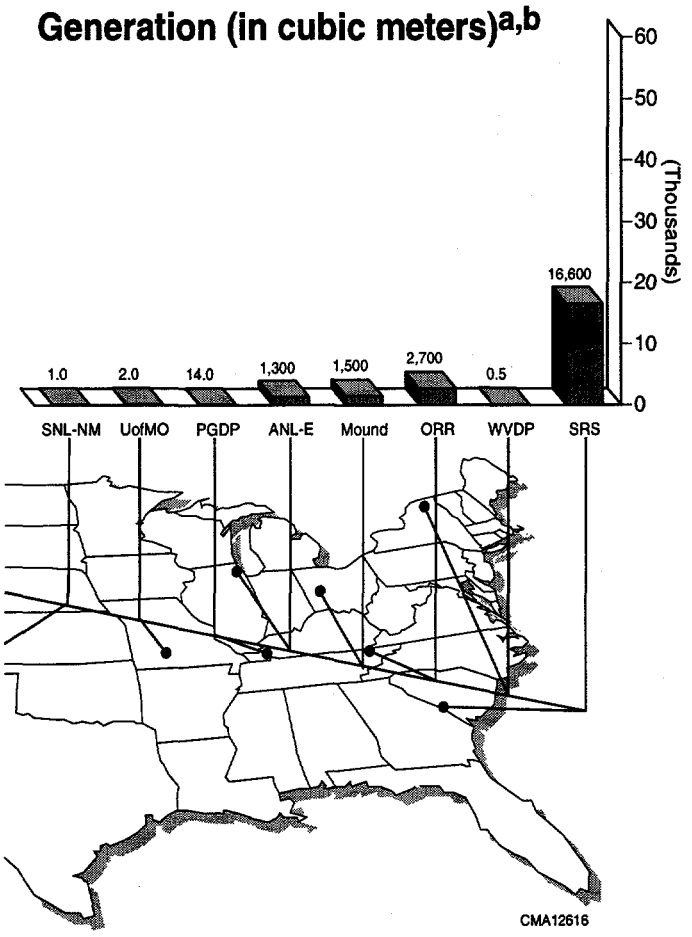
Figure 6.1–1. TRUW Total Volumes



[a] WIPP, the seventeenth major DOE site, is the planned TRUW disposal site.

[b] Updated inventories and waste generation rates are summarized in Appendix I. Different inventories provided in the WIPP SEIS II are also provided in Chapter 8.

at the 16 Major Sites.



*TRUW Volumes**
(Continued)

DOE Sites	Total Volumes (m^3)
10. ORR	2,700
11. PGDP	14
12. RFETS	6,200
13. SNL-NM	1
14. SRS	16,600
15. UofMO	2
16. WIPP	
17. WVDP	0.5
TOTAL	**132,000**

*Estimated TRUW volumes from waste management activities include current inventory plus 20 years of anticipated generation projected volume. Waste volumes used for the WM PEIS analysis may vary from latest site estimates. Updated inventories and waste generation rates are summarized in Appendix I, "Update of Site-Specific Waste Volumes for LLW, LLMW, and TRUW."

6.2.5 Rationale for Treatment and Storage Site Alternatives

TRUW alternatives were developed to cover the range of reasonable alternatives for treatment and storage sites. Thus, the Decentralized Alternative considers treatment and storage of TRUW at all 16 sites where TRUW is currently located, and the Centralized Alternative considers treatment and storage of all CH TRUW at one site and all RH TRUW at two sites. For the regionalized alternatives between these alternatives, DOE focused on the six sites where 95% of the waste is located or expected to be generated and on the four sites where approximately 80% of the waste is located or expected to be generated. Under these alternatives, DOE assumed that the waste from other generating sites would be shipped to the closest site for treatment.

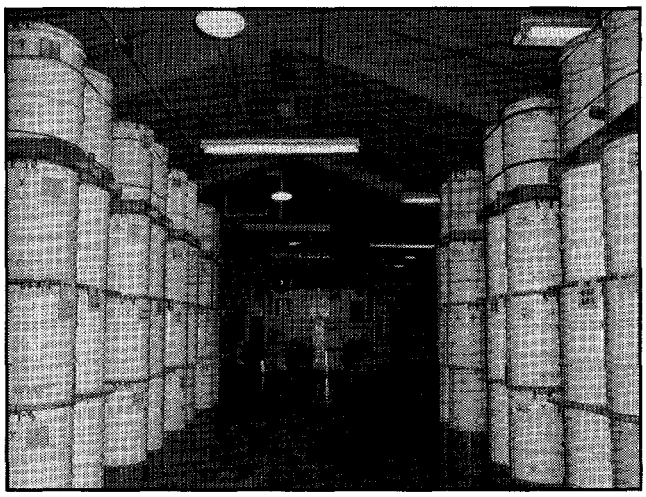
In addition, DOE assumed that it would not be practical or reasonable for sites with small volumes of TRUW (number of sites having less than 15 cubic meters) to treat TRUW either to intermediate levels or to meet LDRs. Onsite treatment to meet current WIPP-WAC was considered feasible for all 16 sites, including the small-volume sites, under the Decentralized Alternative.

Most RH TRUW requires extensive treatment (but not necessarily to meet LDRs) before it can be shipped; therefore, consolidation of RH TRUW at one site for treatment was not considered. Thus, under the Centralized Alternative, DOE would treat RH TRUW at the two sites—Hanford and ORR—where approximately 85% of current and projected inventory would be located.

6.3 Impacts of Managing TRUW

Some impact areas illustrated clear trends across the alternatives, whereas others illustrated sensitivities at particular sites regardless of the alternative.

When reviewing the impacts and costs identified for the No Action Alternative, it is important to realize that the results for indefinite storage are based on



Mixed TRUW assay and shipping area.

the initial 20 years of that indefinite period. This is consistent with the period of analysis for all the alternatives; however, not shown are the impacts from storage expected beyond this 20-year time frame. The longer-term storage impacts and costs are likely to exceed those for the first 20 years, not only as a result of routine indefinite storage operations, but also from degradation of facilities and containers. This differs from the effects predicted for the action alternatives for management of the 20-year forecast of TRUW, where risks to workers and the offsite population, and other impacts and costs, are greatly reduced following disposal. The No Action Alternative does not reduce or avoid impacts and costs; rather it causes impacts and costs to be experienced every year for an indefinite period of time.

The following discussion focuses on the impact areas that would be affected by the management of TRUW under the alternatives.

6.3.1 Health Risks

Facility health risks over 20 years are principally to workers, with approximately three-fourths from physical accidents and one-fourth from radiological exposures. Twenty-year risks to the offsite population are less than a single fatality, except for one fatality in one regionalized alternative to meet LDRs utilizing thermal treatment. Estimated transportation fatalities range from five to seven

Table 6.3–1. Some of the Projected Risks to Workers and the Public From Managing TRUW

Alternative	Number of Sites		Treatment Standard	Treatment Worker Physical Hazard Fatalities	Treatment Worker Cancer Fatalities	Offsite Population Cancer Fatalities	Truck[a] Radiation Fatalities	Truck Non-Radiation Fatalities	Rail[a] Radiation Fatalities	Rail Non-Radiation Fatalities
	CH Treat	RH Treat								
No Action	11	5	WIPP-WAC	*	*	*	0	0	0	0
Decentralized	16	5	WIPP-WAC	2	1	*	4	3	1	*
Regionalized 1	5	2	Reduce Gas	3	1	*	3	3	1	*
Regionalized 2	5	2	LDRs	4	1	1	3	2	1	*
Regionalized 3	3	2	LDRs	3	1	*	3	3	1	*
Centralized	WIPP	2	LDRs	2	1	*	3	3	1	*

Notes: CH = contact-handled TRUW; RH = remote-handled TRUW; LDRs= land disposal restrictions; WIPP-WAC = Waste Isolation Pilot Plant Waste Acceptance Criteria; * = greater than 0 but less than 0.5.
[a] Fatalities are from radiation-induced cancer.
[b] Treatment results under the No Action Alternative include risks from only the first 20 years of indefinite storage of TRUW.

across all alternatives except for No Action, which does not involve transportation. Table 6.3–1 presents selected risk results for the TRUW alternatives.

6.3.2 Air Quality Impacts

The management of TRUW would not cause the air quality standards to be approached or exceeded at most sites; however, emissions of radionuclides were estimated to exceed applicable standards at LANL and WIPP in the alternatives involving thermal treatment to meet LDRs at these sites (Regionalized Alternative 2 and the Centralized Alternative). The exceedances at these sites could require additional control measures to reduce emissions to acceptable levels. Emissions of other hazardous air pollutants and criteria pollutants were estimated to be below the applicable standards and guidelines at all sites.

6.3.3 Economic and Population Impacts

The greatest benefit to the region surrounding any site occurs when TRUW is managed at that site. The most jobs as a percent of overall regional employment would occur in regions surrounding INEL and WIPP under Regionalized Alternative 3 and the Centralized Alternative, respectively. None of the TRUW alternatives would substantially affect the national economy, although some 1,900 to 12,000 jobs would be directly or indirectly created. No regions would experience population increases of 1% or more.

6.3.4 Infrastructure Impacts

No offsite infrastructure impacts are expected. Onsite infrastructure impacts on water use, wastewater treatment, and electrical power are comparable for the Decentralized and Regionalized

Alternatives, but are much greater at WIPP under the Centralized Alternative. Impacts generally increase as the intensity of treatment increases, with the greatest impacts at WIPP under the Centralized Alternative.

In addition, increases in site employment at Hanford, INEL, LANL, and WIPP could lead to traffic increases sufficient to affect onsite transportation infrastructure.

6.3.5 Costs

Costs increase as the level of treatment increases. Processing to meet WIPP-WAC and treatment to reduce gas generation cost about the same. Treatment to meet LDRs costs approximately 22% more except for the Centralized Alternative, which treats RH TRUW at only two sites. Transportation costs are substantially lower than facility costs, making shipment to available facilities at another site generally less expensive than building a new facility onsite. Table 6.3–2 provides the estimated costs to manage TRUW under each of the alternatives over 20 years.

6.3.6 Water Resources, Ecological Resources, Environmental Justice, Land Use, and Cultural Resources Impacts

Major impacts to these resources at the sites are unlikely from treatment of TRUW under any of the alternatives. However, ecological and cultural resources impacts would receive further site-specific studies prior to the siting of new facilities. Assessment of potential environmental justice concerns associated with TRUW management indicated no substantial potential for disproportionately high and adverse health risks or environmental impacts to minority and low-income groups living near INEL and WIPP. The potential at both sites could be mitigated by selection of an alternative treatment technology or employment of more efficient emissions controls.

Table 6.3–2. TRUW Estimated Life-Cycle Costs (Billions of 1994 Dollars)

Alternative	Number of Sites		Treatment Standard	Total (Including Truck Transport)	Transportation Costs	
	CH Treat	RH Treat			Truck	Rail
No Action	11	5	WIPP-WAC	1.7	0	0
Decentralized	16	5	WIPP-WAC	7.4	0.56	1.44
Regionalized 1	5	2	Reduce Gas	7.7	0.51	1.40
Regionalized 2	5	2	LDRs	9.0	0.45	1.24
Regionalized 3	3	2	LDRs	8.5	0.49	1.29
Centralized	WIPP	2	LDRs	7.9	0.51	1.33

Notes: CH = contact-handled TRUW; RH = remote-handled TRUW; LDRs = land disposal restrictions; WIPP-WAC = Waste Isolation Pilot Plant waste acceptance criteria.
[a] Costs under the No Action Alternative include those from only the first 20 years of indefinite storage. The costs of storage beyond 20 years are analyzed as part of the No Action Alternatives in the WIPP SEIS-II.

High-Level Waste

At a Glance: High-Level Waste

No Action Alternative:

- HLW canisters would be stored at Hanford, SRS, and WVDP until shipment to a geologic repository.

Decentralized Alternative:

- HLW canisters would be stored at all four sites generating canisters until shipment to a geologic repository.

Two Regionalized Alternatives:

- Canisters from WVDP would be transported to SRS or Hanford; canisters would be stored at Hanford, SRS, and INEL until shipment to a geologic repository.

Centralized Alternative:

- Canisters would be transported from WVDP, INEL, and SRS to Hanford; canisters would be stored at Hanford until shipment to a geologic repository.

Preferred Alternative:

- Each site would store its own immobilized waste onsite.

HLW Data and Major Assumptions:

- HLW is currently stored at Hanford, INEL, SRS, and WVDP.
- Approximately 378,000 cubic meters of HLW have been or will be generated. Treated HLW will require an estimated 21,600 canisters for packaging.
- The Glass Waste Storage Building for SRS (2,286 canisters) is the model used to analyze storage at Hanford and INEL.
- For transportation impacts analysis, DOE assumed the repository would be Yucca Mountain.
- The repository could accept 800 canisters per year.
- The WM PEIS evaluates canister storage. Treatment and disposal of HLW are not analyzed.
- Two sets of timing assumptions are analyzed—acceptance of canisters at the repository beginning in 2015 and acceptance beginning at some later date.

What Did We Learn From the Results?

- Although costs and risks are slightly higher for centralized storage at Hanford, differences from costs and risks at other sites are not significant. Alternatives are roughly equivalent from the standpoint of environmental impacts and costs.
- The acceptance rate of canisters by the repository controls the length of storage time.

7 High-Level Waste

- *HLW is highly radioactive waste that results from the reprocessing of spent nuclear fuel and of targets irradiated in nuclear defense, research, and production activities.*
- *Approximately 378,000 cubic meters of HLW have been or will be generated. Treated HLW will require an estimated 21,600 canisters for packaging.*
- *HLW will be treated and packaged for disposal in a licensed geologic repository.*
- *The WM PEIS analyzes the impacts of storing vitrified HLW.*
- *HLW is currently stored at Hanford, INEL, SRS, and WVDP.*
- *DOE must decide where to store the HLW canisters.*

7.1 Analysis

High-level waste is the highly radioactive material from the chemical reprocessing of spent nuclear fuel and of irradiated targets that contain fission products in concentrations sufficient to require permanent isolation.

Government operations from 1944 to the present have generated approximately 357,000 cubic meters of HLW with approximately 21,000 cubic meters to be generated in the future. Only four sites manage HLW—Hanford, INEL, SRS, and WVDP.

DOE is proceeding with plans to treat HLW by processing it into a solid form that cannot be readily dispersed into air, groundwater, or surface water. This process is called vitrification. When the existing inventory of HLW is vitrified, the vitrified material will fill an estimated 21,600 canisters. The WM PEIS only analyzes the impacts of storing this vitrified HLW.

Table 7.1-1. High-Level Waste Volumes and Projected Number of HLW Canisters

Site	HLW Volume (m^3)	Estimated Total Number of Canisters to Be Generated
Hanford	213,000	15,000
INEL	10,400	1,700
SRS	152,000	4,600
WVDP	2,200	340
Total	378,000	21,600

Table 7.1-1 shows the HLW inventory at Hanford, INEL, SRS, WVDP, and the projected total of vitrified HLW canisters that will be generated as a result of treating the entire HLW inventory.

Analysis of the impacts of HLW disposal in a repository is not within the scope of this WM PEIS, but those impacts will be analyzed in NEPA reviews relating to the geologic repository. Because Yucca Mountain is the only candidate repository site for HLW being studied at this time, DOE assumed this location in its analysis of the impacts of transporting HLW to a disposal facility.

Each alternative considered in this WM PEIS for storage of HLW canisters involves three major facilities and features: the canisters, the facilities for storage of canisters, and packages for transporting canisters to a geologic repository.

7.2 Alternatives

DOE analyzed five alternatives for HLW. Each of the alternatives was developed in order to estimate health risks, other environmental impacts, and

cost associated with the range of storage options and to provide information for a decision about where to store HLW. For each of the five alternatives, DOE assumed that a geologic repository would begin accepting DOE's HLW in 2015 at the rate of 800 canisters per year. For purposes of this analysis, DOE also evaluated an alternative that assumed that there would be a delay in acceptance of DOE's HLW by the repository until some time later than 2015, but at the same rate of acceptance of 800 canisters per year. Table 7.2–1 presents the alternatives in tabular form. Figure 7.2–1 shows the location of the HLW sites.

