DOE/EIS – 0337F

WEST VALLEY DEMONSTRATION PROJECT WASTE MANAGEMENT ENVIRONMENTAL IMPACT STATEMENT

FINAL

December 2003

Prepared by:

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Abstract:

The purpose of the *Final West Valley Demonstration Project Waste Management Environmental Impact Statement* is to provide information on the environmental impacts of the Department of Energy's proposed action to ship radioactive wastes that are either currently in storage, or that will be generated from operations over the next 10 years, to offsite disposal locations, and to continue its ongoing onsite waste management activities. Decommissioning or long-term stewardship decisions will be reached based on a separate EIS that is being prepared for that decisionmaking. This EIS evaluates the environmental consequences that may result from actions to implement the proposed action, including the impacts to the onsite workers and the offsite public from waste transportation and onsite waste management. The EIS analyzes a no action alternative, under which most wastes would continue to be stored onsite over the next 10 years. It also analyzes an alternative under which certain wastes would be shipped to interim offsite storage locations prior to disposal. The Department's preferred alternative is to ship wastes to offsite disposal locations.

Public Comments:

The WVDP Waste Management EIS was issued in draft on May 16, 2003, for public review and comment. A public hearing on the Draft EIS was held on June 11, 2003, at the Ashford Office Complex near the WVDP site. DOE received comments from 21 individuals, organizations, and agencies.

A complete copy of the WVDP Waste Management Final EIS can be viewed at:
http://www.wv.doe.gov/LinkingPages/RevisedEnvironmental%20Impact%20Statement.htm.

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ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CH-TRU	contact-handled transuranic (waste)
CTF	citizen task force
DOE	U.S. Department of Energy
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FONSI	finding of no significant impact
FY	fiscal year
HEPA	high-efficiency particulate air (filter)
HLW	high-level radioactive waste
INEEL	Idaho National Engineering and Environmental Laboratory
LLW	low-level radioactive waste
LSA	lag storage area
LSB	lag storage building
MOU	Memorandum of Understanding
mrem	millirem
NDA	NRC-licensed Disposal Area
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NYSERDA	New York State Energy Research and Development Authority
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
RCRA	Resource Conservation and Recovery Act
RH-TRU	remote-handled transuranic (waste)
RHWF	Remote Handled Waste Facility
ROD	Record of Decision
SDA	State-licensed Disposal Area
SEQRA	State Environmental Quality Review Act
SRS	Savannah River Site
STS	supernatant treatment system
TRU	transuranic (waste)
TRUPACT-II	transuranic package transporter
WIPP	Waste Isolation Pilot Plant
WM PEIS	*Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*
WVDP	West Valley Demonstration Project

MEASUREMENTS AND CONVERSIONS

The following information is provided to assist the reader in understanding certain concepts in this document.

UNITS OF MEASUREMENT

Measurements in this report are presented in metric units with English units in parentheses. Metric units were also used for measurements that are too small to be defined by English units or with data that were intended to be presented in metric units. Many metric measurements in this volume include prefixes that denote a multiplication factor that is applied to the base standard (for example, 1 centimeter = 0.01 meter). Table MC-1 presents these metric prefixes. Table MC-2 lists the mathematical values or formulas needed for conversion between metric and English units.

Table MC-1. Metric Prefixes

Prefix	Symbol	Multiplication Factor
deci	d	$0.1 = 10^{-1}$
centi	c	$0.01 = 10^{-2}$
milli	m	$0.001 = 10^{-3}$
micro	μ	$0.000\ 001 = 10^{-6}$
nano	n	$0.000\ 000\ 001 = 10^{-9}$
pico	p	$0.000\ 000\ 000\ 001 = 10^{-12}$

Table MC-2. Metric Conversion Chart

To Convert To Metric			To Convert From Metric		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	0.3048	meters	meters	3.281	feet
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
square feet	0.092903	square meters	square meters	10.7639	square feet
square miles	2.58999	square kilometers	square kilometers	0.3861	square miles
Volume					
gallons	3.7854	liters	liters	0.26417	gallons
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths then add 32	Fahrenheit

ROUNDING

Some numbers have been rounded; therefore, sums and products throughout the document may not be consistent. A number was rounded only after all calculations using that number had been made. Numbers that are actual measurements were not rounded.

SCIENTIFIC NOTATION

Scientific notation is based on the use of positive and negative powers of 10. A number written in scientific notation is expressed as the product of a number between 1 and 10 and a positive or negative power of 10.

Examples: 5,000 would be written as 5×10^3
0.005 would be written as 5×10^{-3}

NUMBERING CONVENTIONS

The following conventions were used for presenting numbers in the EIS text and tables:

- Numbers larger than 1 = expressed as whole numbers
- Numbers $\times$ 10^{-1} and 10^{-2} = expressed in decimal form

  Examples: 5×10^{-1} is expressed as 0.5
  5×10^{-2} is expressed as 0.05

- Numbers $\times$ 10^{-3}, 10^{-4}, and smaller = expressed in scientific notation

CHAPTER 1
INTRODUCTION

This chapter introduces the U.S. Department of Energy's proposal for onsite management and offsite transportation of radioactive wastes. This chapter describes the types of wastes that are present at the site, the site facilities, and the alternatives that the Department has analyzed to meet certain of its obligations under the West Valley Demonstration Project Act. This chapter includes brief discussions of other National Environmental Policy Act documents that are relevant to the proposed action and alternatives analyzed in this EIS.

As part of its ongoing West Valley Demonstration Project (WVDP), and in accordance with the West Valley Demonstration Project Act and previous U.S. Department of Energy (DOE or the Department) decisions, DOE proposes to:

- Continue onsite management of high-level radioactive waste (HLW) until it can be shipped for disposal to a geologic repository (assumed for the purposes of analysis to be the proposed Yucca Mountain Repository in Nye County, Nevada),
- Ship low-level radioactive waste (LLW) and mixed (radioactive and hazardous) LLW offsite for disposal at DOE or other disposal sites, and
- Ship transuranic (TRU) radioactive waste to the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico.

The waste volumes that are the subject of evaluation in this environmental impact statement (EIS) include only those wastes that are either currently in storage or that would be generated over the next 10 years from ongoing operations and decontamination activities. This EIS analyzes activities that would occur during a 10-year period.

The proposed actions and alternatives assessed in this EIS are intended to address DOE's responsibilities under the West Valley Demonstration Project Act and are consistent with the terms of the Stipulation of Compromise reached with the Coalition on West Valley Nuclear Wastes and Radioactive Waste Campaign (Appendix A). Implementation of these actions would allow DOE to make progress in meeting its obligations under the Act that pertain to waste management, and they are consistent with programmatic decisions DOE has made (see Sections 1.7.1.2 and 1.7.1.4) regarding the waste types addressed in this EIS. Those decisions and their respective EISs, as they apply to the WVDP, provide for shipping wastes from the West Valley site to other regional or centralized DOE sites for treatment, storage, and disposal, as appropriate. The Department has analyzed the potential environmental impacts associated with this proposal and reasonable alternatives in accordance with the National Environmental Policy Act (NEPA) and applicable NEPA regulations promulgated by the Council on Environmental Quality (Title 40 of the Code of Federal Regulations [CFR] Parts 1500-1508) and DOE (10 CFR Part 1021).

The scope of this EIS is a departure from that which was announced in a March 2001 Notice of Intent (NOI) (66 Fed. Reg. 16447 (2001)). DOE modified the scope of the EIS as a result of public comments received during scoping and the Department's further evaluation of activities that might be required, and independently justified, before final decisions are made on decommissioning and/or long-term stewardship. The scope is now limited to onsite waste management and offsite waste transportation activities, and no longer includes decontamination activities as proposed in the NOI. This change in scope is discussed further in Section 1.2, NEPA Compliance Strategy.

1.1 BACKGROUND

This section describes the Western New York Nuclear Service Center (the Center) and its associated facilities. Also discussed are the activities for which DOE is responsible under the West Valley Demonstration Project Act.

1.1.1 Western New York Nuclear Service Center

The Center comprises 14 square kilometers (5 square miles) in West Valley, New York, and is located in the town of Ashford, approximately 50 kilometers (30 miles) southeast of Buffalo, New York. It was a commercial nuclear fuel reprocessing plant and was the only one to have operated in the United States. Figure 1-1 shows the locations of the Center and the WVDP Site within the State of New York (USGS 1979).

The Center operated under a license issued by the Atomic Energy Commission (now the Nuclear Regulatory Commission [NRC]) in 1966 to Nuclear Fuel Services, Inc. and the New York State Atomic and Space Development Authority, now known as the New York State Energy and Development Authority (NYSERDA) (AEC 1966). Under the Energy Reorganization Act of 1974, the regulatory functions of the Atomic Energy Commission were given to the NRC, which became the licensing authority for the Center's operation.

During reprocessing, spent nuclear fuel from commercial nuclear power plants and DOE sites was chopped, dissolved, and processed by a solvent extraction system to recover uranium and plutonium. Fuel reprocessing ended in 1972 when the plant was shut down for modifications to increase its capacity, reduce occupational radiation exposure, and reduce radioactive effluents. At the time, Nuclear Fuel Services, the owner and operator of the reprocessing plant, expected that the modifications would take 2 years and $15 million to complete. However, between 1972 and 1976, there were major changes in regulatory requirements, including more stringent seismic and tornado siting criteria for nuclear facilities and more extensive regulations for radioactive waste management, radiation protection, and nuclear material safeguards. In 1976, Nuclear Fuel Services judged that over $600 million would be required to modify the facility to increase its capacity and to comply with these changes in regulatory standards (DOE 1978).

As a result, the company announced its decision to withdraw from the nuclear fuel reprocessing business and exercise its contractual right to yield responsibility for the Center to NYSERDA. Nuclear Fuel Services withdrew from the Center without removing any of the in-process nuclear wastes. NYSERDA now holds title to and manages the Center on behalf of the people of the State of New York.

In 1978, Congress passed the Department of Energy Act (Pub. L. No. 95-238), which, among other things, directed DOE to conduct a study to evaluate possible federal operation or permanent federal ownership of the Center and use of the Center for other purposes. DOE issued the *Western New York Nuclear Service Center Study: Companion Report* (DOE 1978) to provide historical perspective and to identify options for the future of the Center. The Companion Report did not attempt to select an option for the future of the Center, although it included recommendations that development of technology to immobilize liquid HLW be started immediately. Congress subsequently passed the West Valley Demonstration Project Act (Pub. L. No. 96-368; 42 U.S.C. 2021a) in 1980.

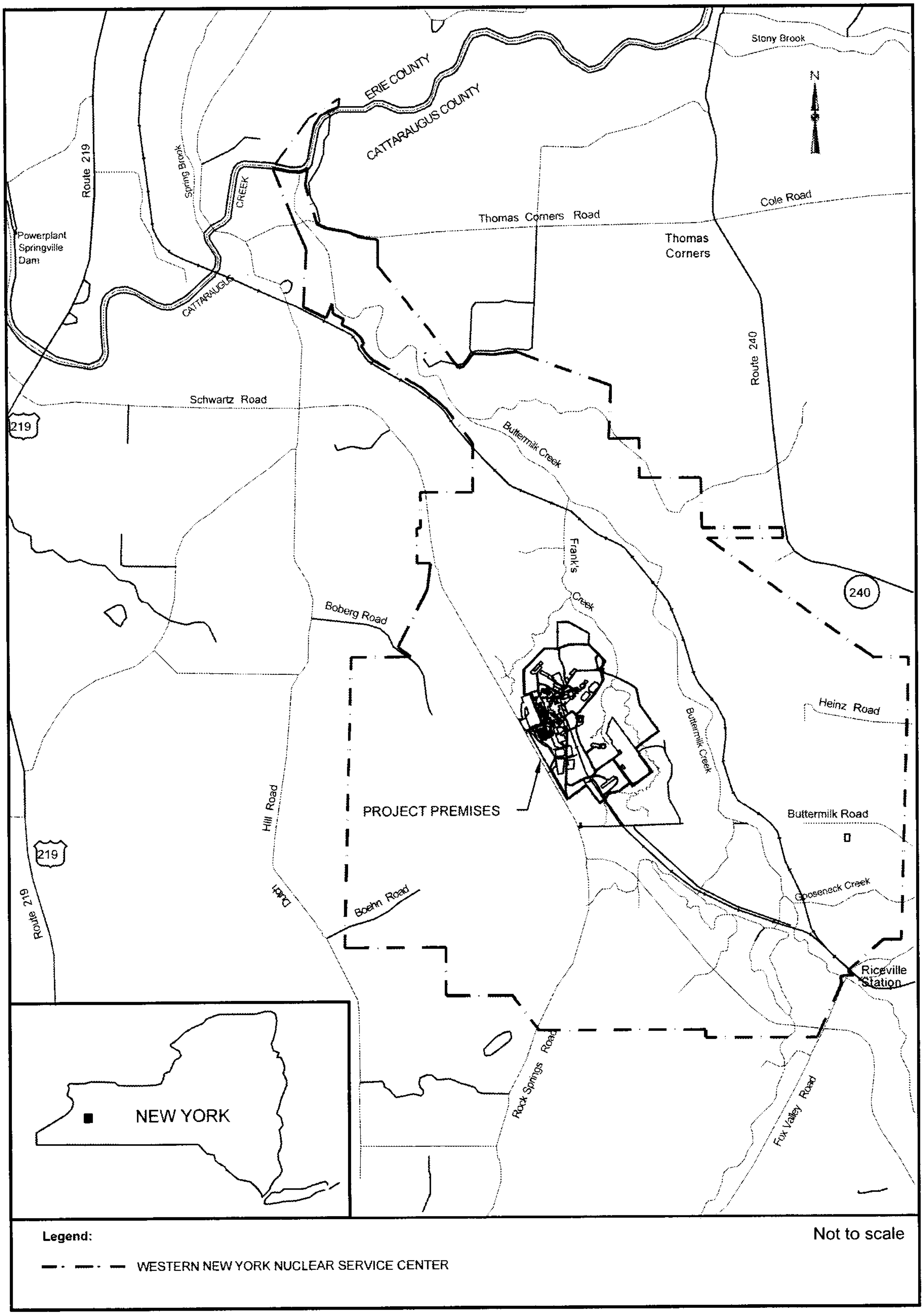

Figure 1-1. Location of the West Valley Demonstration Project

1.1.2 The West Valley Demonstration Project Act

The West Valley Demonstration Project Act requires DOE to demonstrate that the liquid HLW from reprocessing can be safely managed by solidifying it at the Center and transporting it to a geologic repository for permanent disposal. Specifically, Section 2(a) of the Act directs DOE to:

1. Solidify HLW by vitrification or such other technology that DOE deems effective,
2. Develop containers suitable for the permanent disposal of the solidified HLW,
3. Transport the solidified HLW to an appropriate federal repository for permanent disposal,
4. Dispose of the LLW and TRU waste produced by the HLW solidification program,[1] and
5. Decontaminate and decommission the waste storage tanks and facilities used to store HLW, the facilities used for HLW solidification of the waste, and any material and hardware used in connection with the project in accordance with such requirements as the NRC may prescribe.

In the 20 years since the West Valley Demonstration Project Act was enacted, DOE has succeeded in treating 2.3 million liters (600,000 gallons) of HLW by vitrification (combining liquid HLW with borosilicate glass) and has developed stainless-steel canisters suitable for its permanent disposal (actions 1 and 2). The potential environmental impacts of these activities were addressed in the *Environmental Impact Statement, Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley* (DOE 1982).

Implementing actions 3, 4, and 5 will require additional waste management and closure activities. This WVDP Waste Management EIS evaluates alternatives for meeting DOE's onsite waste management and offsite transportation and disposal responsibilities under the Act. As discussed in more detail in Section 1.2, the future *Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center EIS*, hereafter referred to as the Decommissioning and/or Long-Term Stewardship EIS, will address decommissioning and closure alternatives.

1.1.3 Site Facilities

Several terms are used in this EIS to describe areas, activities, and responsibilities at the Center. These were defined in the *Cooperative Agreement between United States Department of Energy and New York State Energy Research and Development Authority on the Western New York Nuclear Service Center at West Valley, New York, October 1, 1980* (DOE 1980b), amended September 18, 1981. The Cooperative Agreement terms, as used in this EIS, are:

[1] TRU waste is currently defined by NRC and DOE as waste containing more than 100 nanocuries of alpha-emitting isotopes, with half-lives greater than 20 years, per gram of waste. However, the West Valley Demonstration Project Act defined TRU waste as "material contaminated with radioactive elements that have an atomic number greater than 92, including neptunium, plutonium, americium, and curium, and that are in concentrations greater than *10* (emphasis added) nanocuries per gram, or in such other concentrations as the [NRC] may prescribe to protect the public health and safety." [In the event wastes are disposed of offsite, the applicable definitions at the disposal site will be used.]

- ***The Center*** – The 14-square-kilometer (5-square-mile) Western New York Nuclear Service Center in West Valley, New York.

- ***The Project or the WVDP*** – All activities undertaken in carrying out the solidification of the liquid HLW at the Center, including (1) solidification of liquid HLW; (2) preparation of the Project Premises and Project Facilities to accommodate action 1; (3) development of containers suitable for the permanent disposal of the HLW solidified at the Center; (4) transportation; (5) decontamination of facilities used for the Project and decommissioning of the tanks, other facilities at the Center in which the solidified wastes were stored, all Project Facilities, and other facilities, material, and hardware used in carrying out the solidification of the HLW at the Center; (6) disposal of LLW, mixed LLW, and TRU waste; and (7) all other activities necessary to carry out the foregoing.

- ***Project Premises*** – An area of approximately 0.8 square kilometer (200 acres) within the Western New York Nuclear Service Center made available to DOE for carrying out the WVDP. The Project Premises include the Project Facilities and the 0.02-square-kilometer (5-acre) NRC-Licensed Disposal Area (NDA).

- ***Project Facilities*** – The facilities that NYSERDA made available to DOE to be used in the solidification of the HLW at the Center.

- ***Retained Premises*** – The 13-square-kilometer (3,300-acre) portion of the Center, not including the Project Premises, retained by NYSERDA. The Retained Premises include the 0.06-square-kilometer (15-acre) State-licensed Disposal Area (SDA) adjacent to the NDA.

The Project Premises, SDA, and NDA are shown in Figure 1-2 (WVNS 2000).

1.1.3.1 Management Responsibilities at the Center

DOE and NYSERDA have individual and shared responsibilities for nuclear wastes, permits, licenses, environmental management, and stewardship activities at the Center. These responsibilities are conferred on DOE and NYSERDA by their respective statutory authorities and the compliance requirements of applicable federal and state regulatory programs. In general, DOE is responsible for completing the actions at the Center directed by the West Valley Demonstration Project Act, including transportation of nuclear wastes to appropriate facilities for disposal and decontamination and decommissioning facilities used in connection with the WVDP in accordance with requirements prescribed by the NRC. NYSERDA is responsible for the SDA and portions of the Center that would normally be subject to NRC commercial nuclear facility regulations.

New York State Environmental Quality Review Act (SEQRA)

SEQRA establishes the State of New York's requirements for reviewing state actions with potential environmental impacts. The statute is implemented in regulations promulgated by the New York State Department of Environmental Conservation at Section 6, Part 617, of the New York Code Rules and Regulations. SEQRA requires that all state agencies determine whether the actions they directly undertake, fund, or approve might have a significant effect on the environment. If it is determined that the action might have a significant effect on the environment, the agency must prepare or request an EIS. NYSERDA closure or long-term management activities at the Center are subject to the SEQRA review process. Because NYSERDA has no jurisdiction over the waste management activities that are the subject of this EIS, SEQRA provisions requiring the State to prepare an EIS do not apply in these circumstances.

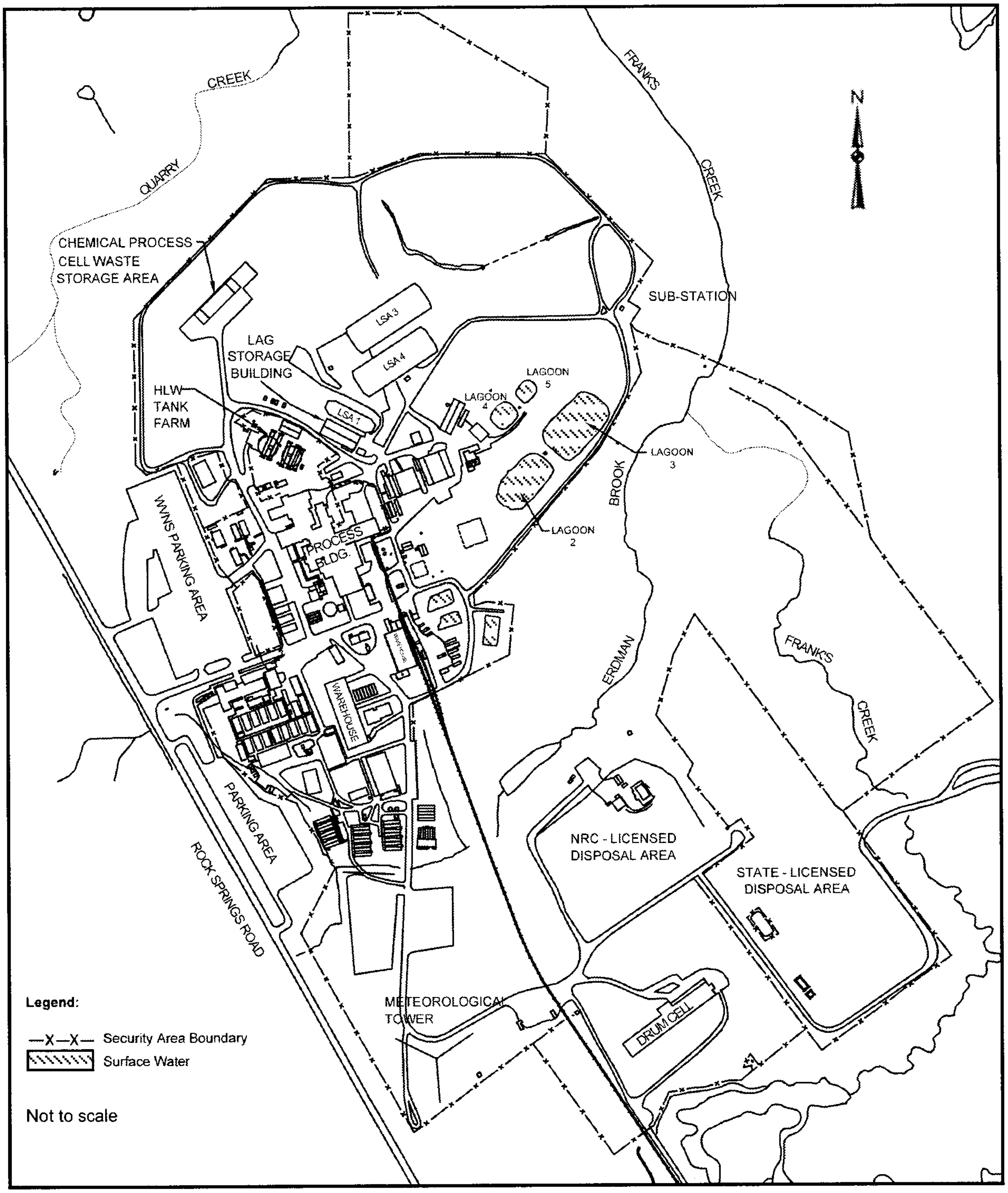

Figure 1-2. Project Premises, NDA, and SDA

Article III of the Cooperative Agreement between DOE and NYSERDA further defined their respective responsibilities to comply with the West Valley Demonstration Project Act. Generally, DOE has sole responsibility for carrying out the Project. This includes (1) exclusive DOE possession of the Project Premises and the Project Facilities used in carrying out the WVDP, and (2) responsibility for protection of public health and safety with respect to the Project Premises and Project Facilities for the duration of the WVDP. Current NYSERDA responsibilities under the Cooperative Agreement include (1) providing services to DOE in connection with the WVDP, and (2) participating in carrying out the WVDP as provided for in the Cooperative Agreement (DOE 1980b). NYSERDA is also responsible for making a timely application for an NRC license, as may be required for NYSERDA to assume possession of the Project Premises and Project Facilities upon completion of the Project (Article VI).

NYSERDA is not a joint lead agency for this WVDP Waste Management EIS, but it will participate as appropriate under Section 6.03 of the Cooperative Agreement between DOE and NYSERDA on the Center at West Valley, New York (October 1, 1980, amended September 18, 1981). However, NYSERDA will work with DOE, as a joint lead agency, in the preparation of the Decommissioning and/or Long-Term Stewardship EIS for the WVDP and the Center (see Section 1.2, NEPA Compliance Strategy).

The NRC also has limited responsibilities for activities at the Center under the West Valley Demonstration Project Act, under a related Memorandum of Understanding (MOU) with DOE (46 Fed. Reg. 56960 (1981)), and as the successor to the agency that issued the operating license to Nuclear Fuel Services, Inc. and NYSERDA (AEC 1966). The Act provides for informal NRC review and consultation in DOE plans and actions. The Act also directs NRC to prescribe decontamination and decommissioning criteria for the Project. The DOE-NRC MOU established the arrangements for NRC review and consultation, NRC review responsibilities, and NRC monitoring of WVDP activities (53 Fed. Reg. 53054 (1988)). Nuclear Fuel Services' operating license was terminated in 1982 after DOE assumed exclusive possession of the Project Premises and Project Facilities (Rouse 1982), and the NRC will again be involved in licensing the Project Premises and Project Facilities upon completion of the WVDP (DOE 1980b).

1.1.3.2 Project Facilities and Areas

The Project Facilities consist of all buildings, facilities, improvements, equipment, and materials located on the Project Premises. This EIS evaluates continued onsite management and offsite shipping of the LLW, HLW, and TRU waste for which DOE is responsible that is currently stored onsite in the four facilities or areas.

The Project Facilities and areas storing the wastes evaluated in this EIS and shown in Figure 1-2 are:

- ***Process Building***, which includes approximately 70 rooms and cells that comprised the original NRC-licensed spent nuclear fuel reprocessing operations (one of the cells—the Chemical Process Cell—now serves as the storage facility for the vitrified HLW canisters produced by the Project);

- ***Tank Farm***, which includes the underground waste storage tanks and supporting systems for maintenance, surveillance, and waste transfer of the tank waste to the Vitrification Facility.

- ***Waste Storage Areas***, which include several facilities such as the Lag Storage Building (LSB), Lag Storage Areas (LSA) 1, 3, and 4 (in the context of this EIS, lag storage refers to facilities used for temporary onsite storage of waste), and the Chemical Process Cell Waste Storage Area, are used to store and manage the radioactive wastes generated from WVDP activities; and

- ***Radwaste Treatment System Drum Cell*** (Drum Cell), which stores cement-filled drums of stabilized LLW produced by the Cement Solidification System.

The NOI to prepare this EIS (issued in March 2001) indicated that the disposition of large containers of soil estimated to have very low levels of radioactive contamination would also be addressed. However, the soils in these containers were shipped offsite for disposal in the summer of 2001, pursuant to earlier NEPA documentation (categorical exclusion ECL 96-01).

1.2 NEPA COMPLIANCE STRATEGY

This section describes DOE's past and present NEPA compliance activities, and the NEPA analysis and documentation the Department expects to undertake in the future. It also addresses why DOE has modified the scope of this EIS from that which was announced in the March 2001 NOI. The scope of this EIS is now limited to onsite and offsite waste management actions and only those decontamination actions previously addressed under NEPA (DOE 1982).

1.2.1 Litigation and NEPA Compliance History

In the early 1980s, DOE prepared an environmental assessment (EA) on the proposed disposal of certain radioactive wastes in two engineered disposal areas in addition to the NDA and SDA that would have been developed near and within the NDA. In 1986, the Coalition on West Valley Nuclear Wastes and Radioactive Waste Campaign filed a lawsuit challenging the EA and subsequent finding of no significant impact (FONSI) prepared by DOE (1986). DOE maintained that the EA and FONSI complied with all aspects of NEPA, but it entered into a Stipulation of Compromise with the Coalition in order to settle the litigation (DOJ 1987). This agreement imposed specific obligations on DOE regarding the scope and content of EIS documentation for Project Completion and Center Closure. In particular, DOE agreed that it would evaluate the disposal of Class A, B, and C LLW generated as a result of activities in a Completion and Closure EIS (see Section 1.5 for definitions of Class A, B, and C LLW). DOE also agreed that this EIS would begin by 1988 and proceed without undue delay and in accordance with applicable law.

DOE began preparation of the *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center* (DOE 1996a), also referred to as the 1996 Completion and Closure Draft EIS, in 1988 with the issuance of a NOI to Prepare an EIS (53 Fed. Reg. 53052 (1988)). DOE and NYSERDA were joint lead agencies for the preparation of the EIS. The scope of that EIS included, among other things, the management of Class A, B, and C LLW and TRU waste that is either stored onsite or that would be generated as a result of site closure activities. The Completion and Closure Draft EIS was issued in January 1996 for a 6-month comment period in accordance with the Stipulation of Compromise.

The 1996 Draft EIS evaluated the environmental impacts of alternatives considered for completing the WVDP and closure or long-term management of facilities at the Center, but it did not specify a preferred alternative. Many of the public comments submitted on the 1996 Draft EIS felt that DOE and NYSERDA should have indicated the preferred alternative in the Draft EIS. Despite long negotiations, DOE and NYSERDA have been unable to reach an agreement on a preferred future course of action for the closure of the Center (GAO 2001).

To allow the Department to continue to meet its obligations under the West Valley Demonstration Project Act, DOE is preparing two EISs: this *West Valley Demonstration Project Waste Management EIS* and the *Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center EIS.*

1.2.2 WVDP Waste Management EIS

In March 2001, DOE published its strategy for completing the 1996 Completion and Closure Draft EIS and an NOI to prepare a Decontamination and Waste Management EIS (66 Fed. Reg. 16447 (2001)). This EIS was originally scoped as a revision of the 1996 Completion and Closure Draft EIS (DOE 1996a).

In the NOI, DOE published for comment its position that its decisionmaking process would be facilitated by preparing and issuing for public comment a Revised Draft EIS that focused on DOE's actions to decontaminate the Project Facilities and manage WVDP wastes controlled by DOE under the West Valley Demonstration Project Act. As part of its strategy to address the full scope of the 1996 Completion and Closure Draft EIS, DOE also stated in the NOI its intention to prepare an EIS with NYSERDA subsequent to this one in order to address the decommissioning and/or long-term stewardship of the WVDP and the Western New York Nuclear Service Center. An Advance NOI was issued on November 6, 2001 (66 Fed. Reg. 56090 (2001)), formalizing DOE's commitment to begin work on the Decommissioning and/or Long-term Stewardship EIS. An NOI was published on March 13, 2003 (68 Fed. Reg. 12044 (2003)).

During scoping for the Decontamination and Waste Management EIS, commentors noted that applicable NEPA regulations require an agency to consider connected actions together in the same EIS (40 CFR 1508.25(a)), and they argued that the decontamination and waste management actions proposed in the NOI were "connected" to the decommissioning and/or long-term stewardship actions that would be addressed in the second EIS. After reconsideration, DOE has limited the scope of this EIS to onsite and offsite waste management actions, and only those decontamination actions previously addressed under NEPA (DOE 1982).

The waste management actions proposed in this EIS would not prejudge the range of alternatives to be considered or the decisions to be made for eventual decommissioning and/or long-term stewardship of the WVDP. Rather, these actions would allow DOE to make progress in meeting its obligations under the West Valley Demonstration Project Act that pertain to waste management (see Appendix A), and they are consistent with programmatic decisions DOE has made (see Sections 1.7.1.2 and 1.7.1.4) regarding the waste types addressed in this EIS. Those decisions and their respective EISs, as they apply to the WVDP, provide for shipping wastes from the West Valley site to other regional or centralized DOE sites for treatment, storage, and disposal, as appropriate. Additionally, there would be no irreversible or irretrievable commitments of resources that would prejudice decommissioning decisions. The Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center EIS will be the continuation of the Completion and Closure Draft EIS begun in 1988 and issued in draft form in 1996.

1.2.3 Decommissioning and/or Long-Term Stewardship EIS

As a result of the change in scope and title of this WVDP Waste Management EIS, the *Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center EIS* will be the continuation of the *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center* (DOE 1996a), and will be reissued in draft as DOE/EIS 0226-R. This revised strategy is not reflected in the Advance NOI issued on November 6, 2001 (66 Fed. Reg. 56090 (2001)), for the Decommissioning and/or Long-Term Stewardship EIS, but has been included in the NOI, which was published on March 13, 2003 (68 Fed. Reg. 12044 (2003)).

1.3 PURPOSE AND NEED FOR AGENCY ACTION

In accordance with the directives in the West Valley Demonstration Project Act, DOE is responsible for the facilities used in connection with the WVDP HLW vitrification effort and for disposal of the LLW, mixed LLW, HLW, and TRU waste produced by the WVDP HLW solidification program. To fulfill its responsibilities under the West Valley Demonstration Project Act, DOE needs to identify a disposal path for the wastes that are currently stored onsite and that will be generated in the future. Decommissioning and/or long-term stewardship decisions will be made under the Decommissioning and/or Long-Term Stewardship EIS.

1.4 ALTERNATIVES

DOE's Proposed Action (that is, preferred alternative) in this EIS is to (1) continue onsite management of Project-generated waste controlled by DOE under the West Valley Demonstration Project Act until they can be sent to offsite disposal, (2) ship, over the next 10 years, all wastes with acceptable offsite disposal destinations, and (3) manage the emptied, ventilated HLW tanks until future decommissioning decisions are made.

This EIS analyzes continued onsite waste management and shipment of wastes to offsite disposal. To address the full range of reasonable alternatives, this EIS evaluates three alternatives:

- No Action Alternative – Continuation of Ongoing Waste Management Activities;
- Alternative A (Preferred Alternative) – Offsite Shipment of HLW, LLW, Mixed LLW, and TRU Wastes to Disposal; and
- Alternative B – Offsite Shipment of LLW and Mixed LLW to Disposal, and Shipment of HLW and TRU Waste to Interim Storage.

These alternatives are described more fully in Chapter 2, Description of Alternatives; an overview of each is provided below.

> ***Ongoing Operations***
>
> Under all alternatives, it is assumed that current levels of maintenance, surveillance, heating, ventilation, and other routine operations would continue to be required while the actions proposed under each alternative were performed. For this EIS, these actions are called *ongoing operations*. Although the impacts of these ongoing actions have been assessed in several previous NEPA documents and are characterized in the Annual Site Environmental Reports, the impacts on worker and public health of these ongoing operations have been included in this EIS using actual operational data from 1995 through 1999. Because ongoing operations would not vary among the proposed alternatives, the impacts from these actions would be the same across all alternatives.

Under the **No Action Alternative, Continuation of Ongoing Waste Management Activities,** waste management would include limited shipments of Class A LLW to offsite disposal and continued storage of the remaining Class A LLW, existing Class B and Class C LLW, mixed LLW, TRU waste, and HLW. These ongoing actions have been previously assessed in other NEPA documentation discussed in Section 1.7. Upon completion of ongoing efforts to eliminate all remaining liquids, the waste storage tanks and their surrounding vaults would continue to be ventilated to manage moisture levels as a corrosion prevention measure until decommissioning and/or long-term stewardship decisions are made based in part on the impact assessment provided by the WVDP Decommissioning and/or Long-Term Stewardship EIS.

Under **Alternative A, Offsite Shipment of HLW, LLW, Mixed LLW, and TRU Wastes to Disposal (Preferred Alternative)**, DOE would ship Class A, B and C LLW and mixed LLW to one of two DOE potential disposal sites (in Washington or Nevada) or to a commercial disposal site (such as the Envirocare facility in Utah), ship TRU waste to WIPP in New Mexico, and ship HLW to the proposed

Yucca Mountain HLW repository. LLW and mixed LLW would be shipped over the next 10 years. TRU waste shipments to WIPP could occur within the next 10 years if the TRU waste is determined to meet all the requirements for disposal in this repository; however, if some or all of WVDP's TRU waste does not meet these requirements, the Department would need to explore other alternatives for disposal of this waste.

Under DOE's current programmatic decisionmaking, offsite disposal of HLW would occur at the proposed Yucca Mountain HLW Repository sometime after 2025 assuming a license to operate is granted by the NRC and NYSERDA signs a standard contract for the disposal of HLW in accordance with the Nuclear Waste Policy Act. Although this period would extend well beyond the 10 years required for all other proposed actions under this alternative, the impacts of transporting the HLW have been included in this EIS to fully inform the decisionmakers should an earlier opportunity to ship HLW present itself. The waste storage tanks would continue to be managed as described under the No Action Alternative.

Under **Alternative B, Offsite Shipment of LLW and Mixed LLW to Disposal, and Shipment of HLW and TRU Waste to Interim Storage,** LLW and mixed LLW would be shipped offsite for disposal at the same locations as Alternative A. TRU wastes would be shipped for interim storage at one of five DOE sites: Hanford Site in Washington; Idaho National Engineering and Environmental Laboratory (INEEL); Oak Ridge National Laboratory (ORNL) in Tennessee; Savannah River Site (SRS) in South Carolina; or WIPP. TRU wastes would subsequently be shipped to WIPP (or would remain at WIPP). HLW would be shipped to SRS or Hanford for interim storage, with subsequent shipment to Yucca Mountain for disposal.

It is assumed that the shipment of LLW and mixed LLW to disposal would occur within the next 10 years, and that TRU waste and HLW would be shipped to interim storage during that same 10 years. Ultimate disposal of TRU wastes and HLW wastes would be subject to the same constraints described under Alternative A; however, the impacts of transporting these wastes to their ultimate disposal sites have been included in the impact analyses for this alternative. The waste storage tanks would continue to be managed as described under the No Action Alternative.

Figure 1-3 shows the locations of the waste disposal and/or interim storage sites under consideration in this EIS.

1.5 WVDP WASTES AND REGULATORY DEFINITIONS

DOE regulates radioactive wastes that are managed or disposed of at DOE facilities, or are otherwise the responsibility of DOE under the Atomic Energy Act. The NRC regulates commercial LLW disposal facilities such as Envirocare. Table 1-1 summarizes the DOE and NRC regulatory definitions of the major categories of wastes managed under the West Valley Demonstration Project Act.

1.6 OFFSITE ACTIVITIES

In addition to activities that would occur at WVDP, DOE's proposed action and alternatives would involve activities at offsite locations as a result of the need for interim storage or disposal. At interim storage sites, activities would include unloading and inspecting the WVDP waste containers and moving the containers to the storage area. Interim storage could require the siting, construction, and operation of additional storage capacity for the volume of WVDP wastes to be stored, depending on site storage capacity at the time. Activities at disposal sites would include unloading trucks or railcars, inspecting the waste containers, and moving the waste to the disposal areas for shallow land burial or deep geologic disposal, depending on the waste type. Offsite activities involving interim storage or disposal have been

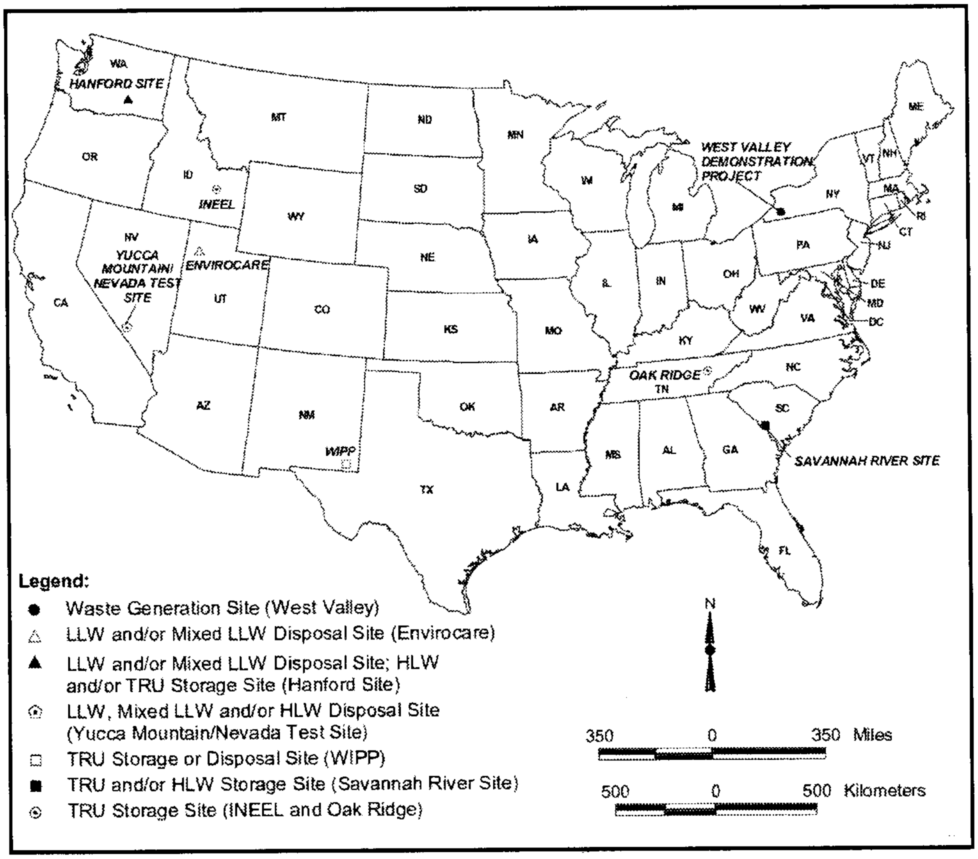

Figure 1-3. WVDP Waste Disposal and/or Interim Storage Sites

addressed in previous NEPA documents (see Section 1.7, Relationship with Other NEPA Documents) or would be the subject of subsequent NEPA review, as needed.

1.7 RELATIONSHIP WITH OTHER NEPA DOCUMENTS

Some of the actions proposed under the alternatives assessed in this EIS have been analyzed, at least in part, in the NEPA documents identified in this section. The NEPA analyses, as they relate to the actions proposed in this EIS, are briefly summarized in this section. Information from these earlier NEPA documents has been either extracted for use in this EIS or incorporated by reference.

1.7.1 Environmental Impact Statements

1.7.1.1 Final Environmental Impact Statement, Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley (DOE/EIS-0081) (DOE 1982)

This EIS evaluated alternatives for long-term management of liquid HLW stored in underground tanks. The DOE Record of Decision (ROD) (45 Fed. Reg. 20694 (1982)) was issued to construct and operate facilities at the Center to solidify the liquid HLW into a form suitable for transportation and disposal in the federal geologic repository in accordance with the West Valley Demonstration Project Act. Related decisions, such as selection of a terminal waste form and final decontamination and decommissioning, were to be addressed in subsequent environmental analyses under NEPA. A supplement analysis to this

Table 1-1. Definitions Used in this EIS for Wastes Present at WVDP

Waste Category	Regulatory Definition(s)
HLW (Canisters of Vitrified HLW)	HLW is defined in the West Valley Demonstration Project Act as the high-level waste that was produced by the reprocessing of spent nuclear fuel at the Center. The term includes both liquid wastes that are produced directly in reprocessing dry solid material derived from such liquid waste and such other material as the NRC designates as high-level radioactive waste for purposes of protecting health and safety. Unless demonstrated otherwise, all HLW is considered mixed waste (containing both radioactive and hazardous components) and is subject to the requirements of both the Atomic Energy Act and Resource Conservation and Recovery Act (RCRA) (DOE 1999).
TRU Waste	TRU waste is currently defined by NRC and DOE as waste containing more than 100 nanocuries of alpha-emitting isotopes, with half-lives greater than 20 years, per gram of waste. However, the West Valley Demonstration Project Act defined TRU waste as "material contaminated with radioactive elements that have an atomic number greater than 92, including neptunium, plutonium, americium, and curium, and that are in concentrations greater than *10* (emphasis added) nanocuries per gram, or in such other concentrations as the [NRC] may prescribe to protect the public health and safety." [In the event wastes are disposed of offsite, the applicable definitions at the disposal site will be used.] TRU waste is classified, for handling purposes, as contact-handled (CH) TRU waste or remote-handled (RH) TRU waste, depending on the radiation dose rate at the surface of the waste container. CH-TRU waste has radioactivity levels that are low enough to permit workers to directly handle the containers in which the waste is kept. This level of radioactivity is specified as a dose rate of no more than 200 millirem per hour at the outside surface of the container. RH-TRU waste has a surface dose rate greater than 200 millirem per hour, so workers use remote manipulators to handle containers of RH-TRU waste.
LLW	LLW is defined as radioactive material that (a) is not HLW, spent nuclear fuel, TRU waste, or by-product material as defined in the Atomic Energy Act; and (b) the NRC classifies as LLW. Additional definitions of specific types of LLW appear below.
Class A LLW	Class A LLW is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of Class A LLW must meet the minimum requirements set forth in 10 CFR 61.56(a). If Class A waste also meets the stability requirements set forth in 61.56(b), it is not necessary to segregate the waste.
Class B LLW	Class B waste refers to waste that must meet more rigorous requirements on waste form to ensure stability after disposal. The physical form and characteristics of Class B waste must meet both the minimum and stability requirements set forth in 10 CFR 61.56.
Class C LLW	Class C waste refers to waste that not only must meet more rigorous requirements on waste form to ensure stability but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in 10 CFR 61.56.
Mixed Waste	Mixed waste contains hazardous components regulated under RCRA and radioactive components regulated under the Atomic Energy Act. Some LLW is mixed, as is some TRU waste and HLW. At WVDP, if necessary to meet waste acceptance criteria for disposal, mixed LLW is shipped off the site for treatment. For the purpose of analysis in this EIS, mixed LLW is assumed to be shipped directly to disposal after treatment.

EIS, completed in 1993 (DOE 1993), evaluated the impacts of modifications in the design, process, and operations since the 1982 EIS ROD. This supplement analysis did not address transportation, TRU waste, Class B and C LLW, waste disposal, or final decontamination and decommissioning of facilities.

A second supplement analysis, completed in 1998 (DOE 1998), addressed HLW solidification, management and interim storage of wastes, disposal of wastes, transport of wastes, general site operations, facility decontamination, and spent nuclear fuel storage. Though the second supplemental analysis discussed a "deactivation" process to substantially remove all waste from facilities in preparation for custodial care, the environmental impacts of this approach were not specifically evaluated. Current actions evaluated by the 1982 EIS and its supplemental analyses include Process Building head-end cell decontamination, construction of a load-in and load-out facility to support shipment of vitrified HLW, construction of a remote-handled waste facility, decontamination of the fuel receiving and storage area, and draining the water from the fuel storage pool.

The alternatives proposed in this EIS include some activities analyzed in the 1982 EIS and supplement analyses.