7.2.1 No Action Alternative

Under the No Action Alternative, only existing and approved HLW storage facilities would be used. Each site would store only those canisters produced at that site. Under this alternative, Hanford would run out of canister storage capacity before canisters could be sent to a geologic repository in 2015. Therefore, production of HLW canisters under the No Action Alternative would be phased because of both the lack of existing storage capacity at most of the sites and the assumed repository acceptance rate of 800 canisters per year.

7.2.2 Decentralized Alternative

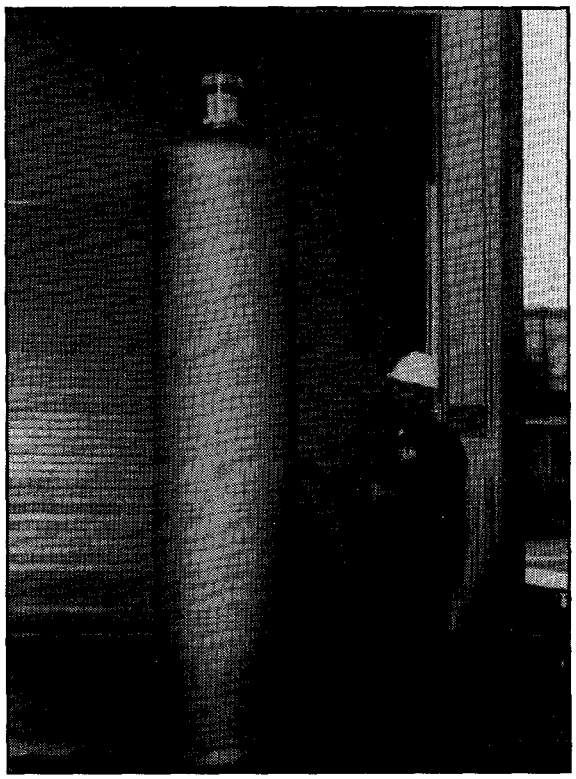
Under the Decentralized Alternative, storage capacity equal to the anticipated total production of HLW canisters would be constructed at each site. This would allow each site to start vitrifying HLW as soon as treatment facilities were available. On the basis of the assumption that storage capacity at all four sites would be adequate until canister acceptance begins at the candidate repository in 2015, no delays in the vitrification of HLW would occur.

Table 7.2–1. High-Level Waste Alternatives

Alternative	Number of Storage Sites	Hanford	INEL	SRS	WVDP
No Action	4	S	S	S	S
Decentralized	4	S	S	S	S
Regionalized 1	3	S	S	S	
Regionalized 2	3	S	S	S	
Centralized[a]	1	S			

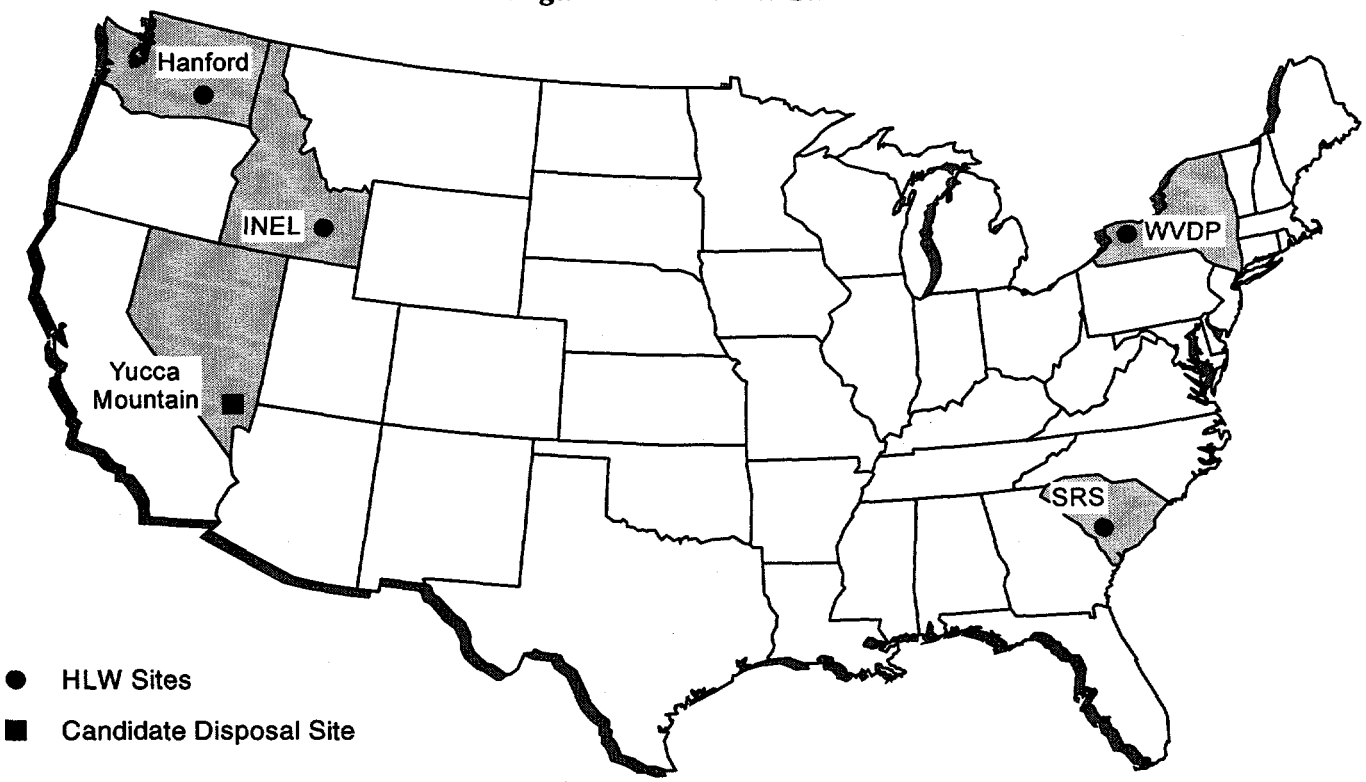
Note: S = storage. A blank cell indicates that there was no storage at a site under the specified alternative.

[a] Canisters generated at WVDP, SRS, and INEL prior to acceptance at the candidate repository in 2015 would be shipped to Hanford for storage. Canisters generated at SRS and INEL after 2015 would be shipped directly to the candidate repository. If acceptance of the DOE-managed HLW is delayed past 2015, then all HLW canisters would be shipped to Hanford for storage.



Typical high-level waste canister.

Figure 7.2–1. HLW Sites.



7.2.3 Regionalized Alternatives

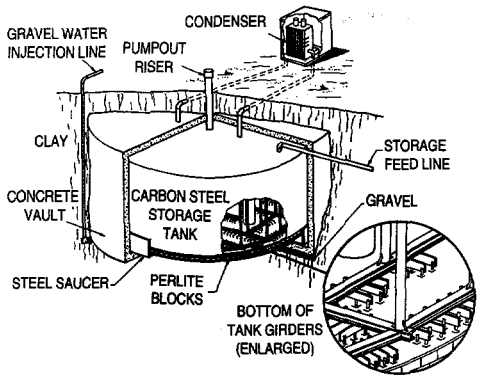
Two regionalized alternatives were analyzed for managing HLW canisters. Under Regionalized Alternative 1, the HLW canisters generated at WVDP would be taken in approved transportation casks to SRS for storage. Adequate storage capacity for HLW canisters would be provided at Hanford, INEL, and SRS until canisters were accepted at a geologic repository.

Under Regionalized Alternative 2, the canisters produced at WVDP would be transported to Hanford in approved transportation casks. Adequate storage capacity for HLW canisters would be provided at Hanford, INEL, and SRS until HLW canisters were accepted at a geologic repository.

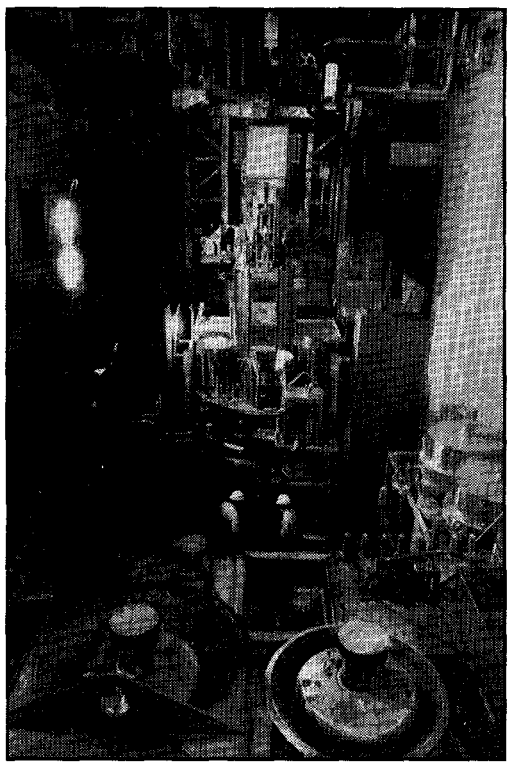
7.2.4 Centralized Alternative

Under the Centralized Alternative, the canisters produced at INEL, SRS, and WVDP would be transported to Hanford in approved transportation casks for storage until a geologic repository began to accept the canisters.

Because the WM PEIS analyzed two different assumptions about when canisters would be accepted at a geologic repository, the alternative has two subalternatives. The WM PEIS assumed that HLW canisters generated before the repository would begin accepting HLW in 2015 would be shipped to Hanford for centralized storage. The remaining canisters generated at SRS and INEL after 2015 would be shipped directly to the repository. Because WVDP



HLW storage tank design.



Vitrification facility at SRS.

would generate all of its canisters before 2015, all 340 canisters would be shipped to Hanford.

For the second subalternative, in which acceptance at a geologic repository would be delayed beyond 2015, all canisters generated at WVDP, SRS, and INEL would be shipped to Hanford for storage before shipment to a geologic repository once it began accepting HLW.

7.2.5 Rationale for Storage Alternatives

The five storage alternatives were developed to cover the range of reasonable alternatives. From one to four sites are available for storage of HLW (the Centralized Alternative and Decentralized Alternative, respectively). DOE identified two intermediate alternatives, in which the relatively small amount of WVDP HLW is transported to either Hanford or SRS. To define the regionalized alternatives, DOE selected the site with the largest amount of HLW (Hanford) and the site where transportation would be minimized (SRS). INEL was eliminated from consideration as a Regionalized Alternative site because it has no existing or approved storage facilities.

Under the Centralized Alternative, all HLW would be shipped to Hanford for storage. Hanford was proposed because it has the greatest volume of HLW. The major variable is the total miles for transportation between HLW sites, the central storage site, and the geologic repository. Consolidating all HLW canisters at Hanford minimizes the transportation impacts required for Centralized storage, because the largest number of canisters (those produced at Hanford) would be shipped directly to the repository. WVDP was eliminated from consideration for the Centralized Alternative because it has the smallest volume of HLW (only 1.6% of the total HLW) and because storage of canisters from other sites would be inconsistent with the West Valley Demonstration Project Act.

Table 7.3–1. Some of the Projected Risks to Workers and the Public From Managing HLW

Alternative	Number of Sites Storing	Worker Physical Hazard Fatalities	Worker Cancer Fatalities	Truck Radiation Fatalities	Truck Non-Radiation Fatalities	Rail Radiation Fatalities[a]	Rail Non-Radiation Fatalities
No Action	4	1	2	3	2	*	*
Decentralized	4	1	3	3	2	*	*
Regionalized 1	3	1	3	3	2	*	*
Regionalized 2	3	2	3	3	2	*	*
Centralized	1	2	3	3	2	*	*

Notes: * = greater than 0 but less than 0.5.
[a] Fatalities are from radiation-induced cancer.

7.3 Impacts of Managing HLW

The impacts were evaluated across all of the alternatives to identify trends, compare alternatives, and help select DOE's preferred alternative. The following discussion focuses on the impact areas that would be affected by the management of HLW canisters under the alternatives.

It should be noted that the No Action Alternative for HLW does not provide enough canister storage capacity for all of the canisters that would be produced after treatment of HLW. Provision of adequate storage would lead to costs and impacts as great as shown for the other HLW alternatives.

7.3.1 Health Risks

Both fatalities and incidences of cancer for waste management workers are comparable under the Decentralized, Regionalized, and Centralized Alternatives and do not favor one alternative over another (see Table 7.3–1). Estimates of worker cancer fatalities from radiation exposure exceed fatalities from physical hazards. Transportation risks are approximately the same for all alternatives. Fatalities from facility accidents are less than one under each of the HLW alternatives.

7.3.2 Economic and Population Impacts

HLW storage facility construction and operations expenditures would minimally benefit the localeconomy at the four HLW sites because estimated job and personal income growth are well below 1% at all sites under all the alternatives. None of the HLW alternatives would affect the national economy, although 300 to 1,200 jobs would be directly or indirectly created. The regional population would remain relatively constant under all proposed alternatives and would not incur a major increase at any site.

7.3.3 Infrastructure Impacts

Proposed HLW activities have the potential for affecting the onsite infrastructure only at the Hanford Site, although the effects would be minor. No offsite infrastructure impacts are expected at any other site. Estimated new requirements for wastewater treatment at Hanford would increase current demand under all alternatives, except No Action. Employment increases

would not approach or exceed 5% of current site employment at any site. Traffic increases would be minimal during construction and would not affect the onsite transportation infrastructure.

7.3.4 Costs

The costs of storage and transportation remain relatively constant, at approximately $3 billion, under all alternatives except No Action. Costs do rise slightly when storage is centralized. Delay in disposing of the waste in a geologic repository causes the life-cycle costs to increase at a rate of 0.2% per year of delay. Table 7.3–2 presents the estimated costs for each of the alternatives.

7.3.5 Air Quality, Water Resources, Ecological Resources, Environmental Justice, Land Use, and Cultural Resources Impacts

The management of HLW canisters would not appreciably affect the air quality or water resources at any site. Operation of HLW storage facilities should not affect ecological resources because airborne emissions, liquid effluents, and loss of habitat are expected to be negligible. Additionally, no impacts to current land uses would result because under all alternatives, no site would need to use more than 1% of its suitable lands for storage facilities. Assessment of potential environmental justice concerns from management of HLW indicated that minority and low-income populations near the HLW sites would not experience disproportionately high adverse health risks or environmental impacts under any of the HLW alternatives. DOE would conduct additional site-specific analyses to assess cultural resource impacts.

Table 7.3–2. HLW Estimated Life-Cycle Costs (Billions of 1994 Dollars)

Alternatives	Number of Sites Storing	Total Cost (Including Transportation Costs)	Transportation Cost	
			Truck	Rail
No Action	4	1.5	0.4	0.6
Decentralized	4	2.7	0.4	0.6
Regionalized 1	3	2.7	0.4	0.6
Regionalized 2	3	2.7	0.4	0.6
Centralized	1	2.9	0.5	0.7

Hazardous Waste

At a Glance:

Hazardous Waste

No Action Alternative:

- Nonwastewater HW would continue to be transported to commercial facilities. Two DOE sites would treat organic materials.

Decentralized Alternative:

- Nonwastewater HW would continue to be transported to commercial facilities. Three DOE sites would treat organic materials.

Two Regionalized Alternatives:

- 50% of nonwastewater HW would be treated at five DOE sites; 50% would be treated at commercial facilities.
- 90% of nonwastewater HW would be treated at two DOE sites; 10% would be treated at commercial facilities.

Centralized Alternative:

- None.

Preferred Alternative:

- No Action (continue use of commercial facilities for nonwastewater HW treatment).

HW Data and Major Assumptions:

- HW is generated or exists at most sites.
- DOE will need to manage 69,000 cubic meters of RCRA-regulated hazardous waste over the next 20 years. Totals do not include wastewater.
- An analysis of RCRA HW shipped to commercial treatment from the 11 sites with the most HW in fiscal year 1992 provides a representative sample for comparing onsite DOE treatment with offsite commercial treatment.
- Wastewater HW will continue to be treated onsite.

What Did We Learn From the Results?

- Risks and impacts are similar for each alternative.
- Costs favor commercial treatment.

8 Hazardous Waste

- *HW is nonradioactive chemical waste.*
- *HW is generated or exists at about 45 sites.*
- *HW is generated as a result of research and development and as a byproduct of nuclear weapons production and dismantlement.*
- *Most nonwastewater DOE HW is treated commercially.*
- *DOE must decide whether to develop additional capacity of its own to treat HW.*

8.1 Analysis

Hazardous waste consists of nonradioactive chemical waste generated as a result of nuclear weapons production and other research and development activities. HW has been generated, or is anticipated to be generated, at most DOE sites. Although HW generation from the production of nuclear weapons has essentially stopped, many chemicals and chemical residues were left in containers and process lines. These wastes must be properly treated and disposed of to manage existing and future inventories.

Most of DOE's HW consists of wastewater, which by definition contains less than a 1% concentration of organic HW materials. Hazardous wastewater is generated as a result of operations such as metal cleaning, etching, and plating. Hazardous wastewater requires treatment before it can be safely discharged to the environment. DOE currently treats its hazardous wastewater at the sites that generate it and will continue to do so in the future because wastewater is not difficult to treat but is difficult and expensive to transport.

Nonwastewater HW consists of sludges, solids, and organic liquids (liquids containing higher concentrations of organic chemicals than wastewater). DOE currently ships most of this HW off site to commercial facilities for treatment, although two sites (ORR and INEL) have the capability to treat nonwastewater HW by thermal treatment. DOE needs to decide the extent to which it should continue its reliance on the commercial treatment of nonwastewater HW.

DOE estimates that more than 90% of the total HW (wastewater and nonwastewater) in a given year is generated by 11 DOE sites. Table 8.1–1 shows the quantities of HW at the 11 sites that generate the most HW. Table 8.1–1 shows waste volume generation per year. The focus of the alternatives is on these RCRA-defined wastes which total approximately 3,440 metric tons annually, and 69,000 for a 20-year period.

8.2 Alternatives

The WM PEIS considered four alternatives for treatment facilities within three general categories of alternatives: no action, decentralized, and regionalized (see Table 8.2–1). No centralized alternative was analyzed because DOE determined it would be an unreasonable alternative in light of the cost, risk, regulatory constraints, and practical considerations of attempting to centrally manage all of DOE's diverse HW.

Each of the alternatives was developed in order to estimate the human health risks, other environmental impacts, and costs associated with the range of HW treatment options available to DOE and to provide input for a decision about whether to continue to rely on offsite treatment of HW.

Table 8.1–1. Waste Management of HW at DOE's 11 Largest Generators (metric tons[a]/year)

DOE Site	Wastewater Treated Onsite[b]	Onsite Thermal Treatment and Fuel Burning[b]	Other Onsite Treatment[b]	Offsite Commercial Treatment[c]
ANL-E	0	0	2	206
Fermi	0	0	12	49
Hanford	0	0	140	303
INEL	33,000	35	80	160
KCP[d]	343,000	0	80	601
LANL	0	0	40	246
LLNL	250	0	230	629
ORR	624,000	66	14,600	207
Pantex	3,000	0	2,700	512
SNL-NM	130,000	0	0	153
SRS[d]	59,000	0	50	273
Total	1,192,250	101	17,934	3,339

[a] Metric ton = 1,000 kilograms = 2,205 lb. One metric ton of HW is approximately one cubic meter in volume.
[b] Based on 1991 data taken from biennial and annual reports (includes temporary storage volumes).
[c] Based on fiscal year (FY) 1992 manifests. Includes only RCRA-defined waste; an additional 6,600 metric tons of Toxic Substances Control Act (TSCA)-regulated HW, State-regulated HW, and environmental-restoration-generated HW was shipped to commercial treatment in FY 1992.
[d] Excludes wastewater treatment of groundwater at KCP and SRS.

Table 8.2–1. Hazardous Waste Alternatives

Alternative	Number of Sites Treating	ANL-E	Hanford	INEL	LANL	LLNL	ORR	Pantex	SNL-NM	SRS
No Action	2			T			T			
Decentralized	3			T			T			T
Regionalized 1	5		T	T	T		T			T
Regionalized 2	2			T			T			

Notes: T = treatment. A blank indicates that a site does not treat waste under the alternative specified.

8.2.1 No Action Alternative

Under this alternative, current operations would continue. Some of the HW that is currently being treated onsite at DOE facilities (i.e., thermal treatment of organic materials at ORR and INEL) would continue to be treated onsite, and other HW would continue to be treated at commercial facilities.

8.2.2 Decentralized Alternative

Under this alternative, DOE would continue thermal treatment at existing facilities at INEL, ORR, and SRS. In addition, the use of commercial facilities would continue as needed. Most wastes generated at the other major sites would also be sent to commercial facilities, except for wastes thermally treated or used as fuel at INEL, ORR, and SRS.

8.2.3 Regionalized Alternatives

Under Regionalized Alternative 1, 50% of the HW generated by the 11 major HW sites would be treated at five onsite treatment centers or "hubs" (Hanford, INEL, LANL, ORR, and SRS). Each regional hub would be permitted under RCRA, and onsite treatment facilities would be constructed for thermal treatment and organic removal and recovery. The hub sites would treat two-thirds of the HW received from other sites and send the other one-third to a commercial facility. For HW that could be thermally treated, two-thirds would be sent to the regional hubs from the generating sites, and the other third would be sent directly to commercial treatment facilities. Approximately 50% of the estimated 3,440 metric tons considered for onsite thermal treatment or offsite commercial treatment of HW would be treated at DOE HW facilities.

Under Regionalized Alternative 2, DOE would build facilities at INEL and ORR for organic treatment and deactivation/neutralization. Metal recovery and recycling, battery recycling, stabilization, and land disposal would continue to be provided by offsite commercial establishments. Approximately 90% of HW would be treated at DOE HW facilities.

8.2.4 Rationale for Treatment Alternatives

The alternatives selected were developed to cover the range of reasonable alternatives on the basis of three primary criteria: (1) the site's experience with HW treatment technologies, (2) the location of the site, and (3) the volume of the HW generated by site. As it was in the case of evaluating alternatives for the management of the radioactive waste types, consideration was given to avoiding the shipment of HW to DOE sites that do not generate HW. These criteria and considerations served to minimize the costs and impacts associated with the alternatives and sites selected.

The technologies evaluated for onsite treatment of HW are thermal treatment, burning as fuel, and deactivation. Of all the sites evaluated in the No Action Alternative, five of the sites—Hanford, INEL, LANL, ORR, and SRS—have operated or plan to operate thermal treatment units.

Regionalized Alternative 1 uses the five DOE sites with thermal treatment units, satisfying the criterion for technology experience. The location criterion is addressed in that the five sites are regionally distributed, which serves to minimize transportation of HW and its associated risks.

Regionalized Alternative 2 is based on using two sites for HW treatment. The two proposed sites, INEL and ORR, satisfy the technology experience criterion as discussed above, and their locations (western and eastern United States) require the least transportation of HW when compared with other two-site combinations. Onsite deactivation, or neutralization, also considered in this alternative, is planned for the two hubs.

8.3 *Impacts of Managing HW*

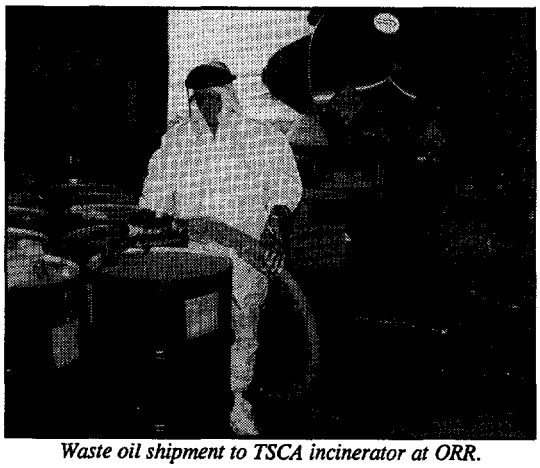
Impacts were evaluated across all of the alternatives to identify trends and compare alternatives. Some impact areas illustrated clear trends across the alternatives, whereas others illustrated sensitivities at particular sites regardless of the alternative.

The following discussion focuses on the impact areas that would be affected by the management of HW under the alternatives, identifying trends when appropriate and highlighting noteworthy findings at particular sites.

Interior of 709-G hazardous waste storage facility at SRS.

8.3.1 Health Risks

Incidences of cancer among the public for both routine operations at DOE facilities and facility accidents were found to be less than one for all alternatives. Noncancer risks to the offsite population and noninvolved workers were also low. However, noncancer risks for WM workers may be of concern under each of the alternatives evaluated.



Waste oil shipment to TSCA incinerator at ORR.

Although DOE would treat more of its HW under the regionalized alternatives and send less to commercial facilities, DOE believes that worker risk is similar under treatment by DOE and commercial facilities. Therefore, there is no significant difference among the alternatives with regard to HW worker risk.

Although HW can be transported both by truck and rail, truck transportation is the predominant method for shipping HW. The risk estimates include a fraction of a single fatality for each of the proposed HW alternatives from vehicle accidents and exposures associated with HW transportation.

8.3.2 Air Quality Impacts

The management of HW would not cause air quality standards to be approached or exceeded at most sites. No criteria pollutants would exceed standards at any site. However, regionalization of treatment facilities

at LANL and ORR would cause adverse air impacts that would require additional control measures for vinyl chloride. The exceedances at LANL and ORR primarily result from emissions from thermal treatment.

8.3.3 Costs

The No Action Alternative is the least costly of the alternatives, at an estimated $144 million, followed by the Decentralized Alternative at $183 million. Regionalized Alternative 1 is the most expensive, at $376 million, closely followed by Regionalized Alternative 2, at a cost of $318 million. Conversely, commercial treatment costs are highest under the No Action Alternative and lowest under Regionalized Alternative 2.

The fundamental differences among the alternatives involve transportation and costs. Table 8.3–1 presents a summary of the transportation and cost differences among the alternatives over the 20-year period of analysis.

8.3.4 Water Resources, Ecological Resources, Economic Impacts, Environmental Justice, Infrastructure, Land Use, and Cultural Resources

The impacts analyses for water, ecological, economic, population, infrastructure, cultural, and land use resources did not indicate significant impacts under any of the HW alternatives; therefore, these analyses do not reveal significant differences among alternatives. Assessment of potential environmental justice concerns from management of HW indicated that minority and low-income populations near the HW sites would not experience disproportionately high and adverse health risks or environmental impacts under any of the HW alternatives.

Table 8.3–1. Summary Comparison of the HW Alternatives

Alternative	Sites	Shipments		Costs[c]		
		Mileage[a]	Number[b]	Transport	Project Life-Cycle	Total
No Action	2	20	34	49	95	144
Decentralized	3	19	41	49	134	183
Regionalized 1	5	35	50	87	289	376
Regionalized 2	2	19	34	47	271	318

[a] Mileage in millions.
[b] Number of shipments in thousands.
[c] Cost in millions of dollars.

9.1 Analysis

Cumulative impacts are those impacts that result from the incremental impact of an action added to other past, present, and reasonably foreseeable actions in the future. Examples of impacts from past and present actions include those from contaminated sites, ongoing activities that result in waste generation, and waste management activities outside the scope of the WM PEIS. Both Council on Environmental Quality regulations and DOE regulations for implementing NEPA require DOE to assess cumulative impacts because significant impacts can result from several smaller actions that individually might not have significant impacts.

To conduct the cumulative impacts analysis, DOE first examined the combined impacts of siting waste management facilities for more than one waste type at each of the 17 major sites. **Combined impacts** are the subset of cumulative impacts resulting from the siting of multiple facilities for managing more than one waste type at a site. DOE then added the impacts of existing site conditions and reasonably foreseeable future actions at a site or in an area to these combined impacts to assess the cumulative impacts.

The combined and cumulative analysis considers the following impacts:

- Offsite population health risks
- Offsite MEI health risks
- Worker health risks
- Air quality exceedances
- Groundwater quality exceedances
- Impacts on resources and infrastructure
- Socioeconomic impacts

In addition, an analysis of both combined and cumulative transportation impacts is presented.

Impacts that are not considered for combined and cumulative effects include:

- Risks from accidents, because accidents are not certain to occur and, even if they were to occur, event-initiating accidents for each waste type would be independent of each other.
- Risks to individual waste management workers, because it is assumed that each waste-type worker is dedicated to that waste type and would not work simultaneously in another waste-type facility.
- Impacts to surface water resources, ecological resources, and cultural resources, because they are dependent on facility location and location-specific environmental factors.

Because the alternatives for the five waste types can be combined in many ways (for some sites there are thousands of possible combinations of alternatives), the combined impacts of placing multiple facilities at each site are presented in the form of minimum and maximum values for each of the combined impacts for each waste type. The values are then summed for each category of impacts to determine the combined minimum and maximum impacts for each site. Following the combined impacts analysis, the minimum and maximum impacts are considered together with the impacts of existing site actions, and reasonably foreseeable future actions at and near each of the 17 major sites. The cumulative impact assessment for these sites includes consideration of actions that DOE is taking or considering for spent nuclear fuel management, tritium supply and recycling, and the consolidation of nonnuclear functions. Other site-specific projects, such as vitrification of HLW at Hanford and SRS and the operation of WIPP, are also discussed for each of the 17 major sites where applicable.

Chapter 11 of the WM PEIS contains tables of combined and cumulative impacts showing the impact categories and the major elements that constitute the cumulative impacts (i.e., combined, existing, and other reasonably foreseeable future actions) for each

of the 17 major sites and for transportation impacts. These data allow the decision maker, when evaluating alternatives for a specific waste type such as LLMW, to consider the range of impacts that might occur at any site caused by implementation of alternatives for other waste types and other activities.

9.2 Results

The following discussion briefly summarizes the key results of the cumulative impacts analysis:

- Even though locating waste management facilities at sites would result in an increase in dose to offsite populations surrounding the sites, cumulative atmospheric radiological releases are not projected to exceed EPA standards except at LANL, as a result of treatment under Regionalized Alternative 2 for TRUW, and at WIPP, as a result of treatment under the Centralized Alternative for TRUW. The exceedance of the EPA standard for the Regionalized 2 and Centralized Alternatives for TRUW indicates that mitigation measures could be needed to achieve compliance if either of these two alternatives is chosen.

- Seven of the 17 sites (BNL, Hanford, INEL, LANL, NTS, ORR, and RFETS) could exceed one or more air pollutant standards as a result of maximum combined atmospheric emissions. Selection of waste management alternatives that result in locating waste management activities at these sites could require mitigation measures.

- Nine of the 17 sites (FEMP, Hanford, LANL, ORR, PGDP, PORTS, RFETS, SNL-NM, and SRS) could exceed one or more drinking water standards in groundwater as a result of disposal of LLMW or LLW on the site. Selection of alternatives for these two waste types at these sites would need to take into consideration potential cumulative groundwater quality impacts as well as potential mitigation measures.

- Nine of the 17 sites could require improvements to onsite water, wastewater, or electric power systems to accommodate requirements for increased capacity. At two sites (Hanford and WIPP), the increases are caused by waste management activities, while at three sites (INEL, NTS, and WVDP), either waste management or other planned future activities could require additional infrastructure. At four additional sites (ANL-E, FEMP, SNL-NM, and SRS), the requirements for additional infrastructure result from future activities other than waste management.

- Eight sites (Hanford, INEL, LANL, NTS, ORR, Pantex, SRS, and WIPP) could require mitigation measures to reduce offsite infrastructure and institution demands caused by possible employment increases resulting from waste management and other actions considered in the cumulative impacts analysis.

- The largest number of shipments to or from a single site would occur at NTS as a result of the shipments of LLMW and LLW and of shipments of HLW if Yucca Mountain is found to be suitable as a repository for HLW. A combined total of more than 295,000 truck shipments or more than 106,000 rail shipments of waste could occur at NTS, or about 118 truck shipments or 42 rail shipments per day (assuming receipt of shipments during 250 days per year).

- The transport of waste by truck is expected to result in a combined total of between 11 and 69 fatalities for the shipment of all waste types. Of these fatalities, about 6 to 23 would result from exposure of transport crew members and the population along transportation routes to the radioactive components in the waste. The remaining fatalities from truck transport would result from emissions and accidents independent of the waste cargo.

- The transport of LLMW, LLW, TRUW, and HLW by rail and HW by trucks is expected to result in a combined total of between two and six fatalities over the periods of analyses for these waste types. Of these fatalities, about one to three would result from the exposure of the train crew and the public to the radioactive components in the waste. The remaining fatalities for rail transport would result from train emissions and accidents independent of the waste cargo.

- Maximum combined health risks from the routine operation of waste management facilities are estimated to range from 0 to 6 worker radiation cancer fatalities and less than one radiation cancer fatality in the offsite populations at the 17 major sites.