1.7.1.2 Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (DOE/EIS-0200) **(DOE 1997a)**

This EIS studied the potential nationwide impacts of managing LLW, mixed LLW, TRU waste, HLW, and non-wastewater hazardous waste generated by defense and research activities at 54 sites around the United States, including the WVDP. DOE analyzed decentralized alternatives (managing waste at sites where it currently exists), regionalized alternatives (managing waste at several treatment, storage, or disposal sites), and centralized alternatives (managing waste at one or two sites), in addition to the no action alternative for each waste type. Inventories of LLW, mixed LLW, TRU waste, and HLW at the WVDP were all considered in the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (WM PEIS) (DOE 1997a).

DOE issued separate RODs for all of the waste types analyzed in the WM PEIS. For LLW, DOE decided to perform minimal treatment at all sites and continue onsite disposal of LLW at INEEL, Los Alamos National Laboratory, Oak Ridge Reservation (ORR), and SRS (65 Fed. Reg. 10061 (2000)). In addition, DOE decided to make the Hanford Site and Nevada Test Site (NTS) available to all DOE sites for LLW disposal. For mixed LLW, DOE decided to treat the waste at the Hanford Site, INEEL, ORR, and SRS, and to dispose of mixed LLW at Hanford and NTS (65 Fed. Reg. 10061 (2000)).

With respect to TRU waste, DOE decided that each site that has generated or would generate TRU waste would store it onsite prior to shipment to WIPP for disposal (63 Fed. Reg. 3629 (1998)). However, the Department may decide to ship TRU waste from sites where it may be impractical to prepare it for disposal to sites where DOE has or will have the necessary capability (the waste would be prepared for transportation at the generating site and would be shipped in conformance with all applicable regulations). The sites that could receive TRU waste from other sites are INEEL, ORR, SRS, and the Hanford Site.

DOE decided to store immobilized HLW at the sites where it was generated (that is, Hanford Site, INEEL, SRS, and WVDP) until it is accepted for disposal at a geologic repository (64 Fed. Reg. 46661 (1999)).

The analyses in the WM PEIS and the resulting RODs are relevant to actions proposed under all alternatives assessed in this Waste Management EIS.

1.7.1.3 Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (DOE/EIS-0250) **(DOE 2002a)**

The proposed action in this EIS is to construct, operate and monitor, and eventually close a geologic repository at Yucca Mountain in southern Nevada. The repository would be used for the disposal of spent nuclear fuel and HLW currently in storage at 72 commercial and 5 DOE sites. The EIS analyses include the HLW from West Valley. The EIS evaluates the potential short-term and long-term impacts associated with repository disposal of spent nuclear fuel and HLW, and the transportation of these materials, including the HLW at West Valley, to the proposed Yucca Mountain Repository. The EIS also analyzes the potential impacts of a no action alternative in which DOE would not build a repository at Yucca Mountain, and the spent fuel and HLW would instead remain at the commercial and DOE sites. The final Yucca Mountain EIS was issued on February 9, 2002. This document is incorporated by reference.

1.7.1.4 Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement (DOE/EIS-0026-S-2) (DOE 1997b)

In October 1980, DOE issued the *Final Environmental Impact Statement for the Waste Isolation Pilot Plant* (DOE 1980a) on the proposed development of WIPP. The subsequent ROD (January 1981) established a phased development of WIPP, beginning with construction of the WIPP facility. DOE then issued the *Final Supplement Environmental Impact Statement for the Waste Isolation Pilot Plant* (DOE 1990) that considered previously unavailable information. Based on the Supplemental EIS, DOE decided to continue phased development of WIPP by implementing test-phase activities. On October 30, 1992, the WIPP Land Withdrawal Act transferred the WIPP site from the U.S. Department of Interior to DOE. The 1997 Defense Authorization Act (September 23, 1996) amended the WIPP Land Withdrawal Act to make the Resource Conservation and Recovery Act (RCRA) hazardous waste land disposal prohibitions inapplicable to WIPP. DOE prepared the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997b) that updated information contained in the 1980 and 1990 EISs, incorporated the analysis of various treatment alternatives for TRU waste contained in the WM PEIS (DOE 1997a), and examined changes in environmental impacts due to new information or changed circumstances. In a ROD issued in January 1998 (63 Fed. Reg. 3624 (1998)), DOE decided to open WIPP for the disposal of TRU waste.

Under Alternatives A and B of this WVDP Waste Management EIS, TRU waste would be shipped to WIPP in accordance with the analyses in the 1997 EIS, if it was determined that the TRU waste met all the requirements for disposal in this repository.

1.7.1.5 Final Environmental Impact Statement for the Nevada Test Site and Off-site Locations (DOE/EIS-0243) (DOE 1996b)

This EIS evaluated the potential impacts that could result from mission activities at the NTS, including LLW and mixed LLW disposal. The NTS EIS evaluated waste management and environmental restoration activities and other mission activities for a 10-year period, including receipt of LLW and mixed LLW from other sites such as West Valley. Under Alternatives A and B of this WVDP Waste Management EIS, DOE would dispose of newly generated and existing LLW and mixed LLW at one of three sites, including NTS (pending issuance of an operating permit for mixed waste disposal under RCRA).

1.7.1.6 Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement (DOE/EIS-0286D) (DOE 2002b)

This EIS evaluates waste management alternatives that may be implemented at the Hanford Site as a result of DOE decisions under the WM PEIS for LLW, mixed LLW, and post-1970 TRU waste. The LLW and mixed LLW waste inventories analyzed (that is, waste volumes and characteristics) for management at Hanford would include waste potentially received from other DOE sites, including the WVDP. Under Alternatives A and B of this EIS, DOE would dispose of LLW and mixed LLW at one of three sites, including Hanford. The Hanford Solid Waste EIS does not address interim storage of TRU waste or HLW generated offsite in its analysis.

1.7.1.7 Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (DOE/EIS-0203-F) (DOE 1995a)

This EIS evaluated, among other things, the environmental impacts of receipt, storage, and treatment of TRU waste from offsite locations at the Idaho National Engineering Laboratory (now INEEL). Under Alternative D (Maximum Treatment, Storage, and Disposal) of the waste management alternatives for TRU waste, DOE assumed that up to 20,000 cubic meters (71,400 cubic feet) of TRU waste would be accepted from offsite generators on a case-by-case basis. Implementation of this alternative would require building additional storage

1.7.1.8 Savannah River Site Waste Management Final Environmental Impact Statement (DOE/EIS-0217-F) (DOE 1995b)

This EIS evaluated alternative strategies for managing radioactive and hazardous wastes at SRS that would protect human health, comply with environmental regulations, minimize waste generation, utilize effective and commercially available technologies for near-term management needs, and be cost effective. Under all alternatives, DOE considered the treatment and storage of TRU waste. For purposes of analysis of the maximum waste forecast, DOE assumed that waste from offsite locations would be shipped to SRS for treatment, storage, or disposal in accordance with the alternatives being considered in the draft Waste Management Programmatic EIS then in preparation and subsequently issued in September 1995.

1.7.1.9 Final Environmental Impact Statement for Treating Transuranic (TRU)/Alpha Low Level Waste at the Oak Ridge National Laboratory, Oak Ridge, Tennessee (DOE/EIS-0305-F) (DOE 2000)

In this EIS, DOE evaluated the proposed construction, operation, and decontamination and decommissioning of a waste treatment facility for the treatment of legacy ORNL TRU waste, alpha low-level waste, and newly generated TRU waste. DOE also considered interim storage of up to 7,768 cubic meters (274,324 cubic feet) of treated TRU waste at ORNL (Treatment and Storage Alternative, Cementation Treatment). The waste volume analyzed did not include waste generated at offsite locations and shipped to ORNL.

1.7.2 Environmental Assessments

The *Environmental Assessment and FONSI for the Treatment of Class A Low-Level Radioactive Waste and Mixed Low-Level Waste Generated by the West Valley Demonstration Project* (DOE 1995c) evaluated treatment activities conducted at West Valley and at commercial facilities in Tennessee, Utah, and Texas. The proposed action consisted of sorting, repackaging, and loading waste at the WVDP; transporting the waste for commercial treatment; treating the waste at the commercial facilities; and returning the residual waste to the WVDP for interim storage. Based on this EA, DOE determined that the proposed action was not a major federal action significantly affecting the quality of the human environment, within the meaning of NEPA, and that preparation of an EIS was not required.

1.7.3 Categorical Exclusions

Categorical exclusion refers to a category of actions that an agency has determined by regulation normally do not, individually or cumulatively, have a significant effect on the human environment. Such actions do not require an EA or an EIS. DOE has issued categorical exclusions for some ongoing decontamination and waste management actions at the WVDP that would occur under the alternatives described in this EIS. These include routine maintenance activities, offsite shipment of a total of

235 cubic meters (8,300 cubic feet) of mixed LLW for treatment and disposal, and offsite shipment of a total of 6,900 cubic meters (245,000 cubic feet) of Class A LLW for commercial disposal (10 CFR Part 1021, Subpart D, Appendix B).

1.8 PUBLIC INVOLVEMENT

DOE issued its NOI to proceed with a rescoped Decontamination and Waste Management EIS on March 26, 2001 (66 Fed. Reg. 16447), and a public meeting was held at West Valley on April 10, 2001, to explain the revised strategy to the public. Comments were received from the State of New York Office of the Attorney General, the Coalition on West Valley Nuclear Wastes, the Concerned Citizens of Cattaraugus County, the Nuclear Information and Resource Service and the Public Citizen/Critical Mass Energy and Environment Program (joint submittal), the West Valley Citizens Task Force, the League of Women Voters of Buffalo/Niagara, and three private citizens. Most commentors questioned DOE's need to revise its EIS strategy and rescope the 1996 Completion and Closure Draft EIS. As noted in Section 1.2, after further evaluation and as a result of public comments, DOE has limited the scope of this EIS to onsite and offsite waste management actions, and only those decontamination actions previously addressed under NEPA (DOE 1982). DOE's responses to comments received during scoping are included in Appendix B.

The WVDP Waste Management EIS was issued in draft form on May 16, 2003, for public review and comment (68 Fed. Reg. 26587 (2003)). The 45-day comment period ended on June 30, 2003, although DOE also considered comments received after that date. A public hearing on the draft version of this EIS was held on June 11, 2003, at the Ashford Office Complex near the WVDP site. DOE received comments from 21 individuals, organizations, and agencies.

Major issues raised in the public comments involve management of the HLW tanks and compliance with the Stipulation, WVDP Act and NEPA. Commenters stated that an action to place low-strength grout in the tanks for interim stabilization that was analyzed under Alternative B should more appropriately be analyzed under the Decommissioning and/or Long-Term Stewardship EIS. DOE agrees and has removed all reference to that activity in this Final EIS.

Commenters concerned about DOE's compliance with the Stipulation, WVDP Act and NEPA stated that the Stipulation and Act allow the preparation of only one EIS, that the Stipulation requires a 6-month public comment period, and that DOE's NEPA strategy of preparing two EISs to meet its responsibility under the Act and Stipulation is akin to segmentation not allowed under NEPA. In DOE's view, neither the Stipulation nor the Act requires the preparation of only one EIS. DOE will meet all of the commitments of the Stipulation by completing this Final Waste Management EIS and the Decommissioning and/or Long-Term Stewardship EIS now in progress. DOE will hold a 6-month public comment period on the Decommissioning and/or Long-Term Stewardship EIS, which is the continuation of the 1996 Cleanup and Closure EIS as described in Section 1.2.3. Regarding DOE's NEPA strategy, none of the alternatives or actions analyzed in this EIS will affect the reasonable range of alternatives available for the Decommissioning and/or Long-Term Stewardship EIS or preclude any decisions to be made under that EIS. DOE therefore does not believe that its NEPA strategy involves impermissible segmentation of the actions.

Other comments from stakeholders in states hosting DOE sites that could receive West Valley wastes expressed concern about receiving those wastes, particularly for interim storage of TRU waste and HLW. DOE's preferred alternative, Alternative A, is to ship LLW and mixed LLW to DOE sites for disposal, consistent with decisions made under the WM PEIS, and to ship TRU waste and HLW directly to WIPP and Yucca Mountain respectively for disposal, consistent with decisions under the EISs for those facilities. While not DOE's preferred alternative, Alternative B, which includes interim storage of West

Valley's TRU waste and HLW, is a reasonable alternative and is therefore included in this Final EIS as required under NEPA.

DOE has made several changes to this Final EIS in response to individual public comments. Sidebars beside the text identify where all changes from the Draft to the Final EIS have been made, although sidebars are not used to indicate changes in figures. Appendix E contains DOE's response to all public comments received on the Draft EIS.

1.9 CONTENTS OF EIS

This EIS consists of ten chapters and five appendices, as follows:

- *Chapter 1, Introduction:* This chapter provides background information regarding the proposed project and its purpose and need, the scope of the EIS, and NEPA-related issues.
- *Chapter 2, Description of Alternatives:* This chapter describes the alternatives proposed in this EIS and those that were considered but are not analyzed in detail. It also includes a summary of the potential impacts associated with each of the alternatives.
- *Chapter 3, Affected Environment:* This chapter describes the affected environment at the Project Premises and surrounding areas.
- *Chapter 4, Environmental Consequences:* This chapter describes the potential environmental impacts at the Project Premises and surrounding areas that could occur as the result of each of the proposed alternatives. An analysis of the environmental justice impacts associated with the proposed alternatives is also presented.
- *Chapter 5, Cumulative Impacts:* This chapter describes the cumulative impacts to the Project Premises and surrounding areas that would result from the proposed activities.
- *Chapter 6, Unavoidable Impacts, Short-term Uses and Long-term Productivity, and Irreversible and Irretrievable Commitments of Resources*: This chapter describes some of the additional considerations that must be analyzed as part of the NEPA EIS process.
- *Chapter 7, List of Preparers and Disclosure Statement:* This chapter includes a list of the individuals who prepared the EIS and their credentials. It also provides the certification by the contractor that assisted DOE in the preparation of this EIS that they have no financial or other interest in the outcome of the project as required by the Council on Environmental Quality (40 CFR 1506.5(c)) and DOE (10 CFR 1021).
- *Chapter 8, List of Agencies, Organizations, and Individuals Receiving Copies of This EIS:* This chapter includes a list of the federal, state, local, or tribal government agencies, various organizations, and members of the public who received copies of the draft version of this EIS.
- *Chapter 9, Glossary:* This chapter includes definitions for many of the technical terms used in this EIS.
- *Chapter 10, Index:* This chapter indexes key terms used in this EIS.
- *Appendix A, Specific Legal Requirements That Apply To West Valley Waste Management Activities:* This appendix provides the legislative and judicial language governing DOE's actions at the site.

- *Appendix B, Responses to Scoping Comments:* This appendix provides DOE's responses to comments received from the public and agencies during scoping.
- *Appendix C, Human Health Impacts*: This appendix describes the methodology used to analyze human health impacts.
- *Appendix D, Transportation*: This appendix describes the methodology used for the transportation analysis, including representative routes.
- *Appendix E, Responses to Public Comments:* This appendix contains the public comments received on the draft version of this EIS and provides responses to the issues raised.

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CHAPTER 2
DESCRIPTION OF ALTERNATIVES

> This chapter describes the three alternatives that DOE has analyzed in this Waste Management EIS: the No Action Alternative (Continuation of Ongoing Waste Management Activities), Alternative A (Offsite Shipment of HLW, LLW, Mixed LLW, and TRU Waste to Disposal), and Alternative B (Offsite Shipment of LLW and Mixed LLW to Disposal, and Shipment of HLW and TRU Waste to Interim Storage). Descriptions of the facilities that would be affected and waste management activities that would be undertaken under each alternative are provided. This chapter ends with discussions of alternatives considered but not analyzed and a summary of the potential impacts under each alternative.

2.1 OVERVIEW OF ALTERNATIVES

This EIS addresses the waste management activities that DOE needs to conduct to meet its responsibilities under the West Valley Demonstration Project Act, as discussed in Section 1.1.2. Proposed waste management activities include the onsite management actions of continued temporary storage of waste and the shipment of wastes for offsite storage or disposal. Three alternatives have been defined for evaluation within this EIS; these alternatives represent the full range of waste management actions available to DOE and have been identified as:

- No Action Alternative – Continuation of Ongoing Waste Management Activities;
- Alternative A (DOE's Preferred Alternative) – Offsite Shipment of HLW, LLW, Mixed LLW, and TRU Waste to Disposal; and
- Alternative B – Offsite Shipment of LLW and Mixed LLW to Disposal and Shipment of HLW and TRU to Interim Storage.

The estimated timeframe for the actions assessed under these alternatives is a period of 10 years. Within that period, with the exception of the shipment of HLW directly from WVDP to a geologic repository (assumed for the purposes of analysis to be the proposed Yucca Mountain Repository near Las Vegas, Nevada), it is anticipated that available funding would allow the complete removal of all existing and any newly generated LLW and TRU wastes. HLW, whether shipped to Yucca Mountain directly from West Valley under Alternative A or from interim offsite storage under Alternative B, is not currently scheduled to be received by the repository until after 2025. The actions proposed under each alternative are summarized in Table 2-1.

Under the **No Action Alternative**, no new waste management activities would be performed beyond those activities that have been evaluated under NEPA in accordance with the provisions of the Council on Environmental Quality implementing regulations for NEPA (40 CFR Parts 1500-1508). DOE would provide continued operational support and monitoring of the facilities to meet the requirements for safety and hazard management. Waste management activities currently in progress would continue for onsite storage of existing Class A, B, and C LLW, mixed LLW, TRU waste and HLW wastes and offsite disposal of a limited quantity of Class A LLW at a facility such as Envirocare (a commercial radioactive waste disposal site in Clive, Utah), DOE's NTS in Mercury, Nevada, or the Hanford site in Richland, Washington. Under the No Action Alternative, active hazard management, operational support,

Table 2-1. Alternatives Matrix

Proposed Action	Alternative		
	No Action	**Alt A – Preferred**	**Alt B**
LLW			
Ship LLW to Envirocare, Hanford, or NTS	X(a)	X	X
TRU Waste			
Continue onsite storage	X		
Ship for disposal to WIPP		X	
Ship to Hanford, INEEL, ORNL, SRS, or WIPP for interim storage, then to WIPP for disposal			X
HLW			
Continue storing HLW onsite in Process Building	X		
Ship to Yucca Mtn directly		X	
Ship to SRS or Hanford for interim storage, then ship to Yucca Mtn			X
HLW Tank Management			
Ongoing management	X	X	X

a. Limited to 145,000 cubic feet (4,100 cubic meters) of Class A LLW.

surveillance, and oversight would continue at the current levels of activity. Upon completion of ongoing efforts to remove wastes to the extent that is technically and economically practical, the waste storage tanks and their surrounding vaults would be ventilated to manage moisture levels as a corrosion prevention measure. Waste transportation destinations proposed under the No Action Alternative are shown in Figure 2-1.

Alternative A (DOE's Preferred Alternative) would emphasize waste management actions focused on (1) the removal of currently stored wastes (existing waste) on the site and waste to be generated over the next 10 years and (2) shipment to offsite locations for disposal. Upon completion of waste removal, DOE would continue active operational support, surveillance, and oversight to safely manage remaining systems and hazards. All LLW types (the remaining Class A LLW and all Class B and C LLW) and mixed LLW would be prepared for disposal and shipped off the site. Under Alternative A, DOE would ship Class A, B and C LLW and mixed LLW to one of two DOE potential disposal sites (in Washington or Nevada) or to a commercial disposal site such as the Envirocare facility in Utah, ship TRU waste to WIPP in New Mexico, and ship HLW to the proposed Yucca Mountain HLW Repository. LLW and mixed LLW would be shipped over the next 10 years. TRU waste shipments to WIPP could occur within the next 10 years if the TRU waste is determined to meet all the requirements for disposal in this repository; however, if some or all of WVDP's TRU waste does not meet these requirements, the Department would need to explore other alternatives for disposal of this waste. Waste transportation destinations proposed under Alternative A are shown in Figure 2-2. The waste storage tanks and their surrounding vaults would be managed as under the No Action Alternative.

Under **Alternative B**, offsite shipment and disposal of existing wastes and newly generated LLW (the remaining Class A LLW and all Class B and C LLW) and mixed LLW would be transported to the same locations assessed under Alternative A. TRU wastes would be shipped to interim storage at one of five DOE sites: Hanford, INEEL, ORNL, SRS, or WIPP, with subsequent shipments from Hanford, INEEL, ORNL, or SRS to WIPP for disposal. HLW would be shipped to SRS or Hanford for interim storage, with subsequent shipments to Yucca Mountain for disposal. The waste storage tanks and their surrounding vaults would be managed as under the No Action Alternative. Waste transportation destinations proposed under Alternative B are shown in Figure 2-3.

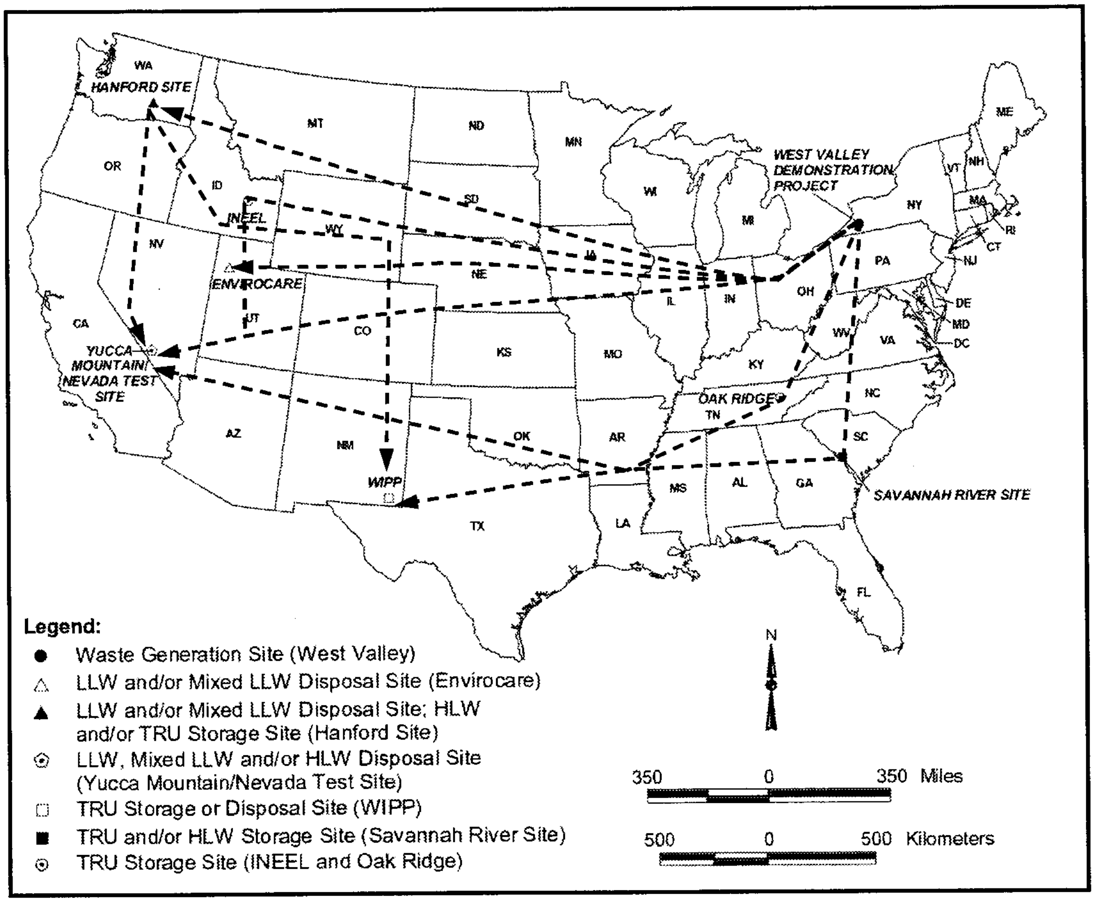

Figure 2-3. Waste Destinations Under Alternative B

2.2 ONSITE WASTE MANAGEMENT FACILITIES

Wastes subject to offsite shipping and disposal under the actions proposed in this EIS are stored in several WVDP buildings. An aerial view of the entire project premises is shown in Figure 2-4, and a schematic of the same view is shown in Figure 2-5. An overview of the site facilities is shown in Figure 1-2.