- Maximum cumulative health risks from the routine operation of waste management facilities and other facilities at the sites are estimated to range from 0 to 12 worker radiation cancer fatalities and less than two radiation cancer fatalities in the offsite populations at the 17 major sites.

Site Summaries

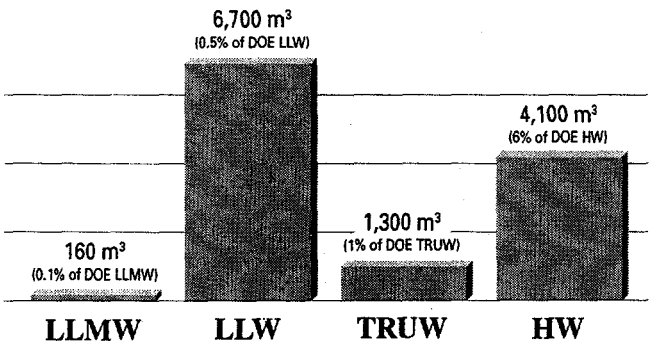
Site Summary

Argonne National Laboratory-East

Argonne National Laboratory-East (ANL-E) is an outgrowth of the Metallurgical Laboratory established in 1942 as part of the Manhattan Project. This laboratory conducts research and development studies of nuclear and non-nuclear energy sources. ANL-E is located on 2.7 square miles, 22 miles southwest of Chicago in northeast Illinois.

ANL-E is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), and hazardous waste (HW) and, in some alternatives, LLMW and LLW from small sites. ANL-E currently does not have an inventory of high-level waste and is not expected to manage this waste type in the future.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the four waste types at ANL-E, are shown in the following chart. Also, how ANL-E relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



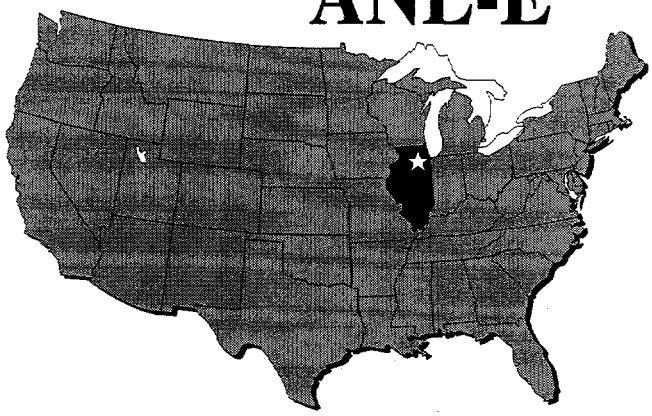
Current waste management activities at ANL-E include the storage of LLMW with the treatment of wastewater only; preparation of LLW for shipment off site for disposal; storage of TRUW; and the transport of HW off site for treatment. A waste minimization and pollution prevention strategic plan has been developed and is being implemented at ANL-E to reduce waste volumes.

Waste Management Alternatives at ANL-E

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	Treatment Off Site	Treatment Off Site
	Storage On Site	Disposal On Site (including shipments from small offsite facilities)	Disposal Off Site	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*4 subalternatives:* Minimum Treatment On Site / Disposal Off Site	*2 subalternatives:* Minimum Treatment On Site / Disposal Off Site
	Disposal Off Site	Disposal On Site (including shipments from small offsite facilities)	*3 subalternatives:* Treatment Off Site / Disposal Off Site	*3 subalternatives:* Treatment Off Site / Disposal Off Site
TRUW	Treatment On Site	Treatment On Site	Treatment Off Site	Treatment Off Site
	Storage On Site	Storage On Site	Storage Off Site	Storage Off Site
HW	Treatment Off Site (commercial facilities)	Treatment Off Site (commercial facilities)	Treatment Off Site (DOE and commercial facilities)	Not Analyzed

= DOE's preferred alternatives.

ANL-E



DOE's Preferred Alternatives

In the development of a national strategy for each waste type, ANL-E's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which ANL-E fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat ANL-E's LLMW on site under the Decentralized Alternative and consistent with ANL-E's proposed site treatment plan. DOE prefers to ship ANL-E's LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat ANL-E's LLW on site. DOE prefers to ship ANL-E's LLW to one of 2 or 3 regional disposal sites.

Transuranic Waste: DOE prefers the Decentralized Alternative for onsite treatment and storage of ANL-E's TRUW.

Hazardous Waste: DOE prefers the No Action Alternative, where ANL-E would continue to use commercial facilities for HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for ANL-E under all of the alternatives that identified a role for this site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for ANL-E under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Latent cancer fatalities among the offsite population are estimated to be essentially zero, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at ANL-E.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW, LLW, and TRUW shipments from ANL-E is estimated to be 1,660 truck or 710 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 132 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Waste management activities could substantially increase waste shipments leaving the site.

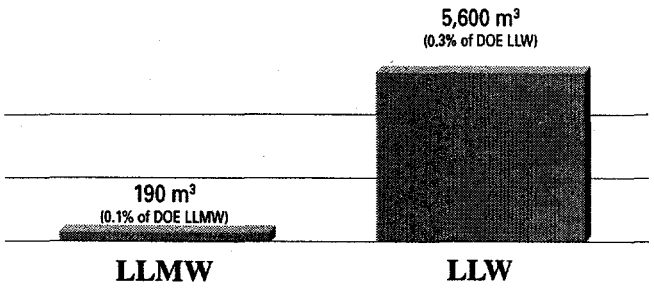
Site Summary

Brookhaven National Laboratory

Brookhaven National Laboratory (BNL) was established in 1946 to provide a multipurpose research and development laboratory capable of supporting the design and operation of large, complex research projects for fundamental scientific studies and basic and applied research. The laboratory provides research capabilities in the physical, biomedical, and environmental sciences and energy technologies for hundreds of users from universities, industry, and other government laboratories. BNL is located in New York on approximately 8.2 square miles, 60 miles east of New York City.

BNL is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW) and low-level waste (LLW). BNL is not considered a major generator of hazardous waste. BNL currently does not have an inventory of transuranic waste or high-level waste and is not expected to manage these waste types in the future.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the two waste types at BNL, are shown in the following chart. Also, how BNL relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



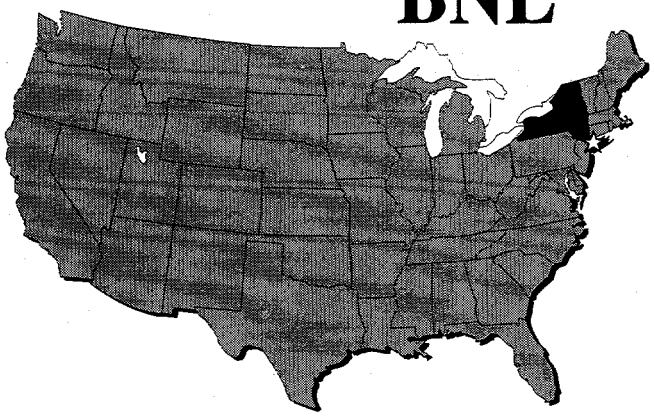
Current waste management activities at BNL include the storage of LLMW with the treatment of wastewater only and the preparation of LLW for shipment off site for disposal. A waste minimization and pollution prevention plan has been developed and is being implemented at BNL to reduce waste volumes.

Waste Management Alternatives at BNL

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	Treatment Off Site	Treatment Off Site
LLMW	Storage On Site	Disposal On Site	Disposal Off Site	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*4 subalternatives:* Minimum Treatment On Site	*2 subalternatives:* Minimum Treatment On Site
LLW			Disposal Off Site	Disposal Off Site
LLW	Disposal Off Site	Disposal On Site	*3 subalternatives:* Treatment Off Site	*3 subalternatives:* Treatment Off Site
LLW			Disposal Off Site	Disposal Off Site

= DOE's preferred alternatives.

BNL



DOE's Preferred Alternatives

In the development of a national strategy for each waste type, BNL's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which BNL fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat BNL's LLMW under the Regionalized Alternative and consistent with BNL's proposed site treatment plan. Under this alternative, BNL's LLMW would be shipped off site for treatment. DOE prefers to ship BNL's LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat BNL's LLW on site. DOE prefers to ship BNL's LLW to one of 2 or 3 regional disposal sites.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for BNL under all of the alternatives that identified a role for this site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for BNL under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Latent cancer fatalities among the offsite population are estimated to be essentially zero, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at BNL.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW and LLW shipments from BNL is estimated to be 1,370 truck or 530 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 41 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Waste management activities could substantially increase waste shipments leaving the site.

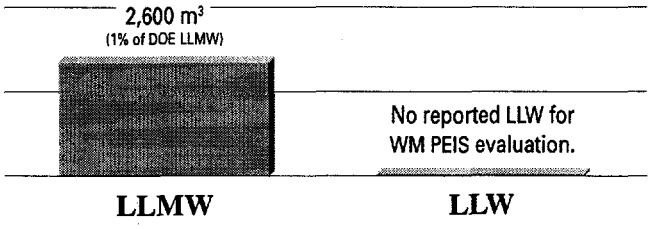
Site Summary

Fernald Environmental Management Project

The Fernald Environmental Management Project (FEMP) has been a major Department of Energy (DOE) site for more than 40 years, producing nuclear materials (primarily uranium metal and uranium compounds) for use at other DOE facilities. Since the late 1980s, the site's mission has focused on environmental restoration. FEMP is located on approximately 1.6 square miles, 17 miles northwest of Cincinnati, Ohio.

FEMP is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), and, in some alternatives, other sites' LLMW and LLW. FEMP is not considered a major generator of hazardous waste. FEMP currently does not have an inventory of transuranic waste or high-level waste and is not expected to manage these waste types in the future.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the two waste types at FEMP, are shown in the following chart. Also, how FEMP relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



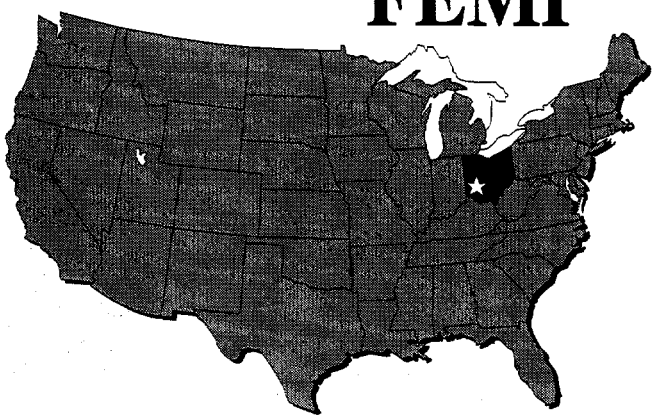
Current waste management activities at FEMP include the storage of LLMW with the treatment of wastewater only. FEMP has no LLW at this time. A waste minimization and pollution prevention plan has been developed and is being implemented at FEMP to reduce waste volumes.

Waste Management Alternatives at FEMP

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	*1 subalternative:* Treatment On Site (including shipments from offsite facilities)	Treatment Off Site
			Disposal On Site (FEMP LLMW only)	
			Disposal Off Site	
	Storage On Site	Disposal On Site	*3 subalternatives:* Treatment Off Site	Disposal Off Site
			Disposal Off Site	
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*2 subalternatives:* Treatment On Site (Minimum treatment in 1 subalternative)	*2 subalternatives:* Minimum Treatment On Site
			Disposal On Site	
			3 subalternatives: Minimum Treatment On Site	Disposal Off Site
	Disposal Off Site	Disposal On Site	Disposal Off Site	*3 subalternatives:* Treatment Off Site
			2 subalternatives: Treatment Off Site	
			Disposal Off Site	Disposal Off Site

= DOE's preferred alternatives.

FEMP



DOE's Preferred Alternatives

In the development of a national strategy for each waste type, FEMP's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which FEMP fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat FEMP's LLMW on site consistent with FEMP's site treatment plan. DOE prefers to ship FEMP's LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: All LLW at FEMP is currently managed under the Environmental Restoration Program and was not analyzed in the WM PEIS.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for FEMP under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for FEMP under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Latent cancer fatalities among the offsite population are estimated to be essentially zero, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at FEMP.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW shipments from FEMP is estimated to be 110 truck or 50 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 212 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded.

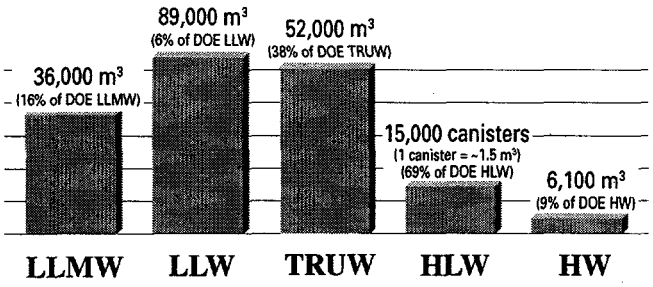
Site Summary

Hanford

The Hanford Site has played a major role in national security for more than 40 years, producing nuclear materials (primarily plutonium) for weapons manufacture, managing the resulting radioactive and hazardous waste, and performing a variety of missions related to research and development for advanced reactors, energy technologies, basic sciences, and waste disposal technologies. Today, Hanford is no longer a production facility but instead focuses solely on waste management and environmental restoration guided by the Hanford Federal Facilities Agreement and Consent Order (Tri-Party Agreement). Hanford encompasses about 560 square miles within the Columbia River Basin in southeastern Washington.

Hanford is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own and, in some alternatives, other sites' low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), high-level waste (HLW), and hazardous waste (HW).

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the five waste types at Hanford, are shown in the following chart. Also, how Hanford relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at Hanford include the storage of LLMW with the treatment of wastewater only, treatment and disposal of LLW on site, storage of TRUW on site, storage of HLW on site pending disposal in a geologic repository, and the transport of HW off site for treatment. A waste minimization and pollution prevention plan has been developed and is being implemented at Hanford to reduce waste volumes.

Waste Management Alternatives at Hanford

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site (including some offsite shipments)	*3 subalternatives:* **Treatment On Site** (including offsite shipments) **Disposal On Site**	Treatment On Site (including shipments from all DOE sites)
	Storage On Site	Disposal On Site	*1 subalternative:* **Treatment On Site** (including offsite shipments) **Disposal Off Site**	Disposal On Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*3 subalternatives:* **Treatment On Site** (minimum treatment in 2 subalternatives) **Disposal On Site**	*2 subalternatives:* **Treatment On Site*** **Disposal On Site** (including shipments from all DOE sites)
			2 subalternatives: **Treatment On Site** (including offsite shipments) **Disposal On Site**	*2 subalternatives:* **Treatment On Site*** **Disposal Off Site**
	Disposal On Site (including offsite shipments)	Disposal On Site	*1 subalternative:* **Minimum Treatment On Site** **Disposal On Site** (including shipments from all western DOE sites)	*1 subalternative:* **Treatment On Site** (including shipments from all DOE sites) **Disposal On Site**
			1 subalternative: **Minimum Treatment On Site** **Disposal Off Site**	
TRUW	Treatment On Site	Treatment On Site	Treatment On Site (including offsite shipments)	**Treatment On Site** (RH only, including offsite shipments) **Treatment Off Site** (CH to WIPP, N.M.)
	Storage On Site	Storage On Site	Storage On Site	**Storage On Site** (RH only)
HLW	Storage On Site	Storage On Site	**Storage On Site** (possibly including offsite shipments)	**Storage On Site** (including offsite shipments)
	Pending Disposal Off Site (geologic repository)	*Pending* Disposal Off Site (geologic repository)	*Pending* **Disposal Off Site** (geologic respository)	*Pending* **Disposal Off Site** (geologic repository)
HW	Treatment Off Site (commercial facilities)	Treatment Off Site (commercial facilities)	*1 subalternative:* **Treatment On Site** (organic only, including offsite shipments) **Treatment Off Site** (commercial facilities) *1 subalternative:* **Treatment Off Site** (DOE and commercial facilities)	Not Analyzed

*Minimum treatment in one subalternative, offsite shipments included in other subalternative.
RH = Remote-handled TRUW. CH = Contact-handled TRUW.
= DOE's preferred alternatives. DOE does not yet have site preferences for LLMW or LLW disposal.

Hanford

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, Hanford's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which Hanford fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers regionalized treatment of LLMW at Hanford. This alternative includes onsite treatment of Hanford's LLMW and could include treatment of some LLMW generated at other sites. LLMW activities at Hanford would be conducted in accordance with the Hanford Site's Tri-Party Agreement with the State of Washington and U.S. Environmental Protection Agency. Hanford could be selected as one of the regional disposal sites for LLMW.

Low-Level Waste: DOE prefers to treat Hanford's LLW on site. Hanford could be selected as one of the regional disposal sites for LLW.

Transuranic Waste: DOE prefers onsite treatment and storage of Hanford's TRUW.

High-Level Waste: DOE prefers onsite storage of Hanford's immobilized HLW pending disposal in a geologic repository.

Hazardous Waste: DOE prefers the No Action Alternative where Hanford would continue to use commercial facilities for HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated Hanford for potential impacts under all of the alternatives that identified a role for this site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for Hanford under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Health risks are principally to workers and could include physical hazard and latent cancer fatalities from waste management activities over the 20-year period of analysis. Collective worker health risk estimates are one fatality for LLMW, three fatalities for HLW, and up to four fatalities for LLW, depending on whether Hanford is selected as a disposal site. Less than one latent cancer fatality is estimated among the offsite population.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. To meet drinking water standards, performance-based waste acceptance criteria may be needed for onsite disposal of LLMW and LLW. No major impacts to ecological resources, land use, or environmental justice are expected. Increases to requirements for wastewater treatment under the preferred alternatives could lead to requirements for additional capacity and corresponding costs; no other major impacts to the infrastructure are estimated. Expenditures for WM activities could cause socioeconomic effects that include the benefits of increased regional employment and income as well as regional population growth that could alter community structure and stress available housing and community services. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the maximum total number of shipments of TRUW and HLW is estimated to be 18,400 truck or 8,140 rail shipments. The total number of shipments of LLMW and LLW to and from Hanford is dependent upon DOE's final selection of disposal sites for these wastes. Centralized disposal of LLW, which was analyzed in the WM PEIS, could result in approximately 242,000 to 257,000 truck shipments or 91,000 to 97,000 rail shipments to a single site; centralized disposal of LLMW could result in 7,500 to 9,600 truck shipments or 3,300 to 3,700 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 3,659 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Wastewater treatment capacity could be exceeded, and the regional employment and community structure could be affected, as noted above. In addition, to meet drinking water standards, performance-based waste acceptance criteria may be needed for onsite disposal of LLMW and LLW. Waste management activities could greatly increase waste shipments entering or leaving the site.

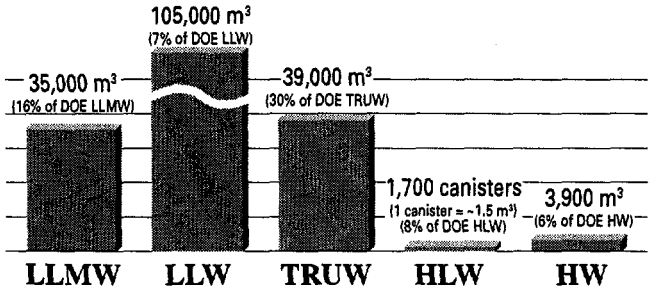
Site Summary

Idaho National Engineering Laboratory

Idaho National Engineering Laboratory (INEL) has been a major Department of Energy (DOE) site for more than 40 years, building, testing and operating various nuclear facilities; managing the resulting radioactive and hazardous waste; and performing a variety of missions related to research and development for advanced reactors, naval nuclear propulsion systems, and waste disposal technologies. INEL occupies 890 square miles in the southeastern portion of Idaho, approximately 42 miles west of Idaho Falls.

INEL is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), high-level waste (HLW), and hazardous waste (HW) and, in some alternatives, other sites' LLMW, LLW, TRUW and HW. The WM PEIS includes waste volumes from Argonne National Laboratory-West and the Naval Reactor Facility in its evaluation of INEL as a candidate site for waste management facilities.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the five waste types at INEL, are shown in the following chart. Also, how INEL relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at INEL include the treatment and storage of LLMW on site, treatment and disposal of LLW on site, storage of TRUW on site, storage of HLW on site pending disposal in a geologic repository, and the transport of HW off site for treatment. A waste minimization and pollution prevention awareness plan has been developed and is being implemented at INEL to reduce waste volumes.

Waste Management Alternatives at INEL

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site	Treatment On Site	*3 subalternatives:* Treatment On Site (including offsite shipments); Disposal On Site	Treatment Off Site (except RH)
	Storage On Site	Disposal On Site	*1 subalternative:* Treatment On Site (including offsite shipments); Disposal Off Site	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*4 subalternatives:* Treatment On Site (minimum treatment in 2 subalternatives); Disposal On Site	*2 subalternatives:* Minimum Treatment On Site; Disposal Off Site
			1 subalternative: Treatment On Site (including offsite shipments)	*2 subalternatives:* Treatment On Site; Disposal Off Site
	Disposal On Site	Disposal On Site	*2 subalternatives:* Minimum Treatment On Site; Disposal Off Site	*1 subalternative:* Treatment Off Site; Disposal Off Site
TRUW	Treatment On Site	Treatment On Site	Treatment On Site (CH only, including offsite shipments); Treatment Off Site (RH only)	Treatment Off Site
	Storage On Site	Storage On Site	Storage On Site (CH only); Storage Off Site (RH only)	Storage Off Site
HLW	Storage On Site	Storage On Site	Storage On Site	Storage On Site
	Pending Disposal Off Site (geologic repository)	*Pending* Disposal Off Site (geologic repository)	*Pending* Disposal Off Site (geologic repository)	*Pending* Disposal Off Site (geologic repository)
HW	Treatment On Site (organic only); Treatment Off Site (commercial facilities)	Treatment Off Site (commercial facilities)	*1 subalternative:* Treatment On Site (organic only); Treatment Off Site (commercial facilities); *1 subalternative:* Treatment On Site (organic only, including offsite shipments); Treatment Off Site	Not Analyzed

RH = Remote-handled TRUW. CH = Contact-handled TRUW.

= DOE's preferred alternatives. DOE does not yet have site preferences for LLMW or LLW disposal.

INEL

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, INEL's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which INEL fits within each preferred waste management alterative are as follows.

Low-Level Mixed Waste: DOE prefers regionalized treatment of LLMW at INEL. This alternative includes onsite treatment of INEL's LLMW and could include treatment of LLMW generated at other sites. LLMW activities at INEL would be conducted in accordance with INEL's site treatment plan. INEL could be selected as one of the regional disposal sites for LLMW.

Low Level Waste: DOE prefers to treat INEL's LLW on site. INEL could be selected as one of the regional disposal sites for LLW.

Transuranic Waste: DOE prefers the Regionalized Alternative for treatment and storage of INEL's TRUW. This alternative could include treatment of TRUW received from RFETS.

High-Level Waste: DOE prefers onsite storage of INEL's immobilized HLW pending disposal in a geologic repository.

Hazardous Waste: DOE prefers the No Action Alternative where organic HW at INEL would continue to be treated on site. INEL would continue to use commercial facilities for all other HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated INEL for potential impacts under all of the alternatives that identified a role for this site. These impacts are discussed in Chapters 6 though 11. Results of the analyses for INEL under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Health risks are principally to workers and could include fatalities from waste management activities over the 20-year period of analysis. Collective worker health risk estimates are one fatality each for LLMW and LLW depending on whether INEL is selected as a disposal site, one fatality for HLW, and two fatalities for TRUW. Less than one latent cancer fatality is estimated among the offsite population for waste management activities under the preferred alternatives for all waste types at INEL.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air or groundwater quality standards. No major impacts to ecological resources, land use, or infrastructure are expected. The assessment of environmental justice impacts associated with treatment of TRUW at INEL identified a potential for disproportionately high and adverse health risks to low-income groups, which could require mitigation measures. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the maximum total number of LLMW, LLW, TRUW, and HLW shipments to and from INEL is estimated to be 23,670 truck or 9,770 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 1,913 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risks are primarily caused by waste management activities; however, the maximum cumulative increase in radiation dose to the offsite population is estimated to be well below the EPA standard of 10 millirems per year to the maximally exposed individual. Cumulative environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Waste management activities could substantially increase waste shipments entering or leaving the site.

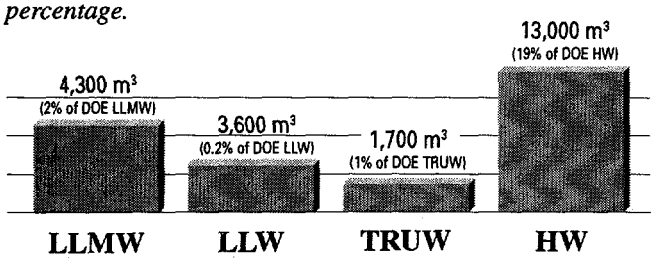
Site Summary

Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory (LLNL), established in 1952 by the Atomic Energy Commission, has been a major Department of Energy (DOE) site for more than 40 years in nuclear weapons research. Today, its major programs include defense and related programs, laser fusion, laser isotope separation, human genome study, supercomputation, and environmental restoration and waste management. LLNL and its components occupy approximately 12.8 square miles east of San Francisco, California. The laboratory includes Site 300, located near Tracy, California, and Sandia National Laboratories-California.

LLNL is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), and hazardous waste (HW) and, in some alternatives, other sites' LLMW and LLW. LLNL currently does not have an inventory of high-level waste and is not expected to manage this waste type in the future. The WM PEIS includes waste volumes for SNL-CA in its evaluation of LLNL as a candidate for waste management facilities.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the four waste types analyzed at LLNL, are shown in the following chart. Also, how LLNL relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at LLNL include the storage of LLMW with the treatment of wastewater only, preparation of LLW for shipment off site for disposal, storage of TRUW on site, and the transport of HW off site for treatment. A waste minimization and pollution prevention program has been developed and is being implemented at LLNL to reduce waste volumes.

Waste Management Alternatives at LLNL

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	*1 subalternative:* **Treatment On Site** (including shipments from offsite facilities)	Treatment Off Site
		Disposal On Site (LLNL waste only)	**Disposal On Site**	
	Storage On Site		**Disposal Off Site** (TRU-contaminated LLMW)	Disposal Off Site
		Disposal Off Site (TRU-contaminated LLMW)	*3 subalternatives:* **Treatment Off Site**	
			Disposal Off Site	
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*2 subalternatives:* **Treatment On Site***	*2 subalternatives:* Minimum Treatment On Site
			Disposal On Site (including shipments from offsite facilities)	Disposal Off Site
	Disposal Off Site	Disposal On Site (including shipments from offsite facilities)	*3 subalternatives:* **Minimum Treatment On Site**	*3 subalternatives:* Treatment Off Site
			Disposal Off Site	
			2 subalternatives: **Treatment Off Site**	Disposal Off Site
			Disposal Off Site	
TRUW	Treatment On Site	Treatment On Site	Treatment Off Site	Treatment Off Site
	Storage On Site	Storage On Site	Storage Off Site	Storage Off Site
HW	Treatment Off Site (commercial facilities)	Treatment Off Site (commercial facilities)	Treatment Off Site (DOE and commercial facilities)	Not Analyzed

* Minimum treatment in one subalternative.
= DOE's preferred alternatives.

LLNL

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, LLNL's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which LLNL fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat LLNL's LLMW on site consistent with LLNL's site treatment plan. DOE prefers to ship LLNL's LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat LLNL's LLW on site. DOE prefers to ship LLNL's LLW to one of 2 or 3 regional disposal sites.

Transuranic Waste: DOE prefers the Decentralized Alternative for onsite treatment and storage of LLNL's TRUW.

Hazardous Waste: DOE prefers the No Action Alternative where LLNL would continue to use commercial facilities for HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for LLNL under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for LLNL under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Less than one latent cancer fatality is estimated among the offsite population, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at LLNL.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. This assumes that any new water requirements at Site-300 would be provided through a municipal system rather than by groundwater. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW, LLW, and TRUW shipments from LLNL is estimated to be 1,010 truck or 430 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 387 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risks are primarily caused by waste management activities; however, the maximum cumulative increase in radiation dose to the offsite population is estimated to be below the EPA standard of 10 millirems per year to the maximally exposed individual. Cumulative environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Waste management activities could substantially increase waste shipments leaving the site.

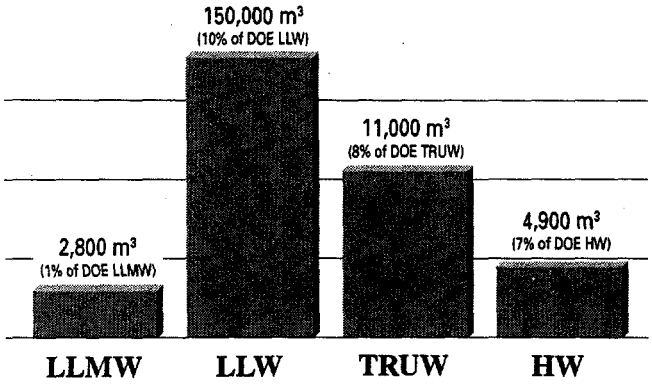
Site Summary

Los Alamos National Laboratory

Los Alamos National Laboratory (LANL) has been a major Department of Energy (DOE) site since 1943, providing nuclear weapons research and development and related projects. LANL is located on 43 square miles, 25 miles north of Santa Fe in north central New Mexico.

LANL is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own, and in some alternatives, other sites' low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), and hazardous waste (HW). LANL currently does not have an inventory of high-level waste and is not expected to manage this waste type in the future.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the four waste types at LANL, are shown in the following chart. Also, how LANL relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at LANL include the storage of LLMW with the treatment of wastewater only; treatment and disposal of LLW on site; storage of TRUW on site; and the transport of HW off site for treatment. A pollution prevention program has been developed and is being implemented at LANL to reduce waste volumes.

Waste Management Alternatives at LANL

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	*2 subalternatives:* **Treatment On Site** (including offsite shipments); **Disposal On Site**	Treatment Off Site
LLMW	Storage On Site	Disposal On Site	*1 subalternative:* **Treatment On Site** (including offsite shipments); **Disposal Off Site**; *1 subalternative:* **Treatment Off Site**; **Disposal Off Site**	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*5 subalternatives:* **Treatment On Site** (minimum treatment in 2 subalternatives); **Disposal On Site** (including offsite shipments)	*2 subalternatives:* **Minimum Treatment On Site** (including offsite shipments); **Disposal Off Site**
LLW	Disposal On Site	Disposal On Site	*2 subalternatives:* **Minimum Treatment On Site**; **Disposal Off Site**	*2 subalternatives:* **Treatment On Site** (including offsite shipments); *1 subalternative:* **Treatment Off Site**; **Disposal Off Site**
TRUW	Storage On Site	Treatment On Site	*2 subalternatives:* **Treatment On Site** (CH only, including offsite shipments); **Treatment Off Site** (RH only)	Treatment Off Site
TRUW	Storage On Site	Storage On Site	**Storage On Site** (CH only); **Storage Off Site** (RH only); *1 subalternative:* **Treatment Off Site**; **Storage Off Site**	Storage Off Site
HW	Treatment Off Site (commercial facilities)	Treatment On Site (organic HW only)	*1 subalternative:* **Treatment On Site** (organic HW only, including offsite shipments); **Treatment Off Site** (non-organic HW to commercial facilities)	Not Analyzed
HW	Treatment Off Site (commercial facilities)	Treatment Off Site (non-organic HW to commercial facilities)	*1 subalternative:* **Treatment Off Site** (DOE and commercial facilities)	Not Analyzed

RH = Remote-handled TRUW. CH = Contact-handled TRUW.

= DOE's preferred alternatives. DOE does not yet have site preferences for LLMW and LLW disposal.

LANL

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, LANL's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which LANL fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat LANL's LLMW on site consistent with LANL's site treatment plan. LANL could be selected as one of the regional disposal sites for LLMW.

Low-Level Waste: DOE prefers to treat LANL's LLW on site. LANL could be selected as one of the regional disposal sites for LLW.

Transuranic Waste: DOE prefers the Decentralized Alternative for onsite treatment and storage of LANL's TRUW. This alternative could include treatment of TRUW received from SNL-NM.