Vitrified HLW is stored in the Process Building (Figure 2-5). The vitrified HLW was the result of processing liquid wastes that were stored in tanks in the Tank Farm (Figure 2-6). LLW and TRU wastes are stored in the LSB; LSAs 1, 3, and 4; the Chemical Process Cell Waste Storage Area (Figure 2-7); and the Radwaste Treatment System Drum Cell (Figure 2-8). Volume reduction of oversized contaminated materials will occur in the Remote Handled Waste Facility (RHWF) that is currently under construction (Figure 2-7).

2.2.1 Process Building

The Process Building is a multi-storied building that was used from 1966 to 1971 to recover uranium and plutonium from spent nuclear fuel (Figure 2-5). The Fuel Receiving and Storage Area is a metal building attached to the east side of the Process Building. Spent fuel shipments were received, transferred to, and stored in the fuel storage pool inside the Fuel Receiving and Storage Area prior to their transfer to the Process Building. Removal of spent fuel from the Fuel Receiving and Storage Area was completed in July 2001. The Process Building is made up of a series of cells, aisles, and rooms constructed of

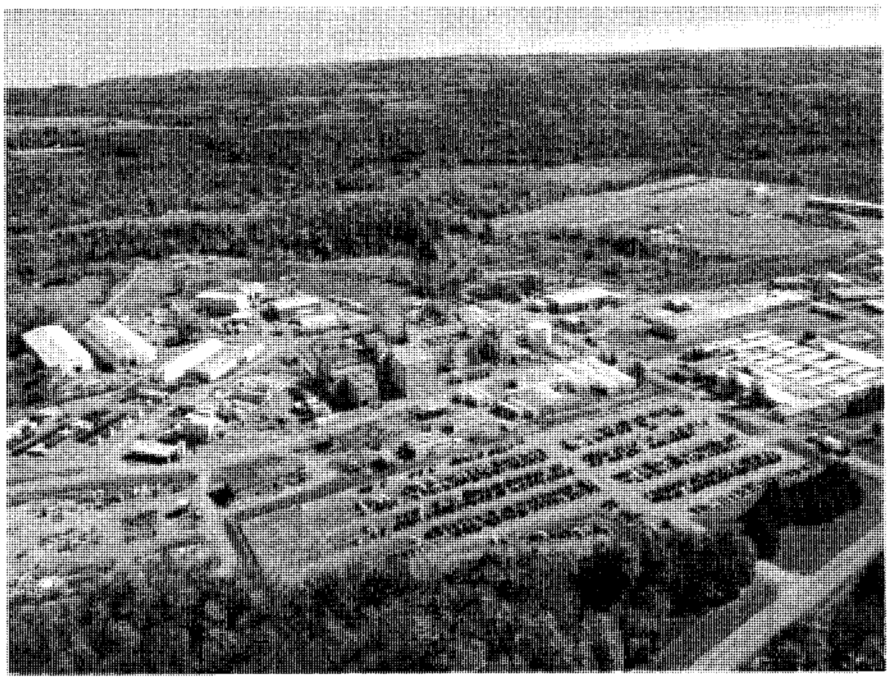

Figure 2-4. Aerial View of WVDP Site Facing Southeast

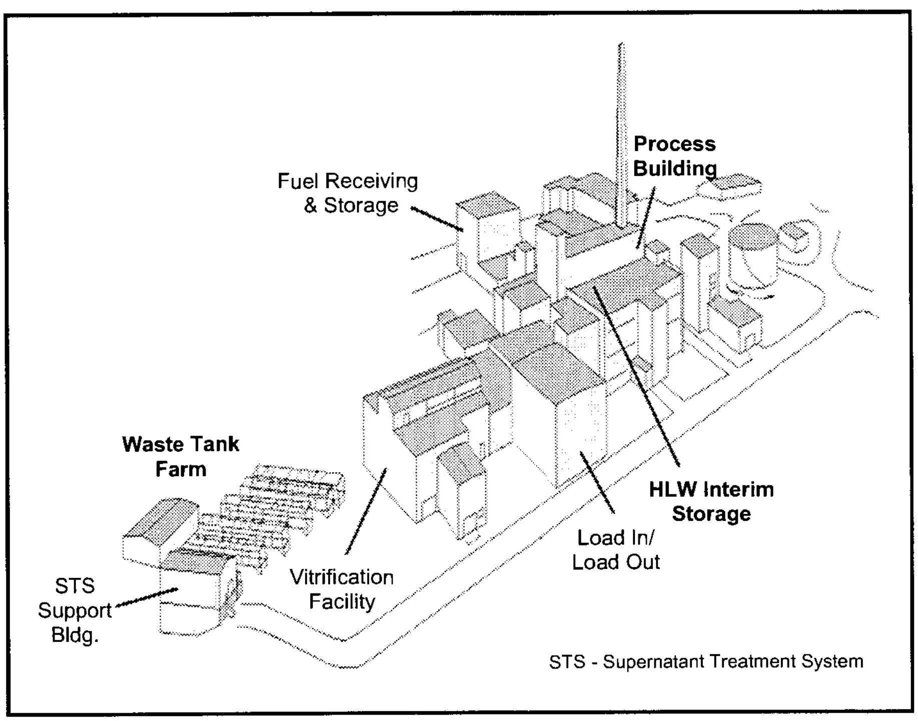

Figure 2-5. Schematic of WVDP Site Facing Southeast

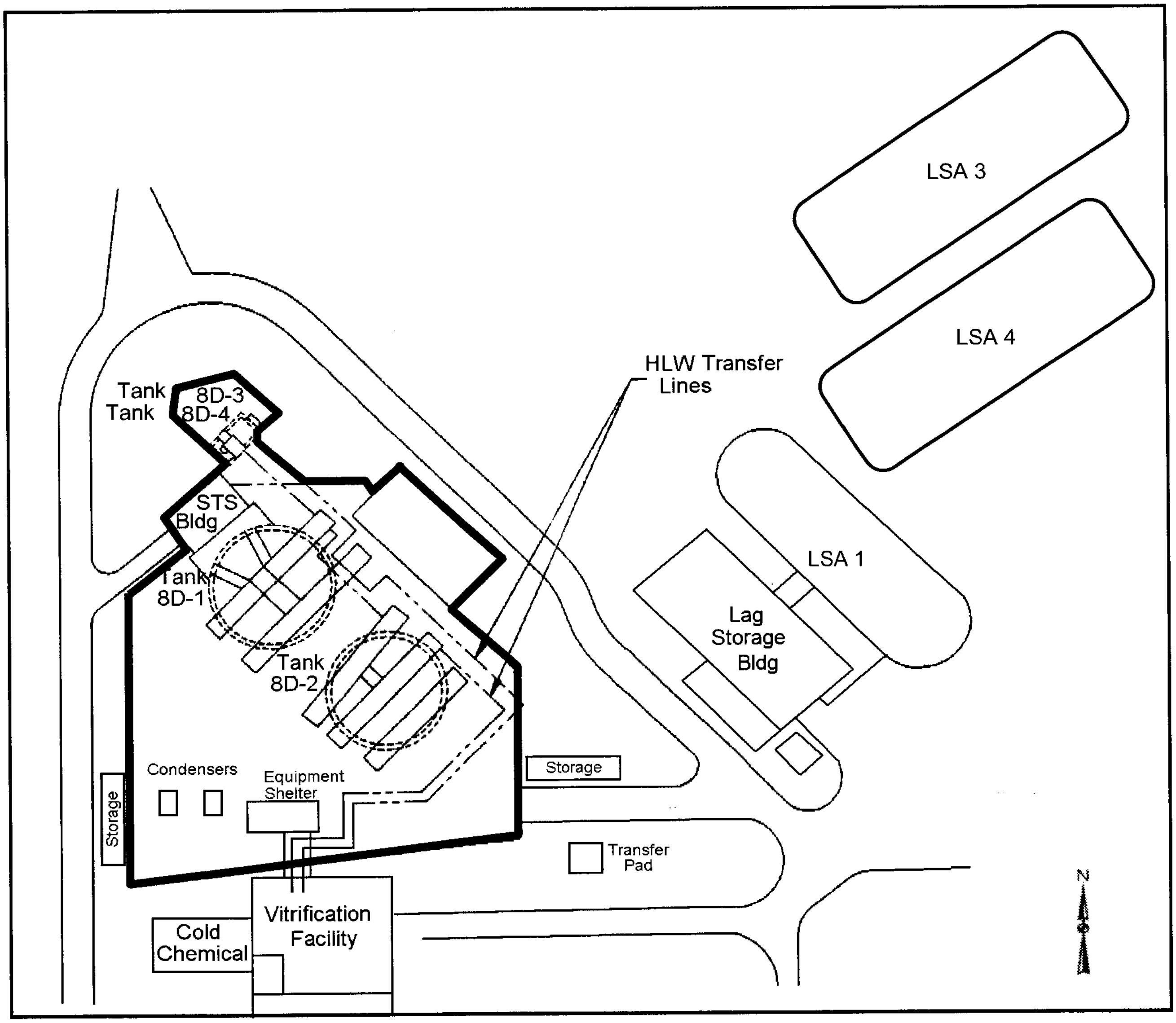

Figure 2-6. Tank Farm Area

reinforced concrete and concrete block. The cells were used for mechanical and chemical processing of spent fuel and management of radioactive liquid waste. Operations in the cells were performed remotely by operators from various aisles formed by adjacent cell walls (Marschke 2001).

From 1982 to 1987, the WVDP decontaminated cells and rooms to prepare them for reuse as interim storage space for HLW or as part of the Liquid Waste Treatment System. This involved such activities as removing vessels and piping from cells, removing contamination from walls, and fixing contamination in place. Among the areas decontaminated were the Chemical Process Cell, Extraction Cell 3, Extraction Chemical Room, and Product Purification Cell (Marschke 2001). The Chemical Process Cell is currently used for storage of 275 canisters of HLW in a borosilicate glass matrix produced in the Vitrification Plant.

2.2.2 Tank Farm

The Tank Farm (outlined in Figure 2-6) includes four waste storage tanks (8D-1, 8D-2, 8D-3, and 8D-4), a HLW Transfer Trench, and four support buildings. Built between 1963 and 1965, the waste storage tanks were originally designed to store liquid HLW generated during fuel reprocessing operations. The two larger tanks, 8D-1 and 8D-2, are reinforced carbon steel tanks. Each of these tanks has a storage capacity of about 2.8 million liters (750,000 gallons) and is housed within its own cylindrical concrete vault. Tank 8D-2 was used during reprocessing as the primary storage tank for HLW, with 8D-1 as its designated spare. Both were modified after the WVDP began to support HLW treatment and vitrification operations. The two smaller tanks, 8D-3 and 8D-4, are stainless steel tanks with a storage capacity of about 57,000 liters (15,000 gallons) each. A single concrete vault houses both of these tanks. Tank 8D-3, once designated as the spare for 8D-4, is currently used to store decontaminated process solutions before they are transferred to the Liquid Waste Treatment System for processing. Tank 8D-4, which was used to store liquid acidic waste generated during a single reprocessing campaign, is now used to collect liquids and slurries from the Vitrification Facility waste header. The HLW Transfer Trench is the 150-meter (500-foot)-long concrete vault containing double-walled stainless steel piping that conveys HLW between the Tank Farm and the Vitrification Facility. Upper sections of the pumps used to transfer the HLW through this trench are housed in stainless-steel-lined concrete pits above each tank vault (Marschke 2001).

Support buildings in the Tank Farm include the Supernatant Treatment System (STS) Support Building, Permanent Ventilation System Building, Con-Ed Building, and Equipment Shelter. The STS Support Building is a radiologically clean, two-story structure adjacent to Tank 8D-1. It houses equipment and auxiliary support systems used to operate the STS. A shielded valve aisle on the lower level of the STS contains remotely operated valves and instrumentation used to control system operations. The Permanent Ventilation System Building is a steel-framed and -sided structure near the north end of Tank 8D-2. It provided ventilation to the STS Support Building, pipeway; and more recently to the four waste storage tanks. Currently, however, it is offline and there is no plan to restart it. The Con-Ed Building is a concrete block building on top of the 8D-3/8D-4 vault. It houses instrumentation and valves used to monitor and control operation of these tanks. The Equipment Shelter is a one-story concrete block building immediately north of the Vitrification Facility. It houses the Tank Farm ventilation system that was used in the past to ventilate all four waste storage tanks (Marschke 2001). DOE manages these tanks in such a way as to minimize the risk of contamination leaching into the surrounding stream corridors.

2.2.3 Waste Storage Areas

The following sections describe the LSB, LSAs, and Chemical Process Cell Waste Storage Area. These are the areas in which LLW, mixed LLW, and TRU wastes are currently stored.

2.2.3.1 Lag Storage Building

The LSB is an interim status, mixed waste storage facility under RCRA. It is used to store containerized, contact-handled (CH) wastes (wastes with surface dose rates less than 100 millirem [mrem] per hour), including mixed waste, LLW, and suspect CH-TRU wastes (wastes suspected of containing transuranic radioisotopes) generated from WVDP operations (Marschke 2001).

The LSB is a pre-engineered, insulated, metal, Butler-style building located about 122 meters (400 feet) northeast of the Process Building (see Figure 2-7). Constructed in 1984, the LSB is supported by a clear span frame anchored to a 43-meter by 8-meter (140-foot by 60-foot) concrete slab. The listed waste storage operating capacity of the LSB under the RCRA permit (including a

Measuring Radiation

The unit of radiation dose for an individual is the rem. A millirem (mrem) is 1/1,000 of a rem. The unit of dose for a population is person-rem and is determined by summing the individual doses of an exposed population. Dividing the person-rem estimate by the number of people in the population indicates the average dose that a single individual could receive. The potential impacts from a small dose to a large number of people can be approximated by the use of population (that is, collective) dose estimates.

center aisle and operating space) is 1,331 cubic meters (47,011 cubic feet), and there are currently 202 cubic meters (7,134 cubic feet) of available storage space (Marschke 2001).

2.2.3.2 Lag Storage Addition 1

LSA 1, used to store LLW, is a flexible fabric structure about 122 meters (400 feet) northeast of the Process Building, next to and just east of the LSB (see Figure 2-7). It was constructed in 1987 to protect radioactive waste containers from wind and precipitation. LSA 1 has a pre-engineered steel frame over which vinyl fabric has been pulled and attached to create a weather-protective enclosure (Marschke 2001).

LSA 1 has a footprint that measures 15 meters by 58 meters (50 feet by 191 feet), and it is 7 meters (23 feet) high at the top center. The usable inside area is about 11 meters wide by 44 meters long by 4 meters high (37 feet by 144 feet by 14 feet). In 1999, a 4-meter (14-foot)-wide concrete corridor was added to the full length of the west side of the addition. The floor on the east side remains compacted gravel. The listed waste storage operating capacity is 1,287 cubic meters (45,454 cubic feet), and there are currently 235 cubic meters (8,282 cubic feet) of available storage space (Marschke 2001).

2.2.3.3 Lag Storage Additions 3 and 4

LSA 3 and LSA 4 are interim status, LLW and mixed LLW storage facilities under RCRA. They are twin, adjacent structures located about 152 meters (500 feet) northeast of the Process Building, just east of LSA 1 (see Figure 2-7). Originally built in 1991 and upgraded in 1996 (LSA 3) and 1999 (LSA 4), these structures provide enclosed storage space for waste containers. LSA 4 also contains the Container Sorting and Packaging Facility, which was added in fiscal year (FY) 1995. A shipping depot has been added to the south side of the structure (Marschke 2001).

LSA 3 and LSA 4 have sheet metal sides and roof over an internal structural steel frame anchored to a concrete floor. Each building's footprint is 27 meters by 89 meters (88 feet by 292 feet). Each building's outside walls rise vertically 8 meters (26 feet). Each concrete floor has a 15-centimeter (6-inch) curb around its perimeter. LSA 3 has an operating capacity of 4,701 cubic meters (166,018 cubic feet), while LSA 4 has an operating capacity of 4,162 cubic meters (146,980 cubic feet). There are currently 789 cubic meters (27,880 cubic feet) of available storage space in LSA 3, and 1,084 cubic meters (38,278 cubic feet) of available space in LSA 4 (Marschke 2001).

Located just inside and to the west of LSA 4's south wall roll-up door is the Container Sorting and Packaging Facility. This engineered area was added in 1995 for contact sorting of previously packaged wastes. The walls and ceiling of this 12-meter by 9-meter (40-foot by 28-foot) area are made of prefabricated, modular, 22-gauge stainless-steel panels. On the south side of LSA 4, there is a 21-meter by 28-meter (69-foot by 91-foot) enclosed shipping depot to enhance WVDP's ability to ship wastes off the site for disposal (Marschke 2001).

2.2.3.4 Chemical Process Cell Waste Storage Area

The Chemical Process Cell Waste Storage Area is an area about 274 meters (900 feet) northwest of the Process Building (see Figure 2-7). Originally built in 1985 as a storage area primarily for radioactively contaminated equipment packaged and removed from the Chemical Process Cell, it now consists of a Quonset-hut-style enclosure and its structural base frame. This enclosure, which is 61 meters (201 feet) long by 20 meters (65 feet) wide by 8 meters (25 feet) high at the center, is built from four major, independent sections. The two center sections are each about 19 meters (62 feet) by 20 meters (65 feet), and the two end sections are each about 12 meters (39 feet) by 20 meters (65 feet). Each section is bolted to the same foundation base and banded to the adjacent section. The structural base frame is an I-beam attached to a top plate of sixty anchors 2 meters (7 feet) long and 25 centimeters (10 inches) in diameter that are screwed into the ground (Marschke 2001).

Twenty-two painted carbon steel waste storage boxes of various sizes are stored within the Chemical Process Cell Waste Storage Area. These boxes, which contain contaminated vessels, equipment, and piping removed from the Chemical Process Cell, are stored in the center area of the enclosure. This center area is surrounded by 45 hexagonal concrete shielding modules. Each cavity contains twenty-one 55-gallon drums arranged as three 7-packs. These modules provide line-of-sight shielding around the 22 waste boxes they encircle. Four carbon steel waste boxes are placed on the east end of the enclosure, outside of the array of shielding modules but inside the metal enclosure for additional shielding. Nine carbon steel waste boxes are stored on the west end of the enclosure for the same purpose. These 13 waste boxes contain low dose LLW equipment and material removed from clean-up activities carried out in the Product Purification Cell and Extraction Cell 3 (Marschke 2001).

2.2.4 Radwaste Treatment System Drum Cell

The Radwaste Treatment System Drum Cell is a metal structure located about 610 meters (2,000 feet) south of the Process Building (see Figures 1-2 and 2-8). Established in 1986, it provides shielded, passive storage for about 19,900 square drums of cement-solidified LLW, each with a capacity of 269 liters (71 gallons), produced during Cement Solidification System operations. The Radwaste Treatment System Drum Cell includes a gravel basepad, a vertical perimeter internal shield wall, an enclosing temporary weather structure, shielded load-in/load-out area, operator office, and miscellaneous mechanical handling and operations support equipment (Marschke 2001).

The basepad is a layered construction of crushed stone on a geotextile mat placed on top of a 1- to 2-meter (3- to 6-foot) layer of compacted native clay. Moisture and settlement detecting instruments are installed in the clay layer. The Temporary Weather Structure is a pre-engineered metal-sided building that is 114 meters long (375 feet) by 18 meters (60 feet) wide by 8 meters (26 feet) high at the outside eave and totally encloses the 0.5-meter (20-inch) thick by 4.6-meter (15 feet) high concrete shield wall and stored drums. A 1,800-kilogram (2-ton) overhead crane that spans the building is used to move concrete drums into and out of their horizontal storage locations with a 900-kilogram (1-ton) drum grabber. A 696-centimeter (274-inch)-wide crane maintenance area occupies the full 18 meters (60 feet) on the west end. The floor of this area is gravel (Marschke 2001).

2.2.5 Remote Handled Waste Facility

Wastes that have high surface radiation exposure rates or contamination levels require processing using remote-handling technologies to ensure worker safety. These are referred to as remote-handled wastes and will be processed in the RHWF.

The RHWF is currently under construction, but when complete it will be a free-standing facility, approximately 58 meters (191 feet) long by 28 meters (93 feet) wide by 14 meters (45 feet) high. It is located in the northwest corner of the WVDP site, northwest of the STS Support Building and southwest of the Chemical Process Waste Storage Area (see Figure 2-7). Primary activities in the RHWF will include confinement of contamination while handling, assaying, segregating, cutting, and packaging remote-handled waste streams. The RHWF will cut relatively large components into pieces small enough to fit into standard types of waste containers.

The RHWF contains a receiving area, buffer cell, work cell, contact maintenance area, sample packaging and screening room, radiation protection operations area, waste packaging and survey area, operating aisle, office area, and the loadout/truck bay. The shield walls, doors, and windows of the RHWF will be constructed so that the radiation exposure rate in normally occupied areas will be no greater than 0.1 milliroentgen per hour.

The wastes to be processed in the RHWF are a variety of sizes, shapes, and materials, including structural steel, concrete, grout, resins, plastics, filters, wood, and water. These materials will be in the form of tanks, pumps, piping, fabricated steel structures, light fixtures, conduits, jumpers, reinforced concrete sections, personal protective equipment, general rubble, and debris. Waste from the RHWF will be packaged into 55-gallon drums and B-25 boxes.

2.3 NO ACTION ALTERNATIVE – CONTINUATION OF ONGOING WASTE MANAGEMENT ACTIVITIES

A no action alternative must be considered in all EISs to provide a benchmark against which the impacts of the proposed action and alternatives can be compared. For this project, the No Action Alternative means continuing with the waste management activities that were previously described in the *Final Environmental Impact Statement, Long-Term Management of Liquid High-level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley* (DOE 1982) and its two supplemental analyses, environmental assessments, and categorical exclusion documentation. These activities would include continued surveillance, maintenance, monitoring, and other operational support of facilities to meet requirements for safety and hazard management. A limited amount of Class A LLW would be shipped to NTS or to a commercial disposal site such as Envirocare (although shipments to Hanford are also included for the purposes of analysis). TRU waste would continue to be stored on the site. HLW would continue to be stored in the Process Building on the site. Management of the waste storage tanks would also continue as under current operations which provide for active ventilation of the tanks and the annulus surrounding the tanks that is filtered through multiple banks of high-efficiency particulate air (HEPA) filters before being discharged.

Under the No Action Alternative, waste management activities would include:

- Using the full capacity of the lag storage facilities (LSB and LSAs 1, 3, and 4). Currently, these facilities are at about 80 percent of their capacity.

- Processing waste from the Chemical Process Cell Waste Storage Area through the RHWF (see Figure 2-7) that is currently under construction, with the processed LLW being stored in one of the other onsite storage facilities. The RHWF will be used for segregating, size-reducing, repackaging, and otherwise preparing remote-handled radioactive wastes for transportation and disposal.

- Continuing onsite storage of all wastes, with the exception of 4,100 cubic meters (145,000 cubic feet) of Class A LLW wastes that would be shipped off the site.

- Ventilating the waste storage tanks and their surrounding vaults to manage moisture levels as a corrosion prevention measure.[1]

[1] Ventilation maintains a slight negative pressure inside the structures, tanks, vessels, and piping, which limits the potential spread of contamination from these systems. It also replaces moisture-laden air in the tanks with outside ambient air. The resulting air flow passes through a filter system to remove at least 99.95 percent of the particulates in the ventilation stream before being released to the environment through a stack equipped with continuous radiological monitors. The original Tank Farm Ventilation System was taken out of service in November 2001; the newer Permanent Ventilation System now ventilates Tanks 8D-1 and 8D-2 and provides backup ventilation to Tanks 8D-3 and 8D-4, which are normally ventilated by the vitrification process ventilation system.

Shipments under the No Action Alternative would be limited to 4,100 cubic meters (145,000 cubic feet) of Class A LLW addressed under previous NEPA documentation, until more extensive shipping can be assessed under the other alternatives in this EIS. Class A LLW is currently being shipped to Envirocare and NTS; however, for the purposes of analysis, shipments of these wastes to Hanford have also been assessed under the No Action Alternative. Table 2-2 identifies the number of containers and shipments required to dispose of up to 4,100 cubic meters (145,000 cubic feet) of Class A LLW.

Table 2-2. Waste Shipped Under the No Action Alternative

Waste Type	Container Type	Waste Shipped (cubic feet)[a]	Number of Containers	Number of Shipments
Class A LLW	Boxes	97,649	1,206	87 (truck) 44 (rail)
	Drums	47,351	6,878	82 (truck) 41 (rail)
Total		**145,000**	**8,084**	**169 (truck) 85 (rail)**

a. To convert cubic feet to cubic meters, multiply by 0.028.

Class A LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. Activities at those sites would include unloading trucks or railcars, inspecting the waste containers, and moving the waste to the disposal areas for shallow land burial. Waste handling and disposal activities at Envirocare are regulated by the NRC and the State of Utah under a Radioactive Material License (UT2300249). LLW handling and disposal activities at Hanford and NTS are described in the *Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement* (DOE 2002b) and the *Final Environmental Impact Statement for the Nevada Test Site and Off-site Locations* (DOE 1996b), respectively.

DOE would conform with all federal and state regulations pertaining to the transport of hazardous/contaminated materials (federal regulations are described in Appendix D). Contingency plans for dealing with accidental releases during transportation would be in place prior to the start of the transportation campaign.

2.4 ALTERNATIVE A – OFFSITE SHIPMENT OF HLW, LLW, MIXED LLW, AND TRU WASTE TO DISPOSAL

Under Alternative A, DOE's Preferred Alternative, DOE would ship Class A, B and C LLW and mixed LLW to one of two DOE potential disposal sites (in Washington or Nevada) or to a commercial disposal site (in Utah), ship TRU waste to WIPP in New Mexico, and ship HLW to the proposed Yucca Mountain HLW repository. LLW and mixed LLW would be shipped over the next 10 years. TRU waste shipments to WIPP could occur within the next 10 years if the TRU waste is determined to meet all the requirements for disposal in this repository; however, if some or all of WVDP's TRU waste does not meet these requirements, the Department would need to explore other alternatives for disposal of this waste. HLW would continue to be stored on the site until 2025 or later, then shipped to the proposed Yucca Mountain Repository. Although this period would extend well beyond the 10 years required for all other proposed actions under this alternative, the impacts of transporting the HLW have been included in this EIS to fully inform the decisionmakers should an earlier opportunity to ship HLW present itself. The waste storage tanks would continue to be managed as described under the No Action Alternative.

Table 2-3 shows the number of containers that would be required and the number of offsite shipments that, by either truck or rail, would be needed to remove the waste under Alternative A. The waste volumes used in this EIS were based on waste volumes that are currently in storage and projections of additional wastes that could be generated from ongoing operations over the next 10 years, as described in Section 2.3. These volumes were then escalated by about 10 percent to account for the uncertainties in future waste projections, packaging efficiency, and the choice of shipping container. Using this process, CH-TRU waste was escalated to 1,130 cubic meters (40,000 cubic feet) (from 1,020 cubic meters [36,000 cubic feet]), and RH-TRU waste was escalated to 250 cubic meters (9,000 cubic feet) (from 230 cubic meters [8,000 cubic feet]). LLW was escalated to 14,000 cubic meters (500,000 cubic feet) (from 13,000 cubic meters [450,000 cubic feet]), with the exception of the LLW volumes stored in the Drum Cell, which were not escalated because actual container counts are known. This escalated volume includes 223 cubic meters (7,889 cubic feet) of mixed LLW.

LLW and mixed LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. Activities at those sites would include unloading trucks or railcars, inspecting the waste containers, and moving the waste to the disposal areas for shallow land burial. Waste handling and disposal activities at Envirocare are regulated by the NRC and the State of Utah under a Radioactive Material License (UT2300249). LLW and mixed LLW handling and disposal activities at Hanford and NTS are described in the *Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200) (DOE 1997a).

TRU waste would be disposed of at WIPP or DOE would explore other alternatives. TRU waste would arrive on tractor-trailer trucks or railcars. At WIPP, DOE would unload the waste, inspect the waste packages, prepare the packages to be moved underground, and then move them underground for disposal. Environmental and health impacts of TRU waste handling and disposal activities at WIPP are described in the WIPP Supplemental EIS II (DOE 1997b).

HLW would be disposed of at a geologic repository (assumed to be the Yucca Mountain Repository). Waste handling and disposal activities for HLW are described in the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE 2002a).

DOE would conform with all federal and state regulations pertaining to the transport of hazardous/contaminated materials (federal regulations are described in Appendix D). Contingency plans for dealing with accidental releases during transportation would be in place prior to the start of the transportation campaign.

2.5 ALTERNATIVE B – OFFSITE SHIPMENT OF LLW AND MIXED LLW TO DISPOSAL AND SHIPMENT OF HLW AND TRU WASTE TO INTERIM STORAGE

Under Alternative B, LLW and mixed LLW shipping would occur as characterized under Alternative A; however, TRU and HLW would be shipped to interim offsite storage. As would be the action under Alternative A, LLW and mixed LLW currently in storage would be prepared for disposal and shipped off the site to Hanford, NTS, or a commercial disposal site such as Envirocare. TRU waste would be shipped to Hanford, INEEL, ORNL, or SRS for interim storage, then to WIPP for disposal. TRU waste could also be shipped to WIPP for interim storage prior to disposal there. TRU waste disposal at WIPP would be subject to the same regulatory requirements described under Alternative A. HLW would be shipped to SRS or the Hanford Site for interim storage, with subsequent shipment to a HLW repository (assumed to be the proposed Yucca Mountain Repository for the purposes of analysis in this EIS). The waste volumes, containers, and shipments, from WVDP, would not change under Alternative B from those proposed under Alternative A. However, the additional shipments of TRU wastes and HLW from interim storage locations result in a higher total number of shipments for Alternative B.

As an alternative to the ongoing ventilation of the waste storage tanks under the No Action Alternative and Alternative A, under Alternative B the waste storage tanks and their surrounding vaults would be partially filled with a retrievable, controlled low-strength material (grout) to provide for interim stabilization of the tanks.

For the purposes of analysis in this EIS, DOE assumed that Tanks 8D-1 and 8D-2 and the annulus surrounding each tank would be filled to a depth of approximately 1 meter (40 inches) with grout. Using a conservative pumping rate of 8 cubic meters (10 cubic yards) per hour, it would take approximately 60 hours to fill each tank/vault. The addition of grout to the tanks would not constitute an irreversible action. The grout material would be formulated to be sufficiently flexible to provide shielding and would be retrievable should DOE decide to remove the tanks in the future. The formulation of this low-strength grout material would need to be developed and would be the subject of additional regulatory reviews (such as RCRA) before the interim stabilization action could be implemented. The grout material would also be developed to provide sufficient structural stability and radionuclide retention should DOE decide to close the tanks in place.

LLW and mixed LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. Activities at those sites would include unloading trucks or railcars, inspecting the waste containers, and moving the waste to the disposal areas for shallow land burial. Waste handling and disposal activities at Envirocare are regulated by the NRC and the State of Utah under a Radioactive Material License (UT2300249). LLW and mixed LLW handling and disposal activities at Hanford and NTS are described in the *Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement* (DOE 2002b) and the *Final Environmental Impact Statement for the Nevada Test Site and Off-site Locations* (DOE 1996b), respectively.

TRU waste would be shipped to Hanford, INEEL, ORNL, or SRS for interim storage, and then to WIPP for disposal. TRU waste could also be shipped to WIPP for interim storage prior to disposal there.

At the interim storage sites, the TRU waste would be unloaded, inspected, and moved to storage areas. Additional storage facilities may be needed at these sites, depending on the available waste storage capacity at the time. Up to 0.2 hectare (0.5 acre) of land might be required for facilities sufficient to safely store the 49,000 cubic feet (1,372 cubic meters) of TRU waste currently stored at WVDP. Siting, constructing, and operating TRU waste storage facilities at INEEL, ORNL, and SRS were addressed in the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE 1995a), the *Final Environmental Impact Statement for Treating Transuranic (TRU)/Alpha Low Level Waste at the Oak Ridge National Laboratory, Oak Ridge, Tennessee* (DOE 2000), and the *Savannah River Site Waste Management Final Environmental Impact Statement* (DOE 1995b), respectively.

Further, the WM PEIS (DOE 1997a) analyzed the potential environmental impacts associated with the possible treatment of TRU waste from offsite generators at WIPP prior to disposal. For that reason, DOE included WIPP as a potential location for interim storage of TRU waste generated at WVDP. A decision to ship TRU waste to WIPP for interim storage prior to disposal at WIPP would require siting, construction, and operation of TRU waste storage capacity at WIPP and additional NEPA review. Shipment of TRU waste from the interim storage facilities to WIPP and activities at that site are described in the WIPP Supplemental EIS II (DOE 1997b).

Interim storage of WVDP HLW at Hanford or SRS for interim storage prior to disposal at a geologic repository was analyzed as part of the Regionalized Alternatives in the WM PEIS (DOE 1997a).

DOE would conform with all federal and state regulations pertaining to the transport of hazardous/contaminated materials (federal regulations are described in Appendix D). Contingency plans for dealing with accidental releases during transportation would be in place prior to the start of the transportation campaign.

2.6 ALTERNATIVES CONSIDERED BUT NOT ANALYZED

In contrast with alternatives assessed in the *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center* (DOE 1996a), this EIS does not analyze any new onsite disposal of wastes or indefinite storage of currently stored wastes or wastes to be generated as a result of ongoing operations over the next 10 years. DOE has issued EISs and decisions that identify disposal sites other than the WVDP for each waste type considered in this EIS (see Section 1.7). These sites, identified in Alternatives A and B, already have existing or planned disposal capacity; they are safe, secure, and suitable from an environmental standpoint. In light of the current and anticipated availability of disposal facilities at these other sites, DOE presently does not consider an alternative to construct and maintain waste storage facilities at the WVDP to be practical or reasonable over time, because of continuing costs of construction of new facilities and maintenance of existing facilities.

For purposes of analysis in this EIS, DOE selected potential sites for interim storage and disposal of TRU waste and HLW based on the WM PEIS (DOE 1997a), the WIPP Supplemental EIS II (DOE 1997b), and the associated RODs for these documents. For TRU waste, DOE analyzed Hanford, INEEL, LANL, ORR, Mound, NTS, SRS, and WIPP as potential storage sites for TRU waste. The TRU waste ROD stated that:

> "In the future, the Department may decide to ship TRU wastes from sites where it may be impractical to prepare them for disposal to sites where DOE has or will have the necessary capability. The sites that could receive such shipments of TRU waste are [INEEL, ORR, SRS, and Hanford]. However, any future decisions regarding transfer of TRU wastes would be subject to appropriate review under [NEPA] and to agreements DOE has entered into." 63 Fed. Reg. 3629 (1998).

Based on this analysis and documentation, DOE considered Hanford, INEEL, ORNL, and SRS as the potential interim storage locations under Alternative B for TRU waste generated at WVDP. Further, the WM PEIS (DOE 1997a) analyzed the potential environmental impacts associated with the possible treatment of TRU waste from offsite generators at WIPP prior to disposal. For that reason, DOE included WIPP as a potential location for interim storage of TRU waste generated at WVDP. A decision to ship TRU waste to WIPP for interim storage prior to disposal at WIPP would require additional NEPA review.

With respect to HLW, the HLW ROD stated that DOE had decided to store immobilized HLW at Hanford, INEEL, SRS, and WVDP (64 Fed. Reg. 46661 (1999)). In this WVDP Waste Management EIS, DOE examined the environmental impacts associated with shipping HLW generated at WVDP to Hanford or SRS for interim storage prior to disposal at a geologic repository. Although the impacts of shipping HLW to INEEL are not specifically analyzed in this EIS, DOE expects those impacts would be less than shipping to Hanford because the distance to INEEL is shorter and impacts are directly related to the miles traveled.

2.7 COMPARISON OF ALTERNATIVES

This section summarizes and compares the potential environmental impacts of the No Action Alternative, Alternative A, and Alternative B. As described previously, the waste management actions proposed under all alternatives would be conducted in existing facilities (or, in the case of waste transportation, on existing road and rail lines) by the existing work force over the next 10 years, and would not involve new construction or building demolition. As a result, the scope of potential impacts that could result from the proposed actions is limited. Specifically, because there would be no mechanism for new land disturbance under any alternative, there would be no potential to directly or indirectly impact current land use; biotic communities; cultural, historical, or archaeological resources; visual resources; threatened or endangered species or their critical habitats; wetlands; or floodplains. Additionally, because the work force requirements would be the same under all alternatives (for example, there would be no increases or decreases from current employment levels), there would be no potential for socioeconomic impacts. For these reasons, the potential for impacts under all the alternatives are limited to human health and transportation impacts. Interim storage of TRU waste and HLW at other DOE sites could require the siting, construction, and operation of additional storage capacity for the volume of WVDP wastes to be stored, depending on the storage capacity at those sites at the time. It is recognized that additional review of interim storage impacts at the receiving sites could be necessary prior to implementation of these actions assessed in this EIS under Alternative B.

Table 2-4 summarizes the normal operational impacts under the three proposed alternatives over the 10-year period analyzed in this EIS. Because the proposed waste management actions would involve only the storage, packaging, loading, and shipment of wastes and management options for the waste storage tanks, the proposed activities would result in a statistically insignificant contribution to the historically low impacts of ongoing WVDP operations. As a result, the human health impacts to involved and noninvolved workers and the public are dominated by ongoing WVDP site operations; therefore, there is little discernible difference in the impacts that could occur among the three alternatives. Table 2-5 summarizes the onsite accident consequences that could result from the proposed actions under each alternative. Chapter 4 provides a detailed assessment of impacts. Under all alternatives, the risk of a latent cancer fatality from the proposed actions that would occur onsite would be less than 1, whether under normal operating conditions or accidents. Offsite transportation of wastes would also result in less than 1 fatality from normal operations and accidents under all alternatives. Under maximum reasonably foreseeable transportation accidents, 1 latent cancer fatality could result from truck transportation, and 2 latent cancer fatalities could result from rail transportation, under the No Action Alternative. About 4 latent cancer fatalities could result from either truck or rail transportation under Alternative A or B.

The WM PEIS (DOE 1997a), the WIPP Supplemental EIS II (DOE 1997b), and the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE 2002a) analyzed potential environmental impacts associated with management (treatment, storage, or disposal) of LLW, mixed LLW, TRU waste, and HLW, including waste generated and stored at WVDP. Using data extrapolated from these earlier NEPA documents, Table 2-6 shows the potential estimated human health impacts of managing WVDP waste at Envirocare, Hanford, INEEL, NTS, ORNL, SRS, WIPP, and a geologic repository at Yucca Mountain. Appendix C, Section C.10, explains how these impacts were derived.

2.8 REFERENCES

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DOE (U.S. Department of Energy), 1996a. *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center - Volumes 1 and 2*, DOE/EIS-0226-D, January.

DOE (U.S. Department of Energy), 1996b. *Final Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada*, DOE/EIS-0243-F, Nevada Operations Office, Las Vegas, Nevada, August.

DOE (U.S. Department of Energy), 1997a. *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (Volumes 1 through 5)*, DOE/EIS-0200-F, Washington, DC, May.

DOE (U.S. Department of Energy), 1997b. *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement,* DOE/EIS-0026-S-2, Washington, DC, September.

DOE (U.S. Department of Energy), 2000. *Final Environmental Impact Statement for Treating Transuranic (TRU)/Alpha Low Level Waste at the Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/EIS-0305-F, June 2000.

DOE (U.S. Department of Energy), 2002a. *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-level Radioactive Waste at Yucca Mountain, Nye County, Nevada,* DOE/EIS–0250, Office of Civilian Radioactive Waste Management, Washington, DC, February.

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Marschke, S.F., 2001. *West Valley Demonstration Project, Decontamination and Waste Management EIS Engineering Report*, Revision 1. Prepared by Stephen F. Marschke, Gemini Consulting Company, for West Valley Nuclear Services Company: West Valley, NY. August.

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CHAPTER 3
AFFECTED ENVIRONMENT

> This chapter summarizes the existing environmental conditions at the Western New York Nuclear Service Center and the surrounding area. Drawing upon information generated for WVDP environmental programs, the 1996 Draft Closure EIS, and Annual Site Environmental Reports, this chapter characterizes the receptors and environmental media that may be affected by the proposed waste management activities described in Chapter 2. This chapter also characterizes, in less detail, the ecological resources, geology, socioeconomics, land use, and related aspects of the environment at the Western New York Nuclear Service Center that would not be affected by the actions described in Chapter 2. This approach is consistent with the Council on Environmental Quality's recommendations in their regulations for NEPA implementation (40 CFR 1502.15). For additional detailed descriptions of the affected environment, refer to the *West Valley Demonstration Project Safety Analysis Report - Project Overview and General Information* (WVNS 2000b) and the *West Valley Demonstration Project Site Environmental Report, Calendar Year 2000* (WVNS 2001).

The waste management actions proposed in Chapter 2 would have very little potential for impacts to workers, the public, or the environment on and around WVDP, because the actions would not involve additional discharges or releases, or new ground disturbance. The proposed actions would occur within existing buildings, or upon existing highways and rail lines. The packaging and handling of wastes for shipment would be accomplished within existing buildings with HEPA filtration systems that would reduce emissions to acceptable levels. The actions proposed in this EIS would involve no discharges of process effluents. The only receptors that would be impacted by the proposed waste management actions would be the workers actually involved in the packaging, loading, and shipping of the wastes, also referred to as involved workers. Other WVDP workers (noninvolved workers) and the public would have no potential exposure to the proposed waste management actions during routine operations and thus would be impacted only by ongoing WVDP operations or under accident scenarios. Nationally, the involved workers and the public could receive exposures along transportation routes.

Because the potential for impacts from the proposed actions assessed in this EIS is very limited, the description of the affected environment in this chapter has been reduced accordingly. This approach is consistent with DOE and Council on Environmental Quality NEPA guidance; both agencies recommend that an EIS focus only on that which is important for the impact analyses. A basic description of the region in which the Center is located has been provided to provide the reader with a broad overview of the potentially affected environment.

3.1 GEOLOGY AND SOILS

The Western New York Nuclear Service Center is located on the Glaciated Allegheny Plateau section of the Appalachian Plateau Physiographic Province. This 78,000-square-kilometer (30,000-square–mile) region is bounded on the north by the Erie-Ontario Lowlands, on the east by the Tughill Upland, on the south by the unglaciated Appalachian Plateau, and on the west by the Interior Lowlands. The Glaciated Allegheny Plateau has been subjected to the erosional and depositional actions of repeated glaciations, resulting in the accumulation of various glacial deposits over the area. Fluvial erosion (that is, erosion resulting from action or movement of a stream or river) and mass wasting (that is, the downslope movement of soil and rock material as the result of gravity) currently are altering the glacial landscape (WVNS 2000b). No geologic fold or fault of any consequence is recognized within the site area. The closest major structural zone is the St. Lawrence Rift Valley System, located about 480 kilometers (300 miles) to the northeast. The north-trending Clarendon-Linden Structure, located 50 kilometers

(30 miles) northeast of the site, is the only significant structural feature in the western New York region. From 1737 to 1999, there have been 119 recorded earthquakes within 480 kilometers (300 miles) of the WVDP with epicentral intensities of Modified Mercalli Intensities V to VII. Of the 119 recorded earthquakes, 25 occurred within 320 kilometers (200 miles) of the WVDP (WVNS 2000b). The highest Modified Mercalli Intensity estimated to have occurred at the Center within the last 100 years was an Intensity of IV, which is similar to vibrations from a heavy truck that might be felt by people indoors, but do not cause damage (DOE 1996).

3.2 HYDROLOGY

This section describes the existing hydrology at the Project Premises and surrounding area.

3.2.1 Surface Water

The WVDP facilities and its two water supply reservoirs lie in separate watersheds, both of which are drained by Buttermilk Creek (Figure 3-1). Buttermilk Creek, which roughly bisects the Western New York Nuclear Service Center, flows in a northwestward direction to its confluence with Cattaraugus Creek, at the northwest end of the Center. Several tributary streams flow into Buttermilk Creek at the Center. The flow length of Buttermilk Creek through the Center is about 7,600 meters (25,000 feet). About 2,700 meters (9,000 feet) of this is adjacent to the Project Facilities and the water supply reservoirs (WVNS 2000b).

Buttermilk Creek lies in a deep, narrow valley cut into glacial soils. A downstream portion of the creek has downcut to shale bedrock. The reach of stream to the east of the facilities has downcut through the Lavery till and the underlying Kent recessional units and is currently incising the Kent till. The stream invert drops from an elevation of 400 meters (1,300 feet) at the southern site boundary, to 370 meters (1,200 feet) at the northern edge of the Project Facilities, to 340 meters (1,100 feet) at the confluence with Cattaraugus Creek. The drainage area of the Buttermilk Creek basin was estimated to be 80 square kilometers (30 square miles) (DOE 1996). The drainage area to this point is estimated to be about 76 square kilometers (29 square miles) (WVNS 2000b).

Cattaraugus Creek flows westward from the Buttermilk Creek confluence to Lake Erie, 63 kilometers (39 miles) downstream. The total drainage area is estimated to be 1,360 square kilometers (520 square miles). A gauging station has been maintained at Gowanda, New York, since 1939. The drainage basin to this point is estimated to be about 1,120 square kilometers (430 square miles). The drainage area of Cattaraugus Creek upstream of the Buttermilk Creek confluence is 560 square kilometers (220 square miles) (WVNS 2000b).

The drainage basin on the Project Premises is relatively small, consisting of approximately 5 square kilometers (2 square miles). The outfall of the watershed (that is, the point where all surface runoff from the site reaches a single stream channel) is at the confluence of Frank's Creek and Quarry Creek, north of the main Project Facilities. The watershed extends in a southwest direction from this point. Ground cover consists of the main Project Facilities, forest, abandoned farmlands, and a small amount of active farmland.

The watershed on the Project Premises is drained by three named streams: Quarry Creek, Frank's Creek, and Erdman Brook (Figure 3-2; WVNS 2000a). Erdman Brook and Quarry Creek are tributaries to Frank's Creek, which in turn flows into Buttermilk Creek. Erdman Brook, the smallest of the three streams, drains the central and largest fraction of the developed WVDP premises, including a large portion of the disposal areas and the areas surrounding the lagoon system; the plant, office, and warehouse areas; and a major part of the parking lots. Following treatment, the WVDP's waste waters are also discharged to this brook. Erdman Brook flows from a height of over 430 meters (1,400 feet) west of Rock Springs Road to 400 meters (1,300 feet) at the confluence with Frank's Creek northeast of the lagoons. It flows for about 900 meters (3,000 feet) through the Project Facilities.