Hazardous Waste: DOE prefers the No Action Alternative where LANL would continue to use commercial facilities for HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for LANL under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for LANL under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Health risks are principally to workers and could include physical hazard and latent cancer fatalities from waste management activities over the 20-year period of analysis. Collective worker health risk estimates are two fatalities for LLW depending on whether LANL is selected as a disposal site, one fatality for TRUW, and less than one fatality for LLMW. Less than one latent cancer fatality is estimated among the offsite population for waste management activities under the preferred alternatives for all waste types at LANL.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air or groundwater quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the maximum total number of LLMW, LLW and TRUW shipments to and from LANL is estimated to be 20,170 truck or 7,810 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 1,012 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Waste management activities could greatly increase waste shipments leaving the site.

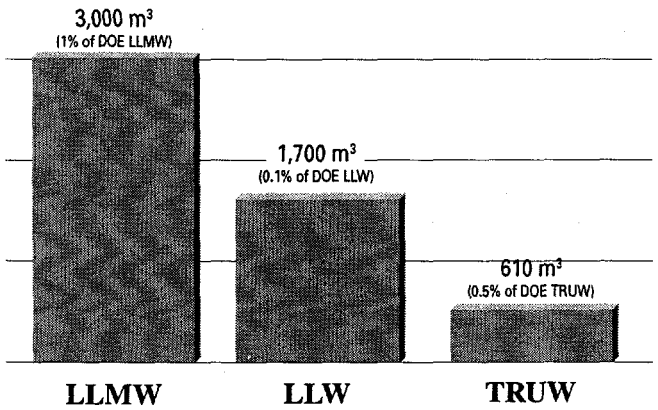
Site Summary

Nevada Test Site

The Nevada Test Site (NTS) has been the primary location for testing nuclear explosive devices since 1957. NTS is also a low-level waste disposal site. NTS occupies 1,350 square miles of desert valley and mountain terrain, 65 miles northwest of Las Vegas in southern Nevada.

NTS is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), and transuranic waste (TRUW) and, in some alternatives, other sites' LLMW and LLW. NTS does not have an inventory of high-level waste and is not considered a major generator of hazardous waste.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the three waste types at NTS, are shown in the following chart. Also, how NTS relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



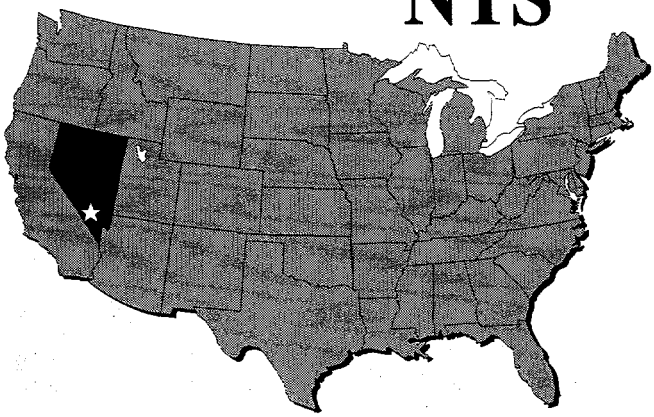
Current waste management activities at NTS include the storage of LLMW with the treatment of wastewater only, treatment and disposal of LLW on site, and storage of TRUW on site. A waste minimization and pollution prevention plan has been developed and is being implemented at NTS to reduce waste volumes.

Waste Management Alternatives at NTS

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	*3 subalternatives:* Treatment Off Site; Disposal Off Site	Treatment Off Site
LLMW	Storage On Site	Disposal On Site (including shipments from offsite facilities)	*1 subalternative:* Treatment Off Site; Disposal On Site (including shipments from all DOE facilities)	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*2 subalternatives:* Minimum Treatment On Site; Disposal On Site	*1 subalternative:* Minimum Treatment On Site; Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*3 subalternatives:* Minimum Treatment On Site (including offsite shipments); Disposal On Site	*1 subalternative:* Minimum Treatment On Site; Disposal On Site (including shipments from all DOE facilities)
LLW	Disposal On Site (including shipments from offsite facilities)	Disposal On Site	*1 subalternative:* Minimum Treatment On Site; Disposal Off Site	*2 subalternatives:* Treatment Off Site; Disposal Off Site
LLW	Disposal On Site (including shipments from offsite facilities)	Disposal On Site	*1 subalternative:* Minimum Treatment On Site; Disposal On Site (including shipments from all western DOE sites)	*1 subalternative:* Treatment Off Site; Disposal On Site
TRUW	Storage On Site	Treatment On Site; Storage On Site (including small quantities of offsite TRUW)	Treatment Off Site; Storage Off Site	Treatment Off Site; Storage Off Site

= DOE's preferred alternatives. DOE does not yet have site preferences for LLMW and LLW disposal.

NTS



DOE's Preferred Alternatives

In the development of a national strategy for each waste type, NTS's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which NTS fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers regionalized treatment of NTS' LLMW. Under this alternative, NTS' LLMW would be shipped off site for treatment. NTS could be selected as one of the regional disposal sites for LLMW.

Low-Level Waste: DOE prefers to treat NTS' LLW on site. NTS could be selected as one of the regional disposal sites for LLW.

Transuranic Waste: DOE prefers the Decentralized Alternative for onsite treatment and storage of NTS' TRUW.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated NTS for potential impacts under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for NTS under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Health risks are principally to workers and could include physical hazard and latent cancer fatalities from waste management activities over the 20-year period of analysis. Collective worker health risk estimates are one fatality for LLMW and three fatalities for LLW, depending on whether NTS is selected as a disposal site, and less than one fatality for TRUW. Among the offsite population latent cancer fatalities are estimated to be essentially zero for waste management activities under the preferred alternatives for all waste types at NTS.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of groundwater quality standards. Equipment and vehicular emissions could require mitigative measures to meet air quality standards for nonattainment areas in the region. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the maximum total number of shipments of TRUW is estimated to be 90 truck or rail shipments. The total number of shipments of LLMW and LLW to and from NTS is dependent upon DOE's final selection of disposal sites for these wastes. Centralized disposal of LLW, which was analyzed in the WM PEIS, could result in approximately 242,000 to 257,000 truck shipments or 91,000 to 97,000 rail shipments to a single site; centralized disposal of LLMW could result in 7,500 to 9,600 truck shipments or 3,300 to 3,700 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 1,535 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded, except for air quality criteria air pollutants (CO). Waste management activities could greatly increase waste shipments entering or leaving the site.

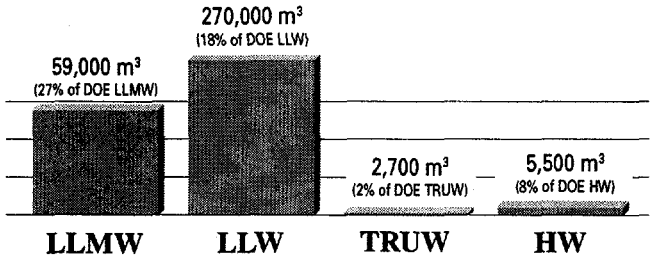
Site Summary

Oak Ridge Reservation

For the past 50 years, the U.S. Department of Energy's (DOE's) mission has involved weapons production, uranium enrichment, and energy research — all of which have contributed to the legacy of complex environmental cleanup challenges at the Oak Ridge Reservation (ORR). The Reservation consists of three separate sites, situated on 54.7 square miles in eastern Tennessee: a national laboratory, a manufacturing and developmental engineering plant, and a former gaseous diffusion plant. Presently, ORR's mission includes environmental restoration, waste management, energy and medical research, defense programs, and technology transfer.

ORR is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own and, in some alternatives, other sites' low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), and hazardous waste (HW). ORR currently does not have an inventory of high-level waste and is not expected to manage this waste type in the future.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the four waste types analyzed at ORR, are shown in the following chart. Also, how ORR relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at ORR include the treatment and storage of LLMW on site, treatment and disposal of LLW on site, storage of TRUW on site, treatment of organic HW on site, and the transport of remaining HW off site for treatment. A pollution prevention program has been developed and is being implemented at ORR to reduce waste volumes.

Waste Management Alternatives at ORR

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site	Treatment On Site	*1 subalternative:* **Treatment On Site**; **Disposal On Site** *2 subalternatives:* **Treatment On Site** (including shipments from offsite facilities); **Disposal On Site**	Treatment Off Site
LLMW	Storage On Site	Disposal On Site	*1 subalternative:* **Treatment On Site** (including shipments from offsite facilities); **Disposal Off Site**	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*2 subalternatives:* **Treatment On Site*** ; **Disposal On Site** *3 subalternatives:* **Treatment On Site*** (including shipments from offsite facilities); **Disposal On Site** (including shipments from offsite facilities)	*2 subalternatives:* **Minimum Treatment On Site**; **Disposal Off Site** *2 subalternatives:* **Treatment On Site** (including shipments from offsite facilities); **Disposal Off Site**
LLW	Disposal On Site	Disposal On Site	*2 subalternatives:* **Minimum Treatment On Site**; **Disposal Off Site**	*1 subalternative:* **Treatment Off Site**; **Disposal Off Site**
TRUW	Treatment On Site	Treatment On Site	Treatment On Site (RH only, including shipments from offsite facilities); Treatment Off Site (CH only)	Treatment On Site (RH only, including shipments from offsite facilities); Treatment Off Site (CH only)
TRUW	Storage On Site	Storage On Site (including shipments from offsite facilities)	Storage On Site (RH only); Storage Off Site (CH only)	Storage On Site (RH only); Storage Off Site (CH only)
HW	Treatment On Site (organic HW only)	Treatment On Site (organic HW only)	**Treatment On Site** (organic HW only, including shipments from offsite facilities)	Not Analyzed
HW	Treatment Off Site (commercial facilities)	Treatment Off Site (commercial facilities)	**Treatment Off Site** (commercial facilities)	

* Minimum treatment in one subalternative.
RH = Remote-handled TRUW. CH = Contact-handled TRUW.
= DOE's preferred alternatives. DOE does not yet have site preferences for LLMW and LLW disposal.

ORR

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, ORR's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which ORR fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers regional treatment of LLMW at ORR consistent with ORR's site treatment plan. This alternative could include treatment of LLMW generated at other sites. ORR could be selected as one of the regional disposal sites for LLMW.

Low-Level Waste: DOE prefers to treat ORR's LLW on site. ORR could be selected as one of the regional disposal sites for LLW.

Transuranic Waste: DOE prefers the Regionalized Alternative for onsite treatment and storage of ORR's remote-handled TRUW. This alternative could include treatment and storage of some remote-handled TRUW received from SRS. Also, under this alternative, DOE could ship ORR's contact-handled TRUW to SRS for treatment and storage.

Hazardous Waste: DOE prefers the No Action Alternative where organic HW at ORR would continue to be treated on site. ORR would continue to use commercial facilities for all other HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for ORR under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for ORR under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Health risks are principally to workers and could include physical hazard and latent cancer fatalities from waste management activities over the 20-year period of analysis. Collective worker health risk estimates are one fatality each for LLMW and LLW, depending on whether ORR is selected as a disposal site, and less than one fatality for TRUW. Among the offsite population latent cancer fatalities are estimated to be essentially zero for waste management activities under the preferred alternatives for all waste types at ORR.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. To meet drinking water standards, performance-based waste acceptance criteria may be needed for onsite disposal of LLMW. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the maximum total number of LLMW, LLW and TRUW shipments to and from ORR is estimated to be 69,130 truck or 26,490 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 1,658 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. However, to meet drinking water standards, performance-based waste acceptance criteria may be needed for onsite disposal of LLMW. Waste management activities could greatly increase waste shipments entering or leaving the site.

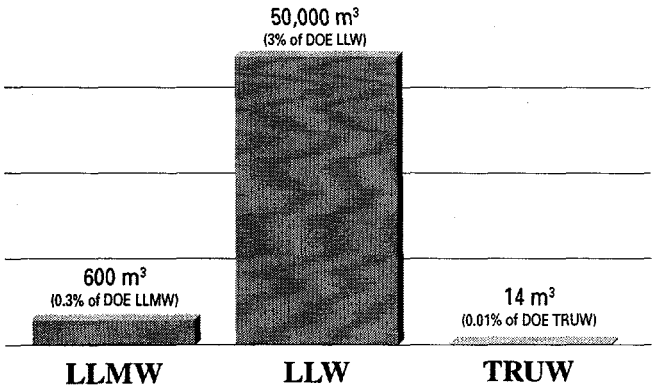
Site Summary

Paducah Gaseous Diffusion Plant

The Paducah Gaseous Diffusion Plant (PGDP) has been a major Department of Energy (DOE) site for more than 40 years, producing enriched uranium for commercial nuclear power reactors in the United States and overseas. PGDP is located on 5.4 square miles in western Kentucky.

PGDP is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), and transuranic waste (TRUW) and, in some alternatives, other sites' LLMW and LLW. PGDP currently does not have an inventory of high-level waste and is not expected to manage this waste type in the future. In addition, PGDP is not considered a major generator of hazardous waste.

The estimated total waste inventories, including current inventory and 20 years of generation for the three waste types at PGDP, are shown in the following chart. Also, how PGDP relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at PGDP include the storage of LLMW with the treatment of wastewater only, preparation of LLW for shipment off site for disposal, and storage of TRUW on site. A waste minimization and pollution prevention program has been developed and is being implemented at PGDP to reduce waste volumes.

Waste Management Alternatives at PGDP

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	*1 subalternative:* Treatment On Site (including shipments from offsite facilities)	Treatment Off Site
			Disposal On Site	
	Storage On Site	Disposal On Site (including shipments from offsite facilities)	*3 subalternatives:* Treatment Off Site	Disposal Off Site
			Disposal Off Site	
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*2 subalternatives:* **Treatment On Site*** (including shipments from offsite facilities)	*2 subalternatives:* Minimum Treatment On Site
			Disposal On Site	Disposal Off Site
	Disposal Off Site	Disposal On Site (including shipments from offsite facilities)	*3 subalternatives:* **Minimum Treatment On Site**	*3 subalternatives:* Treatment Off Site
			Disposal Off Site	
			2 subalternatives: **Treatment Off Site**	Disposal Off Site
			Disposal Off Site	
TRUW	Storage On Site	Treatment On Site	Treatment Off Site	Treatment Off Site
		Storage** Off Site	Storage Off Site	Storage Off Site

*Minimum treatment in one subalternative.

** The WM PEIS analyses assumed offsite storage; however, DOE prefers onsite decentralized storage.

= DOE's preferred alternatives.

PGDP

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, PGDP's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which PGDP fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat most of PGDP's LLMW at an offsite regional treatment facility, although some LLMW would be treated on site, consistent with PGDP's site treatment plan. DOE prefers to ship PGDP's LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat PGDP's LLW on site. DOE prefers to ship PGDP's LLW to one of 2 or 3 regional disposal sites.

Transuranic Waste: DOE prefers onsite treatment and storage of PGDP's TRUW.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for PGDP under all of the alternatives that identified a role for this site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for PGDP under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Latent cancer fatalities among the offsite population are estimated to be essentially zero, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at PGDP.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW, LLW, and TRUW shipments from PGDP is estimated to be 6,330 truck or 2,410 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 157 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Waste management activities could substantially increase waste shipments leaving the site.

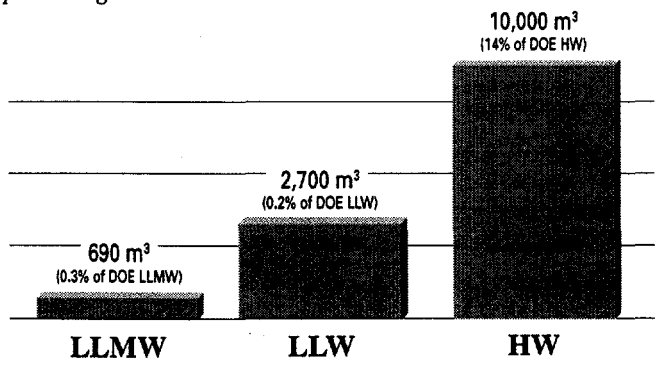
Site Summary

Pantex Plant

The Pantex Plant has been a major Department of Energy (DOE) site for more than 40 years, providing nuclear weapons assembly facilities. The mission of the Pantex Plant includes disassembly, assembly, quality evaluation, and maintenance of the U.S. nuclear weapons stockpile. The site is also a candidate for tritium supply and recycling. The Pantex Plant, consisting of 15.8 square miles of DOE-owned land and 9.2 square miles of land leased from Texas Tech University, is located about 17 miles northeast of Amarillo, Texas.