Quarry Creek, which drains the largest area of the three named streams, receives runoff from the tank farm, the north half of the northern parking lot, and the temporary radioactive waste storage tents. It flows from an elevation of 590 meters (1,900 feet) west of Dutch Hill Road to 380 meters (1,250 feet) at its confluence with Frank's Creek. The segment that flows along the north side of the project is about 900 meters (3,000 feet) in length.

A small dam formerly used for hydroelectric power and water impoundment is located on Cattaraugus Creek about 300 meters (1,000 feet) upstream of the Scoby Road bridge, southwest of Springville, New York. Neither Buttermilk Creek nor Cattaraugus Creek downstream of the WVDP are used as a regular source of potable water. The steep-walled nature of the downstream valley and the region's annual precipitation combine to make irrigation from the creeks impracticable and unnecessary. Cattle from a neighboring dairy farm have access to Buttermilk Creek near the confluence of Cattaraugus Creek. Milk from the cattle is routinely monitored for radioactivity. Cattaraugus Creek downstream of Buttermilk is a popular fishing and canoeing/rafting waterway. Cattaraugus Creek water is also used to irrigate tomato fields in Chautauqua County. As such, Cattaraugus Creek water, fish, and sediments are monitored as part of the WVDP environmental monitoring program (WVNS 2000a, WVNS 2000b).

The two water supply reservoirs, which are interconnected by a short canal, are located to the south of the main Project Facilities. They were formed by blocking off two tributaries to Buttermilk Creek with earthen dams. The south reservoir drains to the north reservoir, which then discharges to Buttermilk Creek through a sluice gate water-level control structure. The emergency spillway is located on the south reservoir. The reservoirs collect drainage from numerous small streams over a 13-square-kilometer (5-square-mile) drainage basin. The watershed ground cover is a mix of forest, cultivated fields, and pastures. Several small farm ponds are located throughout the basin.

Frank's Creek receives runoff from the east side of the WVDP, including the Drum Cell, part of the state radioactive waste burial area, and the former construction demolition and debris landfill. It flows into Buttermilk Creek about 600 meters (2,000 feet) downstream of its confluence with Quarry Creek. It flows from an elevation of 550 meters (1,800 feet) west of Rock Springs Road, to 380 meters (1,250 feet) at the Quarry Creek confluence, to 360 meters (1,200 feet) at the Buttermilk Creek confluence. About 1,800 meters (6,000 feet) of its length is adjacent to WVDP Facilities.

Supplemental information on surface water hydrology may be found in Volume III of the Environmental Information Document (Part 2) (WVNS 1993b). Additional information pertaining to the geomorphology of stream valleys, both onsite and offsite, is presented in Volume III of the Environmental Information Document (Part 1) (WVNS 1993a).

3.2.2 Groundwater

The Center is located within the Cattaraugus Creek Basin Aquifer System, a system that has been designated by the U.S. Environmental Protection Agency (EPA) as a sole or principal source of drinking water for the surrounding towns (52 Fed. Reg. 36102(1987)). This means that all projects with federal financial assistance constructed in this basin are subject to EPA review to ensure that they are designed and constructed so as not to create a significant hazard to public health. WVDP waste management actions would not require any facility construction at the Center and are not expected to cause construction or any other impacts requiring EPA review on the surface water or groundwater resources described in this section.

The WVDP site is underlain by two aquifer zones, neither of which can be considered highly permeable or productive. The groundwater flow patterns pertinent to the site relate to recharge and downgradient movement for these two aquifers. Groundwater in the surficial unit tends to move in an easterly or northeasterly direction from the western boundary of the site, close to Rock Springs Road. Most of the groundwater in this unit discharges via springs and seeps into Frank's Creek or into small tributaries of that creek (for example, Erdman Brook). Groundwater recharging the weathered shale and rubble zone tends to move eastward toward the thalweg of the buried valley (the locus of the lowest points in the cross-section of the buried valley), located about 300 to 350 meters (980 to 1,150 feet) west of Buttermilk Creek. Once attaining the thalweg, the direction of groundwater movement shifts to the direction of the thalweg, about 25 degrees west, and proceeds toward the northwest (WVNS 2000b).

Wells identified near the Western New York Nuclear Service Center serve residences and farms; the maximum number of persons served per well was ten. Most of the wells are located on the higher elevations east and west of the Center, along the principal north-south county roads. A second concentration of wells is located on the lowlands north of the Center in the vicinity of Bond Road and Thomas Corners Road. The wells are upgradient of or are otherwise hydraulically isolated from groundwater at the site (WVNS 2000b).

Water supplies north of the Western New York Nuclear Service Center and south of Cattaraugus Creek derive mainly from springs and shallow dug wells completed in Defiance Outwash, which overlie the Lavery till in this area. The distribution of springs and the general geologic relationships indicate that the groundwater system here is perched above the Lavery and that flow patterns are much the same as those that characterize the North Plateau at the WVDP. This hydrostratigraphic unit clearly is disconnected from the WVDP both hydraulically and topographically. Nonetheless, water supplies developed from bedrock wells in this same area downstream and downgradient of the WVDP might be hydraulically connected to water originating on the site via the surface water system and shale exposures in the lower reaches of Buttermilk Creek (WVNS 2000b).

Supply wells on the uplands bordering the Western New York Nuclear Service Center, such as along Route 240 and Dutch Hill Road, are completed in bedrock. A nominal 15 meters (50 feet) of till overlie a fractured bedrock aquifer on the summit levels west of the site; a comparison of screen depths and static water levels indicate that the aquifer is confined (WVNS 2000b). A similar situation exists on the uplands east of the Center, except that most of these wells intersect from 20 to 45 meters (66 to 150 feet) of the Kent till and ground moraine layers above their completion depths in shale bedrock. Groundwater supplies in both of these areas can be assumed to be isolated hydraulically from groundwater in bedrock at lower elevations beneath the Center and the WVDP (WVNS 2000b).

The Lavery till and underlying lacustrine sequence currently are not drawn upon for groundwater supplies, and there is no reason to anticipate that the till, given its hydraulic properties, ever will be considered a source of groundwater. The Lavery till layer and Kent recessional sequence unit directly beneath the Lavery till layer are generally regarded as containing all the potential routes for the migration of contamination to the surface water system and to offsite areas (WVNS 2000b).

3.3 METEOROLOGY AND AIR QUALITY

The WVDP is situated approximately 50 kilometers (30 miles) inland from the eastern end of Lake Erie in western New York State. The climate of western New York State is of the moist continental type prevalent in the northeastern United States. The climate is diverse due to the influence of several atmospheric and geographic factors or controls (WVNS 2000b).

Western New York is exposed to a variety of air masses. Cold dry air masses that form over Canada reach the area from the northwesterly quadrant. Prevailing winds from the southwest and south bring warm, humid air masses from the Gulf of Mexico and neighboring waters of the subtropical Atlantic Ocean. On occasion, cool, cloudy, and damp weather affects western New York through airflow from the east and northeast (WVNS 2000b).

The prevailing wind direction is southwesterly, and windspeed averages approximately 5.4 meters per second (12 miles per hour). The strongest winds occur from November through March and are generally southwesterly to west-southwesterly (DOE 1996). Figures 3-3 and 3-4 characterize the wind conditions for calendar year 2000 from onsite monitoring stations at 10 meters (33 feet) and 60 meters (197 feet) from the ground.

Western New York is bordered by two of the Great Lakes: Lake Erie on the west and Lake Ontario on the north. These exert a major controlling influence on the climate of the region. Topography also affects the climate. Elevations in western New York range from about 110 meters (350 feet) along the Lake Ontario shore in Oswego County to more than 610 meters (2,000 feet) in the southwestern highlands of Cattaraugus and Allegheny counties. The lake plain extends inland about 40 kilometers (25 miles) from Lake Ontario, but along Lake Erie it gradually narrows from about 16 kilometers (10 miles) in the Buffalo area to 8 kilometers (5 miles) or less in Chautauqua County. The southern two-thirds of the region is composed of hilly, occasionally rugged terrain with elevations generally above 300 meters (1,000 feet). This area is interspersed with numerous river valleys and gently sloping plateau areas. Such topographic features may produce locally significant variation of climatic elements within relatively short distances.

The winter climate of western New York is marked by abundant snowfall. The areas with the lightest snowfall, with average seasonal accumulations of 102 to 127 centimeters (40 to 50 inches), are the lower Chemung Valley, the western Finger Lakes, and northern Niagara County. The heaviest snowfall occurs in the eastern lee of Lake Erie, where the average total is in excess of 305 centimeters (120 inches). The snow season normally begins in mid-November and extends into mid- or late-March (WVNS 2000b).

Snowfall produced in the eastern lee of Lake Erie is a distinguishing and very important feature of western New York's climate. Heavy snow squalls frequently occur, producing from 0.3 to 0.6 meter (1 to 2 feet) of snow and occasionally as much as 1.2 meters (4 feet). Counties to the lee of Lake Erie are subject to these lake-effect snows in November and December, but in mid-winter, as the lake gradually freezes, these snows become less frequent. Areas south of Lake Ontario are exposed to heavy snow squalls well into February, as the lake generally retains considerable open water through the winter months (WVNS 2000b).

The summer season is cool in the southwestern highland but warm elsewhere. High temperatures and high humidity are infrequent during the summer and seldom persist for more than a few days at a time. Readings of 38 degrees Celsius (100 degrees Fahrenheit) or higher are rare. The range of temperature on summer days is commonly from 15 degrees Celsius (60 degrees Fahrenheit) at night to 27 degrees Celsius (the low 80s) in the afternoon (WVNS 2000b).

Summer season precipitation increases to the south, ranging from about 20 centimeters (8 inches) along the Lake Ontario shore to 25 to 30 centimeters (10 to 12 inches) in the counties along the Pennsylvania border. Showers and thundershowers account for much of the warm season rainfall, and the distribution pattern reflects the contrasting influences of the cool Lake Ontario waters to the north and the hilly terrain in the Southern Tier (WVNS 2000b).

The autumn season is marked by frequent periods of sunny, dry weather. With less cloud cover, temperatures from mid-September to mid-October frequently rise to between 15 degrees Celsius and

26 degrees Celsius (60 and 79 degrees Fahrenheit) in the daytime and cool to 1 degree Celsius below zero and 6 degrees Celsius (30s and low 40s Fahrenheit) at night. The comparatively warm waters of the Great Lakes reduce cooling at night to the extent that freezing temperatures in lakeside counties are normally delayed until mid-October or later (WVNS 2000b).

3.3.1 Severe Weather

The lack of significant amounts of recorded data at and near the West Valley site make it difficult to assess past occurrences of extreme winds. Large-scale factors such as intense low-pressure systems passing near the area have produced winds in excess of 27 meters per second (60 miles per hour) at Buffalo, New York, and would probably lead to similar conditions at the WVDP. Strong winds associated with the remnants of tropical storms and hurricanes do occasionally occur in western New York, but damaging winds due to these storms are extremely rare.

Locally, severe thunderstorms would be the most likely event to cause wind damage at the site, particularly in late spring and summer. Thunderstorms occur about 30 days per year, with the most thunderstorms occurring in June, July, and August. Severe thunderstorms, with winds in excess of 22 meters per second (50 miles per hour), do occur in western New York every year (WVNS 1993c).

The frequency and intensity of tornadoes in western New York are low in comparison to many other parts of the United States. An average of about two tornadoes of short and narrow path length strike New York State each year. From 1950 to 1990, 17 tornadoes were reported within 80 kilometers (50 miles) of the WVDP site (WVNS 2000b).

3.3.2 Ambient Air Quality

New York is divided into nine regions for assessing state ambient air quality. The WVDP site is located in Region 9, which is comprised of Niagara, Erie, Wyoming, Chautauqua, Cattaraugus, and Allegany counties. The WVDP site and the surrounding area in Cattaraugus County are in attainment with the National Primary and Secondary Ambient Air Quality Standards contained in 40 CFR 50 and New York State air quality standards contained in 6 NYCRR 257. The city of Buffalo, located about 48 km (30 mi) from the WVDP site, is a marginal nonattainment area for ozone (EPA 2002).

Air emissions of radionuclides from WVDP, are regulated by the EPA under the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations, 40 CFR Part 61, Subpart H, National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities. Annual reporting of the radionuclide emissions for calendar year 2000 was less than 0.1 percent of EPA's standards (WVNS 2001).

Current WVDP operations use two Cleaver Brooks boilers. These boilers are used to generate steam for heating and other processes at the site, and each have a capacity of 20.2 million British thermal units per hour. Together, these boilers use about 2 million cubic meters (70 million cubic feet) of natural gas and about 24,000 liters (6,300 gallons) of No. 2 fuel oil per year, and emit some criteria pollutants - nitrogen dioxide, sulfur dioxide, carbon monoxide, and particulate matter. The other two criteria pollutants, lead and ozone, are produced in insufficient quantities by the boilers for consideration in this analysis.

As shown in Table 3-1, the concentrations of criteria pollutants from the WVDP site emissions are well below the National Primary and Secondary Ambient Air Quality Standards contained in 40 CFR 50 and the New York State air quality standards contained in 6 NYCRR 257. It should be noted that the background concentrations used in Table 3-1 were from near Buffalo, New York; actual background

Table 3-1. Criteria Pollutant Concentrations from WVDP Boiler Emissions and Regional Background

Criteria Pollutant	Averaging Time	Standard[a,b]	Concentration From WVDP Emissions[b,c]	Background Concentration[b,d]	Total Concentration[b]	Percent of Standard
Nitrogen dioxide	Annual	100[g,h,i] (0.053 ppm)	1.5	41	42	42
Carbon monoxide	1 hour	40,000[g,i] (35 ppm)	15	5,800	5,800	14
Carbon monoxide	8 hours	10,000[g,i] (9 ppm)	11	3,200	3,200	32
Sulfur dioxide	Annual	80[g,i] (0.03 ppm)	0.10	17	17	22
Sulfur dioxide	24 hours	365[g,i] (0.14 ppm)	0.50	63	64	17
Sulfur dioxide	3 hours	1,300[h,i] (0.5 ppm)	1.1	160	160	12
Particulate matter[e]	Annual	50[g,h]	0.11	21	21	42
Particulate matter[f]	24 hours	150[g,h]	0.56	61	61	41
Ozone	1 hour	235[g,h] (0.12 ppm)	(--)	210	210	89
Lead	Quarterly	1.5[g,h]	(--)	0.03	0.03	2

a. Standards from 40 CFR 50, National Primary and Secondary Ambient Air Quality Standards and 6 NYCRR 257, Air Quality Standards. Comparisons to the standards for particulate matter with an aerodynamic diameter less than 2.5 micrometers and the 8-hour ozone standard were not made because these standards have been remanded to the U.S. Environmental Protection Agency by the U.S. Court of Appeals.
b. Units in micrograms per cubic meter. Parts per million not calculated for substances that do not exist as a gas or vapor at normal room temperature and pressure.
c. The maximum criteria pollutant concentrations from WVDP boiler emissions were located 1,379 meters (4,524 feet) from the WVDP site.
d. Source: EPA 2001. Background concentrations were measured near Buffalo, New York.
e. Annual state standard is 45 to 75 micrograms per cubic meter according to level designation.
f. 24-hour state standard is 250 micrograms per cubic meter.
g. National primary ambient air quality standard.
h. National secondary ambient air quality standard.
i. New York State air quality standard.

concentrations near the WVDP site would be lower. WVDP emissions of nitrogen dioxide and sulfur dioxide are also well below the New York State Department of Environmental Conservation's annual emission cap of 90,700 kilograms (100 tons). Additionally, all other conditions of the permit continue to be met for other criteria pollutants (WVNS 2001). A more detailed analysis of these emissions is included in Section C.9 of this EIS.

3.4 ECOLOGICAL RESOURCES

This section describes the existing ecology at the Project Premises and surrounding areas.

The Western New York Nuclear Service Center lies within the northern hardwood forest region. Its climax community forests are characterized by the dominance of sugar maple, beech, and Eastern hemlock. At present, the site is about equally divided between forestland and abandoned farm fields. Plant communities found on the site have been categorized into five cover types: mixed hardwood forest, pine-spruce community, successional creek bank communities, late oldfield successional areas, and fields-meadows. The plant communities found on the site are characteristic of western New York. The relatively undisturbed nature of large portions of the Western New York Nuclear Service Center has allowed for natural succession of previous agricultural areas within its boundaries. Because neither the setting nor the former agriculture land use is unique, the forest communities that will eventually develop in the abandoned fields will be similar to others in the region (WVNS 2000b).

In an effort to manage the overpopulation of deer within the Western New York Nuclear Service Center with a goal of reducing the number of deer/vehicle collisions on roads around the Center, NYSERDA has allowed controlled hunting (during the deer hunting season) within the Center premises but not within the Project Premises. A deer management program that was implemented in 1998 resulted in the removal of all the deer within the WVDP premises (WVNS 2000b).

3.4.1 Special Status Species

Animals. The U.S. Department of Interior and the New York State Department of Environmental Conservation maintain lists of threatened and endangered species of wildlife (USFWS 2001; NYSDEC 2001) that are protected under the Endangered Species Act of 1973 and the Fish and Wildlife Coordination Act of 1958. Except for occasional transient individuals, there are no federally listed or proposed endangered or threatened species in the vicinity of the WVDP (USFWS 2001). Based on population range maps, threatened or endangered species with potential for occurring at the Western New York Nuclear Service Center include:

- Birds
  - Common tern - state threatened
  - Bald eagle - federal threatened and state endangered[1]
  - Loggerhead shrike - state endangered
  - Northern harrier - state threatened
  - Osprey - state threatened (recommended for state special concern status)
  - Peregrine falcon - state endangered
  - Piping plover - federal and state endangered
  - Red-shouldered hawk - state threatened (recommended for state special concern status)
  - Spruce grouse - state threatened recently (recommended for state endangered status)

- Mammals
  - Indiana bat - federal and state endangered

- Herptiles
  - Eastern massasauga - state endangered
  - Timber rattlesnake - state threatened

Field investigations in 1990 and 1991 recorded one species (Northern harrier) on the state list of threatened species and six state species of special concern (Cooper's Hawk, upland sandpiper, common raven, Eastern bluebird [recommended for unlisted status], Henslow's sparrow [recommended for threatened status], and vesper sparrow). State of New York "special concern species" are species of fish and wildlife found to be at risk of becoming endangered or threatened in New York (New York Code of Rules and Regulations Title 6, Part 182.2(i)). Typically, species of special concern are those whose populations are declining, often in association with critical habitat loss. All the noted species were observed in areas of the Western New York Nuclear Service Center outside the WVDP. Moreover, none of these threatened species or species of special concern depend on areas within the WVDP for any aspect of their life cycle. Eight birds, two mammals, and six herptiles on the special concern list may potentially

[1] Proposed for removal from the Federal Endangered Species list (USFWS 2001, NYSDEC 2001).

occur at the Center. Four of the listed birds (common loon, Northern raven, common nighthawk, and Eastern bluebird [recommended for unlisted status]) have been recorded at the Center. While suitable habitat for some of these species exists on the site, their presence at the Center (except in the case of the Eastern bluebird) is not due to the presence of critical habitat within the Center. The Eastern bluebird habitat has been artificially created by a substantial bluebird nesting box program; this program has proved very successful. During 1990, approximately 85 birds were fledged from boxes at the Center (WVNS 2000b).

Plants. Field studies from 1982 and 1983 revealed no plant species in the study area on either the state or federal protected plant lists. Field studies conducted by several groups since 1973 have also failed to record any such species. Field studies were conducted in the spring of 1992 to re-examine the Western New York Nuclear Service Center with respect to the current state and federal protected plant lists. No federally threatened or endangered species were identified. One each of New York State endangered and threatened plant species were reported in 1992 within the Western New York Nuclear Service Center (WVNS 2000b). A recent field botanical investigation was conducted in June and August 2000, in an effort to confirm the 1992 reported presence of a New York State endangered plant. No endangered plants were found in the location and area as reported in 1992 (Dames and Moore 2000a and 2000b).

Habitats. The U.S. Department of the Interior, Fish and Wildlife Service, maintains a file of habitat locations designated as critical to the survival of federally listed endangered or threatened species. Based on a review of the most recent listings and contact with the U.S. Fish and Wildlife Service, Cortland, New York field office (June 1997), no such habitats occur in or around the site (WVNS 2000b).

Critical habitats are also designated by the New York State Department of Environmental Conservation, Bureau of Wildlife. The state-designated critical habitats are areas found to be of significance to game and other important wildlife species. Such areas could include seasonally important wintering areas and breeding grounds. A 16-square-kilometer (6-square-mile) area encompassing the entire Western New York Nuclear Service Center site has been classified as critical habitat due to its extensive use as a whitetail deer (a game species) wintering area. The area has been designated because softwood shelter availability is rated intermediate, and food availability is rated good. Five other areas within a 16-kilometer (10-mile) radius of the site are similarly designated (WVNS 2000b).

Examination of state and federal lists of threatened and endangered species and range maps, performance of field sampling and a literature survey, and interviews with local experts provided no indication that any threatened or endangered aquatic flora or fauna exist in the reservoirs, ponds, or streams on the Western New York Nuclear Service Center or in its vicinity. The New York State Department of Environmental Conservation has delineated an Eastern sand darter area on Cattaraugus Creek near Perrysburg, New York. This area is protected to preserve the state-listed endangered species. The Eastern sand darter species is a state-listed threatened species (NYSDEC 2001).

In comments submitted on the draft version of this EIS, the U.S. Fish and Wildlife Service concurred in DOE's determination that no federally listed or proposed endangered or threatened species are known to exist in the project impact area and that no habitat in the project impact area is currently designated or proposed critical habitat in accordance with the provisions of the Endangered Species Act, 16 U.S.C. 1531 et seq.

3.4.2 Wetlands

The Western New York Nuclear Service Center has meadows, marshes, lakes, ponds, bogs, and other areas that are considered functional wetlands. Fifty-one such areas have been identified as "jurisdictional" wetlands, or wetlands that are constrained from dredging or filling actions by Section 404 of the Clean Water Act and by the state Freshwater Wetland Act (WVNS 1992a). These wetlands range in size from 100 square meters (1,100 square feet) to more than 37,000 square meters (398,000 square feet). The total wetlands area is approximately 0.14 square kilometers (0.05 square miles). Eighteen wetlands with a total area of approximately 37,000 square meters (398,000 square feet) were delineated within the Project Premises. The New York State Department of Environmental Conservation has determined that eight wetlands encompassing 81,000 square meters (872,000 square feet) on the south and east sides of the Project Premises and SDA are linked and meet the criteria for a single wetland.

3.4.3 Floodplains

The site's topographic setting renders major flooding unlikely; local run-off and flooding is adequately accommodated by natural and man-made drainage systems in and around the WVDP (WVNS 2000b). Flood levels for the 100-year and the 500-year storms show that no facilities on the Project Premises are in either floodplain (FEMA 1984).

Cattaraugus and Buttermilk creeks lie in deep, narrow valleys. Therefore, the effects on the WVDP of flooding by these creeks are negligible, as supported by historical data. Frank's Creek, Quarry Creek, and Erdman Brook are also located in deep valleys. Historical evidence and computer modeling indicate that flood conditions (including the probable maximum flood) will not result in stream flows overtopping their banks and flooding the plateau. However, indirect damage from the erosional effects of high stream flows and excessive slope saturation during flood conditions is a possibility. The facilities likely to be most affected by bank failure and gully head advancement due to extreme precipitation are lagoons 2 and 3, the NDA, and site access roads in several places (WVNS 2000b).

In the case of a hypothetical flood with peak discharge nearly eight times that of a 100-year flood, computer modeling suggests that floodwaters would overtop Rock Springs Road and some part of the floodwaters would flow across the plant area. Based on the topography in the plant area, it is likely that some portions of the site would experience shallow flows of moderate velocity. Flows would recede quickly, however, since the ditches that drain the site have gradients of up to 5 percent.

3.5 LAND USE AND VISUAL SETTING

The WVDP site consists of approximately 0.9 square kilometer (0.3 square mile) within the 14-square-kilometer (5-square-mile) Western New York Nuclear Service Center. It is located within the Cattaraugus highlands, which is a transitional zone between the Appalachian Plateau to the south and east and the Great Lakes Plain to the north and west. The Cattaraugus highlands range in elevation from 300 to 550 meters (1,000 to 1,800 feet). Deep valleys dissect rather flat-topped plateaus and support a climax plant community of northern hardwoods substantially reduced by agricultural activities (WVNS 2000b).

Slopes range from less than 5 percent to greater than 25 percent, with 5 to 15 percent slopes predominant. The Western New York Nuclear Service Center is drained by Buttermilk Creek, which flows into Cattaraugus Creek. Prior to 1961, much of the Center was cleared for agriculture. As a result, the Center now consists of a mixture of abandoned agricultural areas in various stages of ecological succession, forested tracts, and wetlands and transitional ecotones between these areas. The generally acidic and poorly drained soils influence the occurrence, distribution, and relative abundance of plant communities and their associated faunal species. The region's temperate climate is not prone to natural forest or grassland fires (WVNS 2000b).

The WVDP is on a plateau in the central portion of the Western New York Nuclear Service Center. The WVDP plateau elevation is approximately 430 meters (1,400 feet). The plateau margins are subject to erosion, especially along the banks of gully and stream drainage ways that cut into the plateau and feed to several named streams that, in turn, feed into Buttermilk Creek (WVNS 2000b).

The Western New York Nuclear Service Center is owned and controlled by NYSERDA. However, by cooperative agreement between NYSERDA and DOE, NYSERDA has agreed not to use or authorize use of the Center in a manner that would interfere with DOE's carrying out the waste solidification project under the West Valley Demonstration Project Act. DOE provides general surveillance and security services for the entire Center, including the WVDP site (WVNS 2000b).

Rock Springs Road, a county road, traverses the Western New York Nuclear Service Center immediately to the west of the WVDP site. If required by an emergency situation at the WVDP, access to this road can be controlled by Cattaraugus County authorities (WVNS 2000b).

The Western New York Nuclear Service Center (Figure 1-1) is fenced with barbed wire. The boundary is patrolled by security officers in vehicles at random several times a day. The WVDP site, also referred to as the Security Area, is surrounded by a high chain-link fence and can be entered only through one of three gates. Access is controlled through the use of magnetically coded picture badges, which also must be displayed at all times within the Security Area (WVNS 2000b).

All project-specific activities are performed within the WVDP site boundary. The New York State licensed LLW burial area (SDA), which is currently inactive, is located within the WVDP site boundary but is not part of the project. Figure 1-2 delineates the Project Premises area and the SDA (WVNS 2000b).

The WVDP is an industrial facility that is visible from several miles away, depending on location. It is well lit at night.

Site Vicinity Land Use

Land use within 8 kilometers (5 miles) of the site is predominantly agricultural (active and inactive) and forestry uses. The major exception is the Village of Springville, which comprises residential/commercial and industrial land uses (WVNS 2000b).

The industries near the site are light-industrial and commercial (either retail or service oriented). A field review of an 8-kilometer (5-mile) radius did not indicate the presence of any industrial facilities that would present a hazard in terms of safe operation of the site.

A similar land-use field review of the Village of Springville and the Town of Concord did not indicate the presence of any significant industrial facilities. Industrial facilities near the Western New York Nuclear Service Center include Winsmith-Peerless Winsmith, Inc., a gear reducer manufacturing facility; Robinson/Fiddlers Green Manufacturing Company, Inc., a plastic housewares and knives manufacturing facility; Ashford Concrete Co., Inc., a readi-mix concrete supplier and concrete equipment manufacturing facility; and Springville Manufacturing, a fabricating facility for air cylinders (WVNS 2000b). The industries within the Village of Springville and the Town of Concord, Erie County, are located in a valley approximately 6 kilometers (4 miles) to the north and east of the WVDP.

3.6 SOCIOECONOMICS

This section briefly describes the socioeconomic environment at the Project Premises and surrounding areas, focusing on the population distribution within 80 kilometers (50 miles) and the identification of minority and low-income populations within this area. Because employment levels are not anticipated to change under any of the alternatives evaluated in this EIS, there would be no potential to impact the economy of the local area or the region. Therefore, this section is limited to the characterization of population distribution necessary to support the assessment of human health impacts from the proposed actions.

3.6.1 Population

Data collected during the 2000 Census continue to indicate relatively stable overall population levels in the 12 counties surrounding the Western New York Nuclear Service Center. The area within 16 kilometers (10 miles) of the site lies within Cattaraugus and Erie counties. The total population in these counties has decreased by 3.3 percent since the 1990 census, with a loss of 1.9 percent in Erie County and 0.3 percent in Cattaraugus County. The population and median household income of the 12 New York and Pennsylvania counties that lie within 80 kilometers (50 miles) of the site are presented in Table 3-2. Average income in all counties in the region for 2000 was above the poverty level of $17,600 for a family of four (USCB 2001).

Table 3-2. Socioeconomic Conditions in the 12 Counties Surrounding West Valley, New York

County	Population (2000 Census)	Percent Change Since 1990	Persons per Square Mile	Median Household Income
Allegany County, NY	49,927	-1.10	48.5	31,291
Cattaraugus County, NY	83,955	-0.30	64.1	31,348
Chautauqua County, NY	139,750	-1.50	131.6	31,051
Erie County, NY	950,265	-1.90	910.2	36,711
Genessee County, NY	60,370	0.50	122.2	37,859
Livingston County, NY	64,328	3.10	101.8	39,354
Niagara County, NY	219,846	-0.40	420.4	36,218
Steuben County, NY	98,726	-0.40	70.9	33,732
Wyoming County, NY	43,424	2.20	73.2	35,915
McKean County, PA	45,936	-2.50	46.8	32,517
Potter County, PA	18,080	8.20	16.7	30,554
Warren County, PA	43,863	-2.60	49.7	33,863

Source: USCB 2001.

Figures 3-5 and 3-6 present population densities by the 15 points of the compass. Using the Project Premises plant as the center point, concentric, annular rings were drawn from the plant starting in 1-kilometer (0.6-mile) increments out to 5 kilometers (3 miles); a single 5-kilometer (3-mile) increment out to 10 kilometers (6 miles); and 10-kilometer increments out to 80 kilometers (50 miles). Figure 3-5 plots the data within 80 kilometers but, due to scale limitations, it cannot adequately portray data within 5 kilometers; therefore, Figure 3-6 provides data within 5 kilometers. The total calendar year 2000 U.S. population within 80 kilometers was 1,535,963 (USCB 2001). The population in Canada in 2001 within 80 kilometers of the WVDP site was 148,304 (Statistics Canada 2001a, 2001b).

3.6.2 Employment

DOE estimates that the waste management activities evaluated in this EIS would be accomplished by the existing work force with the technical capabilities now in use at the Western New York Nuclear Service Center. Based on the current employment of approximately 500 persons at the Center, no increases in employment would be anticipated to implement any of the alternatives proposed for this project. Evaluations in this EIS are based on continuation of current program funding and employment levels at the Center for the duration of all three alternatives. Funding for the WVDP and the Center is subject to change on an annual basis, and decreases or increases in the levels of program funding and related increases or decreases in employment levels are always possible.

3.6.3 Public Services

This section describes the public services currently available to the Project Premises and surrounding areas.

3.6.3.1 Human Services

The Cattaraugus County Health Department provides health and emergency services for the entire county, with the closest locations to the Western New York Nuclear Service Center being in the towns of Machias and Little Valley. Other resources providing health care services to the West Valley include Service Medical, Springville Pediatrics, Concord Medical Group, and several private physician practices located in Springville. The closest hospital to the Center is the Bertrand Chaffee Hospital, located approximately 6 kilometers (4 miles) north on Route 39 in Springville. A written protocol for WVDP-related emergency medical needs provides the basis for support in the event of emergency from Bertrand Chaffee Hospital (WVNS 1992b) and the Erie County Medical Center.

3.6.3.2 Community Water Supplies

The Western New York Nuclear Service Center has its own reservoir and water treatment system to service the facility. The system provides potable and facility service water for operating systems and fire protection. A reservoir system created by damming tributaries of Buttermilk Creek south of the Project site is the raw water source for the non-community, non-transient water supply operated by the WVDP. Two outlying buildings outside the Project site have wells that supply sanitary facilities (WVNS 1992b).

The hamlet of the West Valley community water supply is supplied by a spring that is piped to a reservoir. The reservoir supplies water to the hamlet through water mains. The other hamlets in Ashford Township, Ashford Hollow and Riceville, do not have community water supply systems; each individual residence has its own private well. The Village of Springville community water system is supplied by three groundwater wells (WVNS 1992b).

3.6.3.3 Fire and Police Protection

The West Valley Volunteer Hose Company provides fire protection services to the Western New York Nuclear Service Center and the Township of Ashford. Responders are trained and briefed yearly by the Radiation and Safety Department at the Center, and they have some limited training and capability to assist in chemical or radioactive occurrences. The West Valley Volunteer Fire Department has an agreement with the bordering towns' fire departments for mutual assistance in situations needing emergency backup. These neighboring volunteer fire departments are the William C. Edmunds Fire Company (East Otto), Ellicottville Volunteer Fire Department, Machias Volunteer Fire Department, Chaffee-Sardinia Memorial Fire Department, Delevan Volunteer Fire Department, East Concord Volunteer Fire Department, and Springville Volunteer Fire Department (WVNS 1992b).

The New York State Police and the Cattaraugus County Sheriff Department have overlapping jurisdictions for the West Valley area. Any assistance needed may be obtained from the state or county police departments (WVNS 1992b).

3.6.4 Transportation

Transportation facilities near the WVDP include highways, rural roads, a rail line, and aviation facilities. The primary method of transportation in the site vicinity is motor vehicle traffic on the highway system (Figure 3-7).

All roads in Cattaraugus County, with the exception of those within the cities of Olean and Salamanca, are considered rural roads. Rural principal arterial highways are connectors of population and industrial centers. This category includes U.S. Route 219, located 4.2 kilometers (2.6 miles) west of the site; Interstate 86, the Southern Tier Expressway located approximately 35 kilometers (22 miles) south of the site; and the New York State Thruway (I-90), approximately 35 kilometers (22 miles) north of the site. Traffic volume along U.S. 219 between the intersection with NY Route 39 at Springville and the intersection with Cattaraugus County Route 12 (East Otto Road) ranges from a low average annual daily traffic volume of 6,100 to a high volume of 7,500. Seasonal holiday traffic is as much as 128 percent of the average annual daily volume. Approximately 18 percent of the traffic consists of trucks. This route operates at a level of service B, which indicates a stable traffic flow, an operating speed of 80 kilometers per hour (50 miles per hour), and reasonable driver freedom to maneuver (WVNS 2000b).

Rock Springs Road, adjacent to the site on the west, serves as the principal site access road. The portion of this road between Edies Road and U.S. 219 is known as Schwartz Road. Along this road, between the site and the intersection of U.S. 219, are fewer than 24 residences. State Route 240, also identified as County Route 32, is 2 kilometers (1.2 miles) northeast of the site. Average annual daily traffic on the portion of NY Route 240 that is proximate to the site (between County Route 16 - Rosick Hill Road and NY Route 39) ranges from a low of 440 to a high of 2,250 (WVNS 2000b).

The Buffalo and Pittsburgh Railroad line is located within 800 meters (2,600 feet) of the Project Premises. Running from Salamanca, New York, north to Buffalo, the Buffalo and Pittsburgh Railroad line carries a variety of freight and coal north and freight and newly manufactured vehicles south from Canada. As a result of the general decline of heavy industry on the Niagara Frontier and of rail traffic in the northeast, use of this route has also declined. In recent years, the tracks have also experienced several washouts and kindred problems, forcing traffic rerouting for extended periods. While railroad accidents are not uncommon in the United States, the relatively low utilization of the line in the vicinity of the WVDP, coupled with the demographic factors outlined above, tend to minimize the likelihood of an accident with consequences for site operations. This conclusion is reinforced by the presence of a deep ravine with perennial streams between the tracks and the Project Premises. These features reduce the threat of rail accident, which might result in a fire or a spill affecting the project. An airborne threat from a rail accident still exists but is also significantly mitigated by both distance and topography of the site from the rail line. In 1999, the Buffalo & Pittsburgh Railroad completed connection of track between Ashford Junction and Machias, New York. Service by Buffalo and Pittsburgh Railroad on the rail line from the WVDP to Ashford Junction and then to Machias now provides the WVDP rail access (WVNS 2000b).

There are no commercial airports in the site vicinity. The only major aviation facility in Cattaraugus County is the Olean Municipal Airport, located in the Town of Ischua, 34 kilometers (21 miles) southeast of the site. Regularly scheduled commercial air service was terminated at this airport in early 1972. The nearest major airport is Buffalo Niagara International Airport, 55 kilometers (34 miles) north of the site (WVNS 2000b).

3.7 CULTURAL RESOURCES

Cultural resources include but are not limited to:

- Archaeological materials (artifacts) and sites dating to the prehistoric, historic, and ethnohistoric periods currently located on the ground surface or buried beneath it;
- Standing structures that are over 50 years of age or are important because they represent a major historical theme or era;
- Cultural and natural places, select natural resources, and sacred objects that have importance for American Indians; and
- American folklife traditions and arts (WVNS 1994).

The cultural resource potential of the study area was initially considered to be moderate to high for locating unrecorded prehistoric and/or historic resources. Subsequent investigations indicated that these sensitivities were moderated by the extremely high degree of natural erosion and manmade impacts that have occurred in the study area. Cultural resource materials were found and 11 cultural resource sites were identified. The resources included eight historic archaeological sites, two standing structures, and one prehistoric lithic findspot (WVNS 1994).

The Project Premises, in which the proposed waste management actions described in Chapter 2 would take place, contain 114 buildings and structures. The New York State Office of Parks, Recreation, and Historic Preservation has determined that facilities on the Premises are not eligible for inclusion in the *National Register of Historic Places* (SHPO 1995).

3.8 ENVIRONMENTAL JUSTICE

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 Fed. Reg. 7629), directs federal agencies 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. Minorities are members of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander. A minority population has been defined as a group in which minorities represent over 50 percent of the population. Low-income populations are groups with an annual income below the poverty threshold.

Demographic information obtained from the U.S. Census Bureau was used to identify low-income and minority populations within 80 kilometers (50 miles) of the WVDP site. This radius is consistent with that used to evaluate collective dose for human health effects from the proposed waste management actions, continued operations, and accidents. Census data are compiled at a variety of levels corresponding to geographic areas. In order of decreasing size, the areas used are states, counties, census tracts, block groups, and blocks. A "block" is geographically the smallest census area; is usually bounded by visible features such as streets or streams or by invisible boundaries such as city limits, township lines or property boundaries; and offers the finest spatial resolution. Block data were used for characterization of minority distribution. Because block data are so specific to the individuals within a block (for example, sometimes only one family may live in a block), income data are only available at the block group and above. For this reason, block group data were used to identify low-income populations.

Demographic maps were prepared using 2000 data for minority populations and 1990 census data for low-income populations because income data from the 2000 Census were not available for the preparation of this DEIS. If available they will be incorporated into the FEIS. Figures 3-8 and 3-9 illustrate the distributions for minority and low-income populations, respectively. These figures include information for the affected Canadian population.

Using block data, Figure 3-8 shows census blocks with minority populations that are over 50 percent within 80 kilometers (50 miles). The nearest block occurs on the Cattaraugus Reservation of the Seneca Nation of Indians. As shown in Figure 3-8, there are also two other Native American Indian reservations within 80 kilometers: the Allegheny Reservation (10 to 25 percent minority) and the Tonawanda Reservation (25 to 49 percent minority). There are several other census blocks with minority populations that are over 50 percent in the Buffalo metropolitan area. The total minority U.S. population within the 80-kilometer radial distance from the WVDP site accounts for approximately 13 percent of the population in the area, or about 207,852 people. The racial and ethnic composition of this population is predominantly African-American and Hispanic (USCB 2001).

Using block group data from 1990 (income data were not yet available for 2000), Figure 3-9 (DOE 1996) identifies no block groups with an average income below the 1990 poverty level of $12,670 for a family of four. A further assessment of the census data determined that within the 80-kilometer (50-mile) area, approximately 13 percent of the U.S. population was low-income (DOE 1996). The poverty level established by the Census Bureau for 2000 is $17,600. Because this increase from 1990 is based on the annual increases in the consumer price index, it is likely that the regional percentages of low-income have not changed significantly.

3.9 DESCRIPTION OF OTHER SITES

In addition to activities at WVDP, implementation of the proposed action or alternatives would involve activities at one or more offsite locations. Sections 3.9.1 through 3.9.8 briefly discuss the affected environment at these offsite locations. Information regarding Envirocare was taken from its website (Envirocare 2002). Information regarding most of the potentially affected DOE sites was excerpted from the WM PEIS (DOE 1997a) and the WIPP Supplemental EIS II (DOE 1997b). Information regarding the Yucca Mountain site was excerpted from the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE 2002). Additional information regarding these sites is available from the documents noted (and which are incorporated here by reference) and in the other NEPA documents described in Section 1.7, Relationship with Other NEPA Documents.

3.9.1 Envirocare

Envirocare is a private facility licensed by the State of Utah (an NRC Agreement State) to accept Class A LLW. Envirocare is also a RCRA facility that is licensed by the State of Utah and the EPA to receive, possess, use, treat, and dispose of mixed waste. Waste material is disposed of in aboveground, engineered disposal cells that meet regulatory disposal requirements. The facility is located in Clive, Utah, approximately 80 kilometers (50 miles) west of Salt Lake City. Located in a remote area with an arid climate (annual precipitation is approximately 170 millimeters [7 inches] per year), Envirocare received its first DOE waste shipments in 1992 and has received waste shipments from 25 DOE sites. Envirocare is located adjacent to a major rail line and U.S. Interstate Highway 80.

3.9.2 Hanford Site

The Hanford Site has a number of facilities, including retired plutonium production reactors, waste management and spent nuclear fuel processing facilities, and nuclear research and development laboratories. The site occupies approximately 1,450 square kilometers (560 square miles) of semi-arid desert land in southeastern Washington State, approximately 192 kilometers (119 miles) southwest of Spokane and 240 kilometers (150 miles) southeast of Seattle. The nearest city, Richland, borders the site on its southeast corner. The site is bounded on the east by the Columbia River, on the west by the Rattlesnake Hill, and on the north by Saddle Mountain. U.S. Highways 12 and 395, Interstate-82, and State Route 240 run near the Hanford Site. Two railroads also connect the area with much of the rest of the nation.

3.9.3 Idaho National Engineering and Environmental Laboratory

Currently, the focus of INEEL is environmental restoration, waste management, research, and technology development. Included within the boundaries of the site are the Naval Reactors Facility and Argonne National Laboratory-West. INEEL occupies 2,300 square kilometers (890 square miles) of desert in the southeastern portion of Idaho, approximately 44 kilometers (27 miles) west of Idaho Falls on the Eastern Snake River Plain. The site is bordered by mountain ranges and volcanic buttes. Land at INEEL is used for DOE operations (about 2 percent of the site), recreation, grazing, and environmental research. About 144 kilometers (90 miles) of paved public highway run through INEEL; railroads also serve the area.

3.9.4 Nevada Test Site

NTS has been the primary location for testing the nation's nuclear explosive devices since 1951. The site occupies 3,500 square kilometers (1,350 square miles) of desert valley and Great Basin mountain terrain in southern Nevada, 105 kilometers (65 miles) northwest of Las Vegas, Nevada. The only permanent onsite water bodies are ponds associated with wastewater disposal and springs. No continuously flowing streams occur on the site. Vehicular access to NTS is provided by U.S. Route 95 from the south. Interstate-15 is the major transportation route in the region. The major railroad in the area is the Union Pacific, which runs through Las Vegas and is located approximately 80 kilometers (50 miles) east of the site.

3.9.5 Oak Ridge National Laboratory

ORNL is part of the ORR, which also contains the Y-12 Plant, the East Tennessee Technology Park (formerly known as K-25), and the Oak Ridge Institute of Science and Education. ORNL's mission is to conduct applied research and development in support of DOE programs in fusion, fission, conservation, and other energy technologies. The ORR occupies 140 square kilometers (34,545 acres) and is located in the City of Oak Ridge, Tennessee, and 32 kilometers (20 miles) west of Knoxville, Tennessee, in the rolling terrain between the Cumberland Mountains and Great Smoky Mountains. The Clinch River and its tributaries are the major surface water features of the area. Interstate-40, located 2.4 kilometers (1.5 miles) south of the ORR boundary, provides the main access to the cities of Nashville and Knoxville. Interstate-75, located 24 kilometers (15 miles) south of the site, serves as a major route to the north and south. Several state routes provide local access and form interchanges with Interstate-40. Railroad service is also available in the area.

3.9.6 Savannah River Site

DOE activities conducted at SRS have involved tritium recycling, support for the nation's space program missions, storage of plutonium on an interim basis, processing of backlog targets and spent nuclear fuel, waste management, and research and development. SRS is approximately 20 kilometers (12 miles) south of Aiken, South Carolina in southwest-central South Carolina. It is on approximately 800 square kilometers (198,000 acres) of land in a principally rural area, with most of the land serving as a forestry research center. The primary surface water feature is the Savannah River, which borders the site for approximately 32 kilometers (20 miles) to the southwest. Six major streams flow through SRS into the Savannah River, and approximately 190 Carolina bays are scattered throughout the site. Interstate-20 is located approximately 29 kilometers (18 miles) northeast of SRS, providing the nearest interstate access to the site. Railroad service is also available through SRS.

3.9.7 Waste Isolation Pilot Plant

WIPP is located in southeastern New Mexico, about 50 kilometers (30 miles) east of Carlsbad, New Mexico, in a relatively flat, sparsely inhabited plateau with little surface water. The constructed underground facilities include four shafts, an experimental area, an equipment and maintenance area, and connecting tunnels. These underground facilities were excavated 655 meters (2,150 feet) beneath the land surface. The site can be reached by rail or highway. DOE has constructed a rail spur to the site from the Burlington Northern and Santa Fe Railroad 10 kilometers (6 miles) west of the site. The site can also be reached from the north and south access roads constructed for the WIPP project. The south access road intersects New Mexico Highway 128 approximately 7 kilometers (4 miles) to the southwest of WIPP.

3.9.8 Yucca Mountain Repository

The Yucca Mountain Repository has been approved by the President and Congress for further development as the nation's first geologic repository for HLW and spent nuclear fuel. The site, located in the southwest corner of NTS, is in a remote area of the Mojave Desert in southern Nevada, about 160 kilometers (100 miles) northwest of Las Vegas, Nevada. The Yucca Mountain region is sparsely populated and receives only about 170 millimeters (7 inches) of precipitation each year. The area is characterized by a very dry climate, limited surface water, and generally deep aquifers. Shipments of HLW and spent nuclear fuel arriving in Nevada would travel to the Yucca Mountain site by truck or rail. At present, there is no rail access to the Yucca Mountain site. If material were shipped by rail, a branch line that connected an existing main line to the Yucca Mountain site would have to be built or the material would have to be transferred to heavy-haul trucks at an intermodal transfer station and transported over existing highways that might need upgrading.

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter describes the impacts that would result from implementing the waste management alternatives described in Chapter 2. As an aid to the reader, this chapter begins with a guide to understanding the human health and transportation analyses (Section 4.1), followed by a summary of the impacts of the alternatives (Section 4.2).

The three alternatives and the sections in which they are fully discussed are:

- No Action Alternative – Continuation of Ongoing Waste Management Activities (Section 4.3);
- Alternative A – Offsite Shipment of HLW, LLW, Mixed LLW, and TRU Waste to Disposal – Preferred Alternative (Section 4.4); and
- Alternative B – Offsite Shipment of LLW and Mixed LLW to Disposal and Shipment of HLW and TRU Waste to Interim Storage (Section 4.5).

The potential for minority and low-income populations to bear a disproportionate share of high and adverse impacts from the proposed activities is discussed in Section 4.6.

The analyses in this chapter are limited to human health and transportation impacts. None of the proposed alternatives would require changes in the workforce or additional facilities at the WVDP premises; therefore, they would not affect the surrounding natural and cultural environments.

Additional information regarding the methodology used to conduct the analyses is contained in Appendices C and D.

As characterized in Chapter 2, the waste management activities assessed in this EIS would occur in the following facilities at the WVDP site: the Process Building; the Tank Farm; the LSB; LSAs 1, 3, and 4; the Chemical Process Cell Waste Storage Area; and the Radwaste Treatment System Drum Cell. This EIS evaluates proposed activities necessary to (1) store or prepare wastes for shipping, including loading containerized wastes onto transportation vehicles; (2) ship wastes to offsite disposal or interim storage; and (3) manage the emptied waste storage tanks until final decommissioning or long-term stewardship decisions can be made in the future.

The waste management actions proposed under all alternatives would be conducted in existing facilities (or in the case of waste transportation, on existing road and rail lines) by the existing work force and would not involve new construction or building demolition. Ongoing facility operations would continue, unaffected by the proposed actions assessed in this EIS. As a result, the scope of potential impacts that could result from the proposed actions is limited. Specifically, because there would be no mechanism for new land disturbance under any alternative, there would be no potential to directly or indirectly impact current land use; biotic communities;[1] cultural, historical, or archaeological resources; visual resources;

[1] In comments submitted on the draft version of this EIS, the U.S. Fish and Wildlife Service concurred in DOE's determination that no federally listed or proposed endangered or threatened species are known to exist in the project impact area and that no habitat in the project impact area is currently designated or proposed critical habitat in accordance with the provisions of the Endangered Species Act, 16 U.S.C. 1531 et seq. However, DOE would contact the U.S. Fish and Wildlife Service's New York Field Office for updated information on the presence of listed species or their habitat within 1 year prior to implementing the Record of Decision.

ambient noise levels; threatened or endangered species or their critical habitats; wetlands; or floodplains. Additionally, because the work force requirements would be the same under all alternatives (for example, there would be no increases or decreases from current employment levels), there would be no potential for socioeconomic impacts. Therefore, these elements of the affected environment would not be impacted by any actions proposed under the three alternatives and will not be discussed further in this chapter.

None of the onsite management activities under any of the alternatives would result in any new criteria air pollutant emissions (nitrogen dioxide, sulfur dioxide, carbon monoxide, and particulate matter). As shown in Section 3.3.2, the ambient air quality in the region of the Center complies with federal and state ambient air quality standards. Impacts of criteria air pollutant emissions resulting from transportation activities are incorporated in the transportation analysis. Radioactive emissions that could result from ongoing management are addressed under the human health analysis. Therefore, this chapter includes no further discussion of air quality impacts.

Consistent with DOE and Council on Environmental Quality NEPA guidance, the analysis of impacts in the following sections focuses on those limited areas in which impacts may occur from any action proposed by the three alternatives assessed in this EIS. Because of the limited scope of the proposed actions, there would be potential for impacts to only the workers and the public from the proposed onsite waste management actions, ongoing operations, and the offsite shipping of wastes.

4.1 UNDERSTANDING THE ANALYSIS

This section describes how impacts to worker and public human health from onsite waste management and offsite shipping were analyzed. This discussion is intended to help the reader understand the impacts described for each alternative in subsequent sections.

4.1.1 Human Health Impacts

4.1.1.1 Routine Operations

The waste management activities that would be undertaken under each of the three alternatives analyzed would result in the exposure of workers to radiation and exposure of the public to very small quantities of radioactive materials from controlled releases to the environment. Radiation can cause a variety of ill-health effects in people, including cancer.

To determine whether health effects could occur as a result of radiation exposure from a particular activity and the extent of such effects, the radiation dose must be calculated. An individual may be exposed to radiation externally, through a radiation source outside of the body, and/or internally from ingesting or inhaling radioactive material. The dose is a function of the exposure pathway (for example, external exposure, inhalation, or ingestion) and the type and quantity of radionuclides involved.

The unit of radiation dose for an individual is the rem. A millirem (mrem) is 1/1,000 of a rem. The unit of dose for a population is person-rem and is determined by summing the individual doses of an exposed population. Dividing the

Exposure Standards

The following radiation protection standards were established by the EPA and DOE.

- *EPA:* 10-mrem radiation dose per year to the maximally exposed individual member of the public from airborne releases (40 CFR Part 61, Subpart H, *National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities*)
- *DOE:* 100-mrem dose per year to the maximally exposed individual member of the public through all exposure pathways (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*)
- *DOE*: 5-rem dose per year for workers (10 CFR 835, *Occupational Radiation Protection*)

person-rem estimate by the number of people in the population indicates the average dose that a single individual could receive. The impacts from a small dose to a large number of people can be approximated by the use of population (collective) dose estimates.

After the dose is estimated, the health impact is calculated from current internationally recognized risk factors. The potential health impact is stated in terms of the probability of a latent cancer fatality (a fatality resulting from a cancer that was originally induced by radiation but which may occur years after the exposure) to an individual or the number of latent cancer fatalities expected in a population.

To estimate the human health impact from radiation dose, a dose-to-risk factor that indicates the potential for a latent cancer fatality is used. The dose-to-risk factor for low (less than 20 rem) annual doses is 6×10^{-4} of a latent cancer fatality per person-rem for the general public, which includes the very young and the very old, and 5×10^{-4} for the worker population. For example, a population dose of 1,700 person-rem is estimated to result in 1 additional cancer fatality ($0.0006 \times 1,700 = 1$) in the general public.

Calculations of the number of latent cancer fatalities associated with radiation doses often do not yield whole numbers, and the number may be less than 1. For example, if a population of 1,000,000 people each received a radiation dose of 1 mrem (1×10^{-3} rem) per person, the population dose would be 1,000 person-rem. The number of latent cancer fatalities would be 0.6 (1,000,000 persons × 0.001 rem × 0.0006 latent cancer fatalities per person-rem = 0.6 latent cancer fatalities). The value of 0.6 is the average number of latent cancer fatalities that would occur if the same radiation dose were applied to many different groups of 1,000,000 people. Some groups would experience 1 latent cancer fatality from the radiation dose, some groups would experience no latent cancer fatalities from the radiation dose, and the average would be 0.6. In this context, the value of 0.6 is often referred to as the probability of a latent cancer fatality in the exposed population of 1,000,000 people.

For perspective, it is estimated that the average individual in the United States receives a dose of about 300 mrem (0.3 rem) each year from natural sources of radiation. The probability of a latent cancer fatality corresponding to a single individual's exposure over an assumed 72-year lifetime to 300 mrem annually is about 0.013 or about 1 in 80 (1 person × 300 mrem per year × 1 rem per 1,000 mrem × 72 years × 0.0006 latent cancer fatalities per person-rem = 0.013 latent cancer fatality). If 1,000,000 people were exposed to 300 mrem per year over a 72-year lifetime, about 13,000 latent cancer fatalities would be estimated to occur (1,000,000 people × 300 mrem/year × 72 years × 6E-7 latent cancer fatalities/mrem = 13,000 latent cancer fatalities).

Under all alternatives, people near the WVDP site would be exposed to radionuclides (radioactive atoms) that are released to the atmosphere and to surface water during normal ongoing operations at the site. For this EIS, DOE estimated the radiation doses from those releases using the GENII computer model (Napier et al. 1988). People were assumed to inhale radioactive material and to be exposed to external radiation from the radioactive material released during normal ongoing operations. People were also assumed to ingest radioactive material through foodstuffs such as leafy vegetables, produce, meat, and milk and to be

Ongoing Operations

Under all alternatives, it is assumed that current levels of maintenance, surveillance, heating, ventilation, and other routine operations would continue to be required while the actions proposed under each alternative were performed. For this EIS, these actions are called *ongoing operations*. Although the impacts of these ongoing actions have been assessed in several previous NEPA documents and are characterized in the Annual Site Environmental Reports, the impacts on worker and public health of these ongoing operations have been included in this EIS using actual operational data from 1995 through 1999. Because ongoing operations would not vary among the proposed alternatives, the impacts from these actions would be the same across all alternatives.

exposed through activities such as swimming and boating; inadvertent soil ingestion; inhaling resuspended radioactive material; drinking water; and consuming fish from Lake Erie.

Human Health Impacts

DOE estimated radiation doses to:

- Involved workers
  - Worker population
  - Individual workers
- Noninvolved workers
  - Worker population
  - Individual workers
- Members of the public
  - Collective population
  - Maximally exposed individual

Using accepted dose-to-risk conversion factors, DOE calculated the probability that an individual would suffer a latent cancer fatality or that a latent cancer fatality would occur within the exposed population.

DOE analyzed the exposure of members of the public and workers to radiation or radioactive releases as a result of the alternatives. For workers, DOE analyzed the exposure of both involved and noninvolved workers at the site. Involved workers are those who would be undertaking the proposed waste management activities analyzed in this EIS. They would be exposed to radioactive releases from both the waste management activities and the ongoing operations of the site. Noninvolved workers are those workers who would be present on the site but who would not be conducting the proposed waste management activities. These workers would be conducting activities related to the ongoing operations of the WVDP site. Doses to the worker populations and to individual workers were estimated.

For the public, dose estimates were derived for both the maximally exposed individual (a member of the public located nearest to the site) and the collective U.S. population within 80 kilometers (50 miles) of the site. Dose estimates for the affected Canadian population were not included but would be very small because of the distance of this population from the WVDP site and the prevailing southwesterly wind direction.

For both the public and workers, DOE then calculated the probability that the maximally exposed individual would suffer a latent cancer fatality if exposed to that radiation dose and the probability that a latent cancer fatality would occur within the exposed U.S. population.

Additional information regarding the analysis of human health impacts under routine operations can be found in Appendix C.

4.1.1.2 Accident Conditions

For this EIS, DOE evaluated a wide range of potential facility accidents at the WVDP site that could result from handling mishaps, fires, or spills, or from external events such as high winds or earthquakes. Although a great many accidents could occur at WVDP facilities, only a few accidents could potentially result in an uncontrolled release of radioactive material to the environment.

Of the accidents that were evaluated, DOE selected 12 accidents for further evaluation using the GENII computer model (Napier et al. 1988). These accidents were selected because they could result from operations and activities that were determined to present the greatest risk, based on their accident consequence and probability.

The chance that an accident might occur during the conduct of an activity is called the probability of occurrence. An event that is certain to occur has a probability of 1 (as in 100 percent certainty). The probability of occurrence of an accident is less than 1 because accidents, by definition, are not certain to occur. However, in its accident analysis, when calculating the probability of a latent cancer fatality occurring as a result of exposure to radiation in particular accident situations, DOE did not take into account the probability of occurrence of the accident.

In an accident, radioactive material could be released from ground level or from a stack. Atmospheric conditions at the time of an accident would affect the dose received by workers, the maximally exposed individual, and the public. For that reason, DOE used two types of atmospheric conditions to estimate radiation doses: (1) atmospheric conditions that are not exceeded 50 percent of the time and provide a realistic estimate of the likely atmospheric conditions that would exist during an accident (50-percent atmospheric conditions), and (2) atmospheric conditions that are not exceeded 95 percent of the time and provide an upper bound on the atmospheric conditions that would exist during an accident (95-percent atmospheric conditions). Site-specific meteorological data from 1994 through 1998 (WVNS 2000a) were used to determine 50-percent and 95-percent atmospheric conditions.

After estimating the radiation that could be released as a result of specific postulated accidents at the WVDP site (the dose to workers or the public), DOE estimated the probability of latent cancer fatalities if those accidents were to occur. As with routine operations, DOE provides the probability of latent cancer fatalities under accident conditions for workers and members of the public (the maximally exposed individual and the collective population within 80 kilometers [50 miles] of the site). Estimates of latent cancer fatalities for Canadian populations were not included but would be very small because of the distance of this population from the WVDP site and the prevailing southwesterly wind direction.

Additional information regarding the analysis of human health impacts under accident conditions can be found in Appendix C.

4.1.2 Transportation Impacts

DOE analyzed the potential impacts of shipping radioactive waste from the WVDP site to a storage or disposal site under both incident-free and accident conditions. Representative highway and rail routes from the WVDP site to specific destinations were determined using the WebTRAGIS routing computer code (Johnson and Michelhaugh 2000). The routes conform to current routing practices and applicable routing regulations and guidelines. The populations that might be exposed along these routes were determined using data from the 2000 census.

The total impacts of transportation are the sums of the radiological and nonradiological incident-free and accident impacts (transportation impacts on Canadian populations would not be expected because the transportation routes would move generally in the opposite direction from the Canadian border). For incident-free transportation, the potential human health impacts were estimated for transportation workers and populations along the route, people sharing the route (in traffic), and people at stops along the route. The impacts from incident-free transportation are the radiological impacts from exposure to low levels of radiation from the radioactive waste containers and the nonradiological impacts from truck or train exhaust. The RADTRAN 5 computer code (Neuhauser et al. 2000) was used to estimate the impacts for transportation workers and populations. Impacts were also estimated for the maximally exposed individual, who may be a worker or a member of the public, using the RISKIND computer code (Yuan et al. 1995). The impacts for the maximally exposed individual are presented separately from the other incident-free transportation impacts.

Human health impacts could result from transportation accidents in which radioactive material could be released from a waste container and from traffic accidents in which no radioactive material would be released. For transportation accidents involving a release of radioactive material, DOE estimated radiological accident risks (probability of occurrence × consequence) expressed as the number of latent cancer fatalities summed over a complete spectrum of accidents. Impacts were evaluated for the population within 80 kilometers (50 miles) of the road or railway using the RADTRAN 5 computer code. DOE assumed that people would be exposed through inhalation, direct external dose from radioactive material that has deposited on the ground after being dispersed from the accident site (referred to as groundshine), and direct external dose from the passing cloud of dispersed radioactive material (referred to as cloudshine). In rural areas, DOE assumed that exposure could also occur through ingestion of agricultural products grown in contaminated soil. Consequences were also estimated for a severe transportation accident, known as the maximum reasonably foreseeable accident. These consequences were estimated using the RISKIND computer code and are presented separately from the other transportation accident impacts.

Additional information regarding the analysis of transportation impacts under both incident-free and accident conditions can be found in Appendix D.

4.2 SUMMARY OF IMPACTS

The actions proposed by the alternatives analyzed in this EIS would have an almost imperceptible impact on the health of the workers and the public, even when combined with the minimal impacts of ongoing operations. Health impacts for all alternatives under normal onsite operating conditions and offsite transportation would result in less than 1 cancer fatality among workers or the public.

4.2.1 Human Health Impacts

Waste management activities under each alternative would result in the exposure of workers to radiation and contaminated material and exposure of the public to very small quantities of radioactive materials. Because the proposed waste management actions would involve only the storage, packaging, loading, and shipping of wastes and management options for the waste storage tanks, the proposed activities would result in a statistically insignificant contribution to the historically low impacts of ongoing WVDP operations. As a result, the human health impacts to involved and noninvolved workers and the public are dominated by ongoing WVDP site operations that would continue under all alternatives; therefore, there would be little discernible difference in the impacts that could occur among the three alternatives. The potential human health impacts for onsite waste management actions are summarized below and demonstrate that the impacts of each alternative would result in less than 1 cancer fatality among workers or the public under normal operating conditions.

- Total Involved and Noninvolved Worker Population Dose (in person-rem)
  - No Action Alternative 150
  - Alternative A 210
  - Alternative B 210

- Latent Cancer Fatalities in Involved and Noninvolved Worker Population
  - No Action Alternative less than 1 (0.077)
  - Alternative A less than 1 (0.11)
  - Alternative B less than 1 (0.11)

- Total Public Population Dose (in person-rem)
  - No Action Alternative 2.5
  - Alternative A 2.5
  - Alternative B 2.5

- Latent Cancer Fatalities in Public Population
  - No Action Alternative — less than 1 (1.5×10^{-3})
  - Alternative A — less than 1 (1.5×10^{-3})
  - Alternative B — less than 1 (1.5×10^{-3})

- Total Maximally Exposed Individual Dose (in mrem)
  - No Action Alternative — 0.62
  - Alternative A — 0.62
  - Alternative B — 0.62

- Total Probability of Latent Cancer Fatality to Maximally Exposed Individual
  - No Action Alternative — 3.7×10^{-7}
  - Alternative A — 3.7×10^{-7}
  - Alternative B — 3.7×10^{-7}

Based on the detailed analyses provided later in this chapter and in Appendix C, under all alternatives, neither individual involved workers, the maximally exposed individual, nor the general public near the WVDP site would be expected to incur a latent cancer fatality under any atmospheric conditions if an accident were to occur during waste management activities. Among the accident scenarios evaluated, the projected latent cancer fatalities among the public ranged from a high of 0.084 to a low of 4.5×10^{-6}. The frequencies of these accidents ranged from 0.1 to 10^{-8} per year. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of the fractions of the biota concentration guides for these accidents was less than 1. Therefore, the radioactive releases from these accidents would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.2.2 Transportation Impacts

Projected impacts from offsite waste transportation were less than 1 latent cancer fatality among workers and the public for all three alternatives. Rail transportation was generally found to be slightly higher than, but similar to, the impacts from truck transportation. Impacts are also projected to be slightly higher for Alternative B due to the increased shipping required to move the TRU and HLW wastes to interim storage prior to ultimate disposal. Although the same number of shipments would be loaded at the WVDP site (2,250 truck or 847 rail), the total number of shipments required to reach disposal destinations would be higher under Alternative B due to the interim storage of TRU waste and HLW (see Table 2-3).

The transportation impacts that could result from transportation are summarized below.

- No Action Alternative
  - 169 truck or 85 rail shipments of Class A LLW
  - 0.034 – 0.041 fatalities expected from truck shipments
  - 0.042 – 0.049 fatalities expected from rail shipments

- Alternative A
  - 2,550 truck or 847 rail shipments of LLW, mixed LLW, TRU waste and HLW canisters
  - 0.79 – 0.82 fatalities expected for truck shipments
  - 0.60 – 0.68 fatalities expected for rail shipments

- Alternative B
  - 3,120 truck or 1,079 rail shipments of LLW, mixed LLW, TRU waste, and HLW canisters
  - 0.84 – 0.93 fatalities expected for truck shipments;
  - 0.66 – 0.79 fatalities expected for rail shipments

The consequences of the maximum reasonably foreseeable transportation accidents under each alternative would vary slightly among the alternatives and between truck and rail transport. Under the No Action Alternative, the maximum reasonably foreseeable transportation accident would involve Class A LLW. For truck transport, this accident could result in about 1 latent cancer fatality, and for rail about 2 latent cancer fatalities, among the exposed population. For Alternatives A and B, the maximum reasonably foreseeable truck or rail transportation accident with the highest consequences would involve CH-TRU waste. Because one TRUPACT-II shipping container was assumed to be involved in either the truck or rail accident, the consequences for the truck or rail accident would be the same. Among the exposed population, this accident could result in about 4 latent cancer fatalities. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of the fractions of the biota concentration guides for the Class A LLW accidents and the CH-TRU accident was less than 1. Therefore, the radioactive releases from the Class A LLW accidents and the CH-TRU accident would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.2.3 Offsite Impacts

Impacts of waste management activities at offsite locations (Envirocare, Hanford, INEEL, NTS, ORNL, SRS, WIPP, and Yucca Mountain) have been addressed in earlier NEPA documents (see Section 1.7.1). For all waste types, WVDP waste represents less than 2 percent of the total DOE waste inventory. Human health impacts at all sites as a result of the management (storage or disposal) of WVDP during the 10-year period of analysis would be very minor (substantially less than 1 latent cancer fatality).

4.3 IMPACTS OF THE NO ACTION ALTERNATIVE – CONTINUATION OF ONGOING WASTE MANAGEMENT ACTIVITIES

As described in Chapter 2, under the **No Action Alternative**, no additional waste management activities would be performed beyond those activities that have already been evaluated under prior NEPA analyses (Section 1.7.1) in accordance with the provisions of the Council on Environmental Quality Implementing Regulations for NEPA (40 CFR Parts 1500-1508). DOE would provide continued operational support and monitoring of the facilities to meet the requirements for safety and hazard management. Waste management activities currently in progress for onsite storage of existing wastes and offsite disposition of a limited quantity of Class A LLW to a facility such as Envirocare (a commercial radioactive waste disposal site in Clive, Utah) or NTS in Mercury, Nevada, would continue. For the purposes of analysis, however, offsite disposal of Class A LLW at Hanford was also considered. The emptied waste storage tanks would continue to be ventilated and maintained in either a wet or dry condition to mitigate corrosion until final decisions are reached in a ROD for the Decommissioning and/or Long-Term Stewardship EIS. Both wet and dry conditions were analyzed in this EIS. Under the No Action Alternative, active hazard management, operational support, surveillance, and oversight would continue at the current levels of activity. The waste management activities evaluated under this alternative would occur over the next 10 years.

4.3.1 Human Health Impacts (No Action Alternative)

This section characterizes the radiological impacts from the No Action Alternative activities that could result from exposure of workers to direct radiation and contaminated material and exposure of the public to small quantities of radioactive material from controlled releases to the environment. Nonradiological injuries and fatalities have also been estimated using Bureau of Labor Statistics on incident rates for construction, manufacturing, and services. The figures shown in the textbox provide the relative probabilities of cancer fatalities from more common sources of risk.

Comparative Risk

Cause of Death	**Approximate Probability**
Cancer	1 chance in 5
Lung cancer due to smoking	1 chance in 10
Cancer caused by background radiation	1 chance in 100
Second-hand smoke	1 chance in 700
Motor vehicle accident	1 chance in 5,000
Cancer due to CAT scan	1 chance in 20,000
Cancer due to chest x-ray	1 chance in 250,000

Worker Impacts. Under the No Action Alternative, waste management activities currently in progress would continue for onsite storage of existing wastes and offsite disposal of a limited quantity of Class A LLW. Management of the waste storage tanks would also continue as under current operations. Table 4-1 presents the radiological impacts to involved and noninvolved workers for the No Action Alternative. During the 10-year time period, the collective radiation dose to involved workers was estimated to be about 4.1 person-rem or about 0.41 person-rem per year from activities under the No Action Alternative. Over this same time period, the individual radiation dose to the average involved worker would be about 68 mrem per year.

Table