The Pantex Plant is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), and hazardous waste (HW). The Pantex Plant currently has a very small amount of transuranic waste (TRUW). The Pantex Plant currently does not have an inventory of high-level waste and is not expected to manage this waste type in the future.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the three waste types at the Pantex Plant, are shown in the following chart. Also, how Pantex relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at the Pantex Plant include the storage of LLMW with the treatment of wastewater only, preparation of LLW for shipment off site for disposal, and the transport of HW off site for treatment. A pollution prevention and waste minimization program has been developed and is being implemented at the Pantex Plant to reduce waste volumes.

Waste Management Alternatives at Pantex

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	*1 subalternative:* Treatment On Site / Disposal On Site	Treatment Off Site
LLMW	Storage On Site	Disposal On Site	*3 subalternatives:* Treatment Off Site / Disposal Off Site	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*2 subalternatives:* Treatment On Site (minimum treatment in one subalternative) / Disposal On Site / *3 subalternatives:* Minimum Treatment On Site / Disposal Off Site	Treatment Off Site (minimum treatment in 2 subalternatives)
LLW	Disposal Off Site	Disposal On Site	*2 subalternatives:* Treatment Off Site / Disposal Off Site	Disposal Off Site
HW	Treatment Off Site (commercial facilities)	Treatment Off Site (commercial facilities)	Treatment Off Site (DOE and commercial facilities)	Not Analyzed

= DOE's preferred alternatives.

Pantex

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, Pantex's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which Pantex fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat LLMW generated at Pantex on site consistent with Pantex's site treatment plan. DOE prefers to ship Pantex's LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat LLW generated at Pantex on site. DOE prefers to ship Pantex's LLW to one of 2 or 3 regional disposal sites.

Transuranic Waste: DOE prefers offsite treatment and storage of Pantex's very small amount of TRUW.

Hazardous Waste: DOE prefers the No Action Alternative where Pantex would continue to use commercial facilities for HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for Pantex under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for Pantex under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Latent cancer fatalities among the offsite population are estimated to be essentially zero, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at Pantex.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW and LLW shipments from the Pantex Plant is estimated at 460 truck or 190 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 102 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risks are primarily caused by waste management activities; however, the maximum cumulative increase in radiation dose to the offsite population is estimated to be well below the EPA standard of 10 millirems per year to the maximally exposed individual. Cumulative environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded.

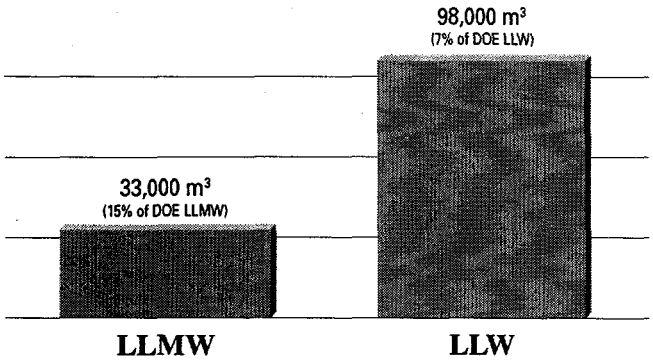
Site Summary

Portsmouth Gaseous Diffusion Plant

The Portsmouth Gaseous Diffusion Plant (PORTS) has been a major Department of Energy (DOE) site for more than 40 years, producing enriched uranium. PORTS is located on 6.3 square miles, about 22 miles northeast of Portsmouth, Ohio.

PORTS is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW) and low-level waste (LLW) and, in some alternatives, other sites' LLMW and LLW. PORTS currently does not have an inventory of transuranic waste or high-level waste and is not expected to manage these waste types in the future. In addition, PORTS is not considered a major generator of hazardous waste.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the two waste types at PORTS, are shown in the following chart. Also, how PORTS relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at PORTS include the storage of LLMW with the treatment of wastewater only and preparation of LLW for shipment off site for disposal. A waste minimization and pollution prevention program has been developed and is being implemented at PORTS to reduce waste volumes.

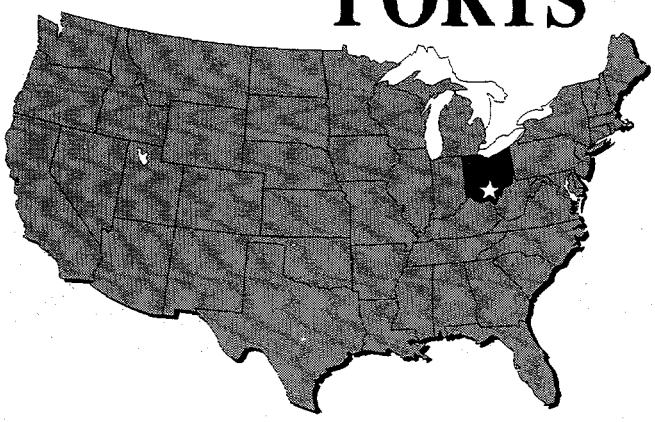
Waste Management Alternatives at PORTS

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	*1 subalternative:* Treatment On Site (including shipments from offsite facilities)	Treatment Off Site
			Disposal On Site (including shipments from offsite facilities)	
			2 subalternatives: Treatment On Site (including shipments from offsite facilities)	
	Storage On Site	Disposal On Site (including shipments from offsite facilities)	Disposal Off Site	Disposal Off Site
			1 subalternative: Treatment Off Site	
			Disposal Off Site	
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*2 subalternatives:* **Treatment On Site*** (including shipments from offsite facilities)	*2 subalternatives:* Minimum Treatment On Site
			Disposal On Site (including shipments from offsite facilities)	Disposal Off Site
			3 subalternatives: **Minimum Treatment On Site**	*2 subalternatives:* Treatment On Site (including shipments from offsite facilities)
			Disposal Off Site	Disposal Off Site
	Disposal Off Site	Disposal On Site (including shipments from offsite facilities)	*1 subalternative:* **Treatment On Site** (including shipments from offsite facilities)	*1 subalternative:* Treatment Off Site
			Disposal Off Site	
			1 subalternative: **Treatment Off Site**	Disposal Off Site
			Disposal Off Site	

*Minimum treatment in one subalternative.

= DOE's preferred alternatives.

PORTS



DOE's Preferred Alternatives

In the development of a national strategy for each waste type, PORTS's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which PORTS fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat PORTS' LLMW on site consistent with Portsmouth's site treatment plan. DOE prefers to ship PORTS' LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat PORTS' LLW on site. DOE prefers to ship PORTS' LLW to one of 2 or 3 regional disposal sites.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for PORTS under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for PORTS under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Latent cancer fatalities among the offsite population are estimated to be essentially zero, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at PORTS.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW and LLW shipments from PORTS is estimated to be 34,090 truck or 13,000 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 399 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Waste management activities could greatly increase waste shipments leaving the site.

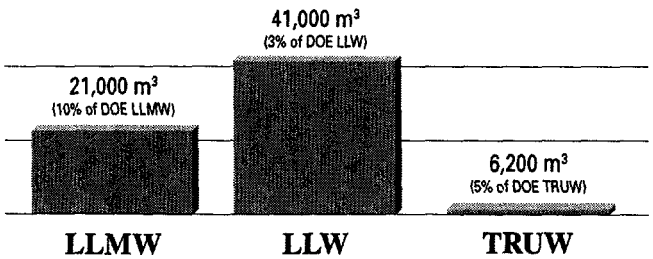
Site Summary

Rocky Flats Environmental Technology Site

The Rocky Flats Environmental Technology Site (RFETS) has been a major Department of Energy (DOE) site for more than 40 years, producing nuclear weapons components from plutonium and other metals. In 1992, its mission changed to environmental restoration and decontamination and decommissioning. RFETS occupies 11 square miles, approximately 16 miles northwest of Denver, Colorado.

RFETS is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), and transuranic waste (TRUW) and, in some alternatives, other sites' LLMW and LLW. RFETS currently does not have an inventory of high-level waste and is not expected to manage this waste type in the future. In addition, RFETS is not considered a major generator of hazardous waste.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the three waste types at RFETS, are shown in the following chart. Also, how RFETS relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at RFETS include the storage of LLMW with the treatment of wastewater only, preparation of LLW for shipment off site for disposal, and storage of TRUW on site. A waste minimization program has been developed and is being implemented at RFETS to reduce waste volumes.

Waste Management Alternatives at RFETS

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	*1 subalternative:* Treatment On Site (including shipments from offsite facilities)	Treatment Off Site
			Disposal On Site	
	Storage On Site	Disposal On Site (including shipments from offsite facilities)	*2 subalternatives:* Treatment On Site (including shipments from offsite facilities)	Disposal Off Site
			Disposal Off Site	
			1 subalternative: Treatment Off Site	
			Disposal Off Site	
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*2 subalternatives:* Treatment On Site*	*2 subalternatives:* Minimum Treatment On Site
			Disposal On Site	
			1 subalternative: Treatment On Site (including shipments from offsite facilities)	Disposal Off Site
			Disposal Off Site	*2 subalternatives:* Treatment On Site (including shipments from offsite facilities)
	Disposal Off Site	Disposal On Site	*1 subalternative:* Treatment Off Site	
			Disposal Off Site	Disposal Off Site
			2 subalternatives: Minimum Treatment On Site	*1 subalternative:* Treatment Off Site
			Disposal Off Site	Disposal Off Site
TRUW	Treatment On Site	Treatment On Site	*2 subalternatives:* Treatment On Site	Treatment Off Site
			Storage On Site	
	Storage On Site	Storage On Site	*1 subalternative:* Treatment Off Site	Storage Off Site
			Storage Off Site	

*Minimum treatment in one subalternative.

= DOE's preferred alternatives.

RFETS

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, RFETS's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which RFETS fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat RFETS' LLMW on site consistent with RFETS' site treatment plan. DOE prefers to ship RFETS' LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat RFETS' LLW on site. DOE prefers to ship RFETS' LLW to one of 2 or 3 regional disposal sites.

Transuranic Waste: DOE prefers the Decentralized Alternative for onsite treatment and storage of some of RFETS' TRUW. Some of RFETS' TRUW could be treated at INEL.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for RFETS under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for RFETS under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

The largest estimated health risks are to workers and are related to the waste volumes being handled. Physical accidents typically result in a higher potential for fatalities than exposure to radiation. One worker fatality could occur for the preferred treatment alternative for LLMW. Among the offsite population, latent cancer fatalities are estimated to be essentially zero for waste management activities under the preferred alternatives for all waste types at RFETS.

Environmental Effects

Under the preferred alternatives, equipment and vehicular emissions could require mitigative measures to meet air quality standards for nonattainment areas in the region. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW, LLW and TRUW shipments from RFETS is estimated to be 6,920 truck or 2,690 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 774 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risks are primarily caused by waste management activities; however, the maximum cumulative increase in radiation dose to the offsite population is estimated to be below the EPA standard of 10 millirems per year to the maximally exposed individual. Cumulative environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded, except for air quality criteria air pollutants (CO and NO_2). Waste management activities could greatly increase waste shipments leaving the site.

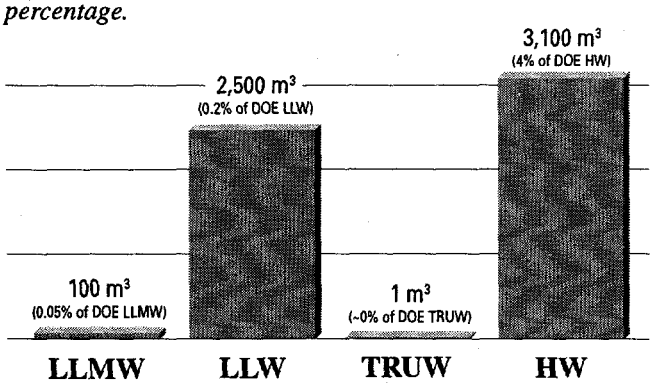
Site Summary

Sandia National Laboratories

Sandia National Laboratories-New Mexico (SNL-NM) is a major Department of Energy (DOE) research and development laboratory with a primary mission of developing, engineering, and testing non-nuclear components of nuclear weapons. SNL-NM is located on 4.4 square miles southeast of Albuquerque, New Mexico, on the Kirtland Air Force Base.

SNL-NM is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), and hazardous waste (HW). SNL-NM currently does not have an inventory of high-level waste and is not expected to manage this waste type in the future. The WM PEIS includes waste volumes for ITRI in its evaluation of SNL-NM as a candidate site for waste management facilities.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the four waste types at SNL-NM, are shown in the following chart. Also, how SNL-NM relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



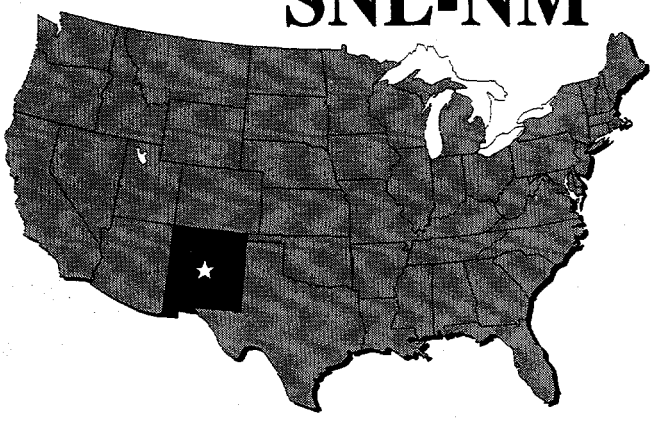
Current waste management activities at SNL-NM include the storage of LLMW with the treatment of wastewater only, preparation of LLW for shipment off site for disposal, storage of TRUW on site, and the transport of HW off site for treatment. A waste minimization and pollution prevention plan has been developed and is being implemented at SNL-NM to reduce waste volumes.

Waste Management Alternatives at SNL-NM

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	Treatment Off Site	Treatment Off Site
	Storage On Site	Disposal On Site	Disposal Off Site	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*3 subalternatives:* Treatment Off Site / Disposal Off Site	*2 subalternatives:* Minimum Treatment On Site / Disposal Off Site
	Disposal Off Site	Disposal On Site	*4 subalternatives:* Minimum Treatment On Site / Disposal Off Site	*3 subalternatives:* Treatment Off Site / Disposal Off Site
TRUW	Storage On Site	Treatment On Site	Treatment Off Site	Treatment Off Site
		Storage Off Site	Storage Off Site	Storage Off Site
HW	Treatment Off Site (commercial facilities)	Treatment Off Site (commercial facilities)	Treatment Off Site (DOE and commercial facilities)	Not Analyzed

= DOE's preferred alternatives.

SNL-NM



DOE's Preferred Alternatives

In the development of a national strategy for each waste type, SNL-NM's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which SNL-NM fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat SNL-NM's LLMW on site consistent with SNL-NM's site treatment plan. DOE prefers to ship SNL-NM's LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat SNL-NM's LLW on site. DOE prefers to ship SNL-NM's LLW to one of 2 or 3 regional disposal sites.

Transuranic Waste: DOE prefers the offsite treatment and storage of SNL-NM's TRUW.

Hazardous Waste: DOE prefers the No Action Alternative where SNL-NM would continue to use commercial facilities for HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for SNL-NM under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for SNL-NM under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Latent cancer fatalities among the offsite population are estimated to be essentially zero, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at SNL-NM.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW, LLW, and TRUW shipments from SNL-NM is estimated to be 370 truck or 180 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 46 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Waste management activities could greatly increase waste shipments leaving the site.

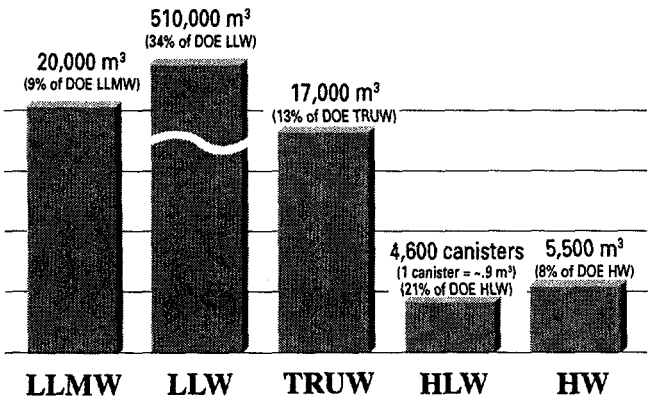
Site Summary

Savannah River Site

The Savannah River Site (SRS) has played a major role in national security for more than 40 years, producing nuclear materials (primarily plutonium and tritium) for weapons, managing the resulting radioactive and hazardous waste, and performing a variety of missions related to energy research and nuclear materials management. SRS is located on approximately 310 square miles, about 20 miles south of Aiken, South Carolina, and 25 miles southeast of Augusta, Georgia.

SRS is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), high-level waste (HLW), hazardous waste (HW), and, in some alternatives, other sites' LLMW, LLW, TRUW and HLW.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the five waste types at SRS, are shown in the following chart. Also, how SRS relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at SRS include the treatment and storage of LLMW, treatment and disposal of LLW on site, storage of TRUW on site, storage of HLW on site pending disposal in a geologic repository, and the transport of HW off site for treatment. A waste minimization and pollution prevention plan has been developed and is being implemented at SRS to reduce waste volumes.

Waste Management Alternatives at SRS

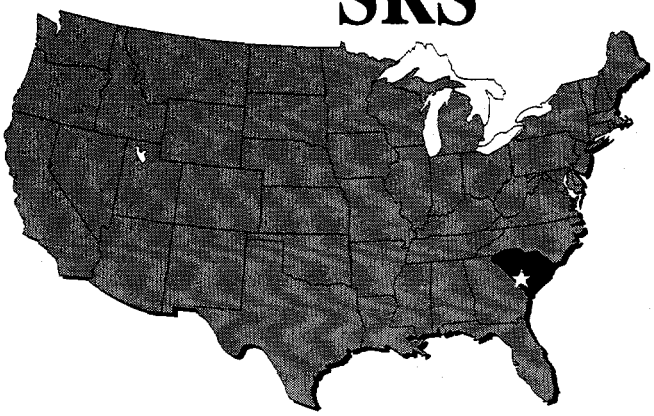
	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site	Treatment On Site	*3 subalternatives:* **Treatment On Site** (including offsite shipments)	Treatment On Site (RH only)
			Disposal On Site	Treatment Off Site
	Storage On Site	Disposal On Site (including offsite shipments)	*1 subalternative:* **Treatment On Site** (including offsite shipments)	Disposal Off Site
			Disposal Off Site	
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*5 subalternatives:* **Treatment On Site***	*4 subalternatives:* **Treatment On Site*** (including offsite shipments)
			Disposal On Site (including offsite shipments)	**Disposal Off Site**
	Disposal On Site (including offsite shipments)	Disposal On Site (including offsite shipments)	*2 subalternatives:* **Minimum Treatment On Site**	*1 subalternative:* **Treatment Off Site**
			Disposal On Site (including shipments from all eastern sites)	**Disposal Off Site**
TRUW	Treatment On Site	Treatment On Site	Treatment On Site (including offsite CH)	Treatment Off Site
	Storage On Site	Storage On Site	Storage On Site	Storage Off Site
HLW	Storage On Site	Storage On Site	Storage On Site (possibly including offsite shipments)	Storage Off Site
		Pending Disposal Off Site (geologic repository)	*Pending* Disposal Off Site (geologic repository)	
HW	Treatment Off Site (commercial facilities)	Treatment On Site (organic only)	*1 subalternative:* **Treatment On Site** (organic only)	Not Analyzed
			Treatment Off Site (commercial facilities)	
		Treatment Off Site (commercial facilities)	*1 subalternative:* **Treatment Off Site** (DOE and commercial facilities)	

* Minimum treatment in 2 subalternatives.

RH = Remote-handled TRUW. CH = Contact-handled TRUW.

= DOE's preferred alternatives. DOE does not yet have site preferences for LLMW and LLW disposal.

SRS



DOE's Preferred Alternatives

In the development of a national strategy for each waste type, SRS' future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which SRS fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers regionalized treatment of LLMW at SRS. This alternative includes onsite treatment of SRS's LLMW and could include treatment of LLMW generated at other sites. LLMW activities at SRS would be conducted in accordance with SRS's site treatment plan. SRS could be selected as one of the regional disposal sites for LLMW.

Low-Level Waste: DOE prefers to treat SRS' LLW on site. SRS could be selected as one of the regional disposal sites for LLW.

Transuranic Waste: DOE prefers the Regionalized Alternative for onsite treatment and storage of SRS' contact-handled TRUW. Under this alternative, some contact-handled TRUW could be received from ORR for treatment and storage. Also, DOE could ship SRS' remote-handled TRUW to ORR for treatment and storage.

High-Level Waste: DOE prefers onsite storage of SRS' immobilized HLW pending disposal in a geologic repository.

Hazardous Waste: DOE prefers the No Action Alternative where SRS would continue to use commercial facilities for HW treatment.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for SRS under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for SRS under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Health risks are primarily to workers and could include fatalities from waste management activities over the 20-year period of analysis. Collective worker health risk estimates are one fatality for LLMW and five fatalities for LLW, depending on whether SRS is selected as a disposal site, one fatality for HLW, and less than one fatality for TRUW. Less than one latent cancer fatality is estimated among the offsite population for waste management activities under the preferred alternatives for all waste types at SRS.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. To meet drinking water standards, performance-based waste acceptance criteria may be needed for onsite disposal of LLMW. Expenditures for WM activities could cause socioeconomic effects that include the benefits of increased regional employment and income as well as regional population growth that could alter community structure and stress available housing and community services. No major impacts to ecological resources, land use, infrastructure, or environmental justice are expected. The programmatic analyses did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the maximum total number of LLMW, LLW, TRUW, and HLW shipments to and from SRS is estimated to be 74,862 truck or 27,275 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 2,406 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

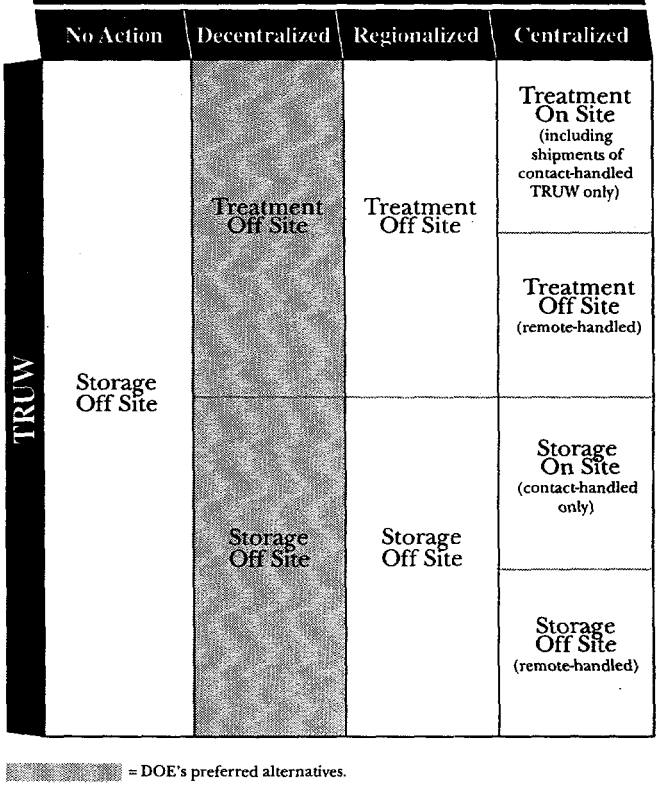
Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. However, to meet drinking water standards, performance-based waste acceptance criteria may be needed for onsite disposal of LLMW and LLW. Waste management activities could greatly increase waste shipments entering or leaving the site.

Site Summary

Waste Isolation Pilot Plant Site

The Waste Isolation Pilot Plant (WIPP) is a Department of Energy (DOE) research and development facility for the safe and permanent disposal of defense-generated transuranic waste (TRUW). WIPP will become a permanent disposal site for TRUW if it meets all regulatory requirements and DOE decides to open it. The WIPP site is located on 16 square miles in southeastern New Mexico, approximately 25 miles from Carlsbad.

Waste Management Alternatives at WIPP



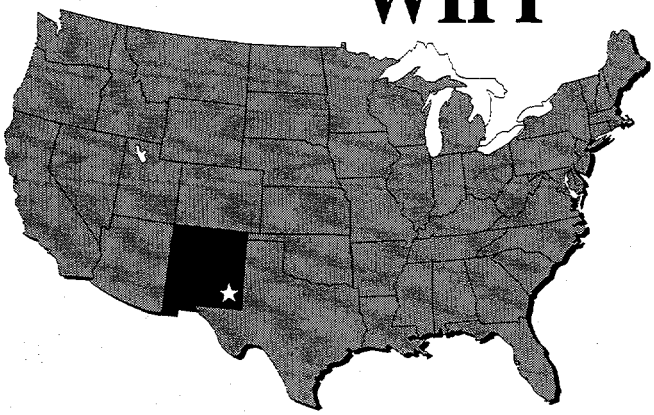
= DOE's preferred alternatives.

WIPP is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential geologic disposal site for TRUW from other DOE sites. The WIPP site does not currently manage or contain waste.

In 1981, DOE issued a Record of Decision for the phased development of WIPP. In 1990, a subsequent Record of Decision was issued that called for the continuation of the phased development of WIPP. To support a decision on whether to proceed to disposal, DOE prepared a second Supplemental EIS (SEIS II) to evaluate impacts associated with disposal at the site. Also, a number of regulatory and legislative requirements must be met before shipments of TRUW for disposal at WIPP could begin.

DOE's current strategy is to have all TRUW meet the WIPP waste acceptance criteria established by DOE in consultation with the Environmental Protection Agency (EPA) and the State of New Mexico. These criteria are not yet final and may be modified to require more extensive treatment of TRUW before disposal. The WM PEIS only analyzes the role of the WIPP site with respect to the treatment of TRUW. The environmental impacts of TRUW disposal at WIPP are evaluated in the WIPP SEIS II mentioned above. If certified as a TRUW disposal site by EPA, WIPP will operate as a repository, accepting TRUW for approximately 35 years (under the Proposed Action in the WIPP SEIS II). At the end of that time, DOE will backfill and permanently seal the facility.

WIPP



DOE's Preferred Alternative

In the development of a national strategy for each waste type, WIPP's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS, the WIPP SEIS II, and regulatory requirements. Although the site's role will not be determined until the Records of Decision are issued and other requirements are met, the way in which WIPP fits within the preferred waste management alternative for TRUW is as follows.

Transuranic Waste: DOE prefers the Decentralized Alternative in which all DOE-generated TRUW would be treated and stored at the sites where it is generated and then shipped to WIPP for disposal. Although the FFC Act's requirement for a Site Treatment Plan would not apply to WIPP, DOE did include management plans for mixed TRUW in the proposed site treatment plans of the sites where mixed TRUW is currently being managed.

Potential Impacts of Preferred Alternative

The WM PEIS evaluated WIPP only under the Centralized Alternative, in which treatment of TRUW would occur at WIPP. These impacts are discussed in Chapter 8. However, in the preferred Decentralized Alternative, treatment of TRUW would occur elsewhere. The potential impacts of TRUW disposal have been assessed in previous EISs and the WIPP SEIS II.

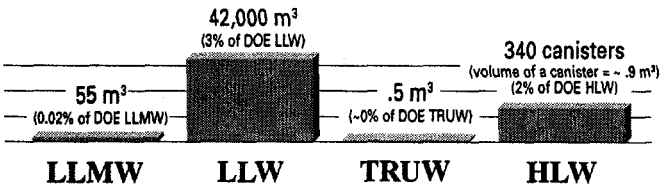
Site Summary

West Valley Demonstration Project

The West Valley Demonstration Project (WVDP) is located on the site of the only U.S. commercial nuclear fuel reprocessing plant, which recycled fuel from commercial and federally owned reactors until 1972. Under the WVDP Act, a Public Law enacted by Congress in 1980, the Department of Energy (DOE) is required to develop and demonstrate a technology for solidifying high-level waste in preparation for disposal. Other WVDP activities include programs for waste management and decontamination and decommissioning. The WVDP is located on 0.3 square mile in West Valley, approximately 31 miles south of Buffalo, New York.

WVDP is considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) as a potential waste management site for its own low-level mixed waste (LLMW), low-level waste (LLW), transuranic waste (TRUW), and high-level waste (HLW). WVDP currently does not have a large inventory of hazardous waste and is not expected to manage large quantities of this waste type in the future.

The estimated total waste inventories, consisting of current inventory and 20 years of generation for the four waste types at WVDP, are shown in the following chart. Also, how WVDP relates to DOE's entire 20-year projected inventory for each waste type is provided below as a percentage.



Current waste management activities at WVDP include the storage of LLMW with the treatment of wastewater only, preparation of LLW for shipment off site for disposal, storage of TRUW on site, and the storage of HLW on site pending disposal in a geologic repository. A waste minimization/pollution prevention program has been developed and is being implemented at WVDP to reduce waste volumes.

Waste Management Alternatives at WVDP

	No Action	Decentralized	Regionalized	Centralized
LLMW	Treatment On Site (wastewater only)	Treatment On Site	Treatment Off Site	Treatment Off Site
	Storage On Site	Disposal On Site	Disposal Off Site	Disposal Off Site
LLW	Minimum Treatment On Site	Minimum Treatment On Site	*3 subalternatives:* Treatment Off Site / Disposal Off Site	*2 subalternatives:* Minimum Treatment On Site / Disposal Off Site
	Disposal Off Site	Disposal On Site	*4 subalternatives:* Minimum Treatment On Site / Disposal Off Site	*3 subalternatives:* Treatment Off Site / Disposal Off Site
TRUW	Storage On Site	Treatment On Site	Treatment Off Site	Treatment Off Site
		Storage* Off Site	Storage Off Site	Storage Off Site
HLW	Storage On Site	Storage On Site	Storage Off Site	Storage Off Site
		Pending Disposal Off Site (geologic repository)		

* Although the WM PEIS analyses assumed offsite storage, DOE prefers onsite decentralized storage of WVDP transuranic waste.

= DOE's preferred alternatives.

WVDP

DOE's Preferred Alternatives

In the development of a national strategy for each waste type, WVDP's future role will be shaped in part by DOE's preferred alternatives, along with decision criteria discussed in Section 1.7.3 of the WM PEIS. Although the site's role will not be determined until the Records of Decision for each waste type are issued, the ways in which WVDP fits within each preferred waste management alternative are as follows.

Low-Level Mixed Waste: DOE prefers to treat WVDP's LLMW according to the Regionalized Alternative and consistent with WVDP's site treatment plan. Under this alternative, WVDP's LLMW would be shipped off site for treatment. DOE prefers to ship WVDP's LLMW to one of 2 or 3 regional disposal sites.

Low-Level Waste: DOE prefers to treat WVDP's LLW on site. DOE prefers to ship WVDP's LLW to one of 2 or 3 regional disposal sites.

Transuranic Waste: DOE prefers the onsite treatment and storage of WVDP's TRUW.

High-Level Waste: DOE prefers onsite storage of WVDP's immobilized HLW pending disposal in a geologic repository.

Potential Impacts of Preferred Alternatives

The WM PEIS evaluated potential impacts for WVDP under all of the alternatives that identified a role for the site. These impacts are discussed in Chapters 6 through 11. Results of the analyses for WVDP under DOE's preferred alternatives are highlighted for the following impacts.

Health Effects

Latent cancer fatalities among the offsite population are estimated to be essentially zero, and collective physical hazard and latent cancer risks to workers are less than one fatality, for waste management activities under the preferred alternatives for all waste types at WVDP.

Environmental Effects

The preferred alternatives are not expected to cause exceedances of air quality standards. No major impacts to ecological resources, land use, or environmental justice are expected; moderate increases to requirements for wastewater treatment and power for activities under the preferred alternatives could lead to requirements for additional capacity and corresponding costs for these systems. The programmatic analysis did not select exact locations for facilities within site boundaries; some location-specific impacts, such as to cultural and sensitive ecological resources, could require impacts assessment when exact locations are determined.

Transportation

Under the preferred alternatives, the total number of LLMW, LLW, TRUW, and HLW shipments from WVDP is estimated to be 6,990 truck or 2,578 rail shipments.

Site Employment

Under the preferred alternatives, the annual workforce required for waste management operations is estimated to average 142 workers. This could include workers currently employed for existing waste management operations.

Cumulative Effects

Cumulative health risk and environmental impacts are primarily caused by existing conditions and other actions at the site. Although waste management activities may add to cumulative impacts, these additions are not expected to cause standards or guidelines to be exceeded. Wastewater and power requirements could cause current capacities to be exceeded. Waste management activities could substantially increase waste shipments leaving the site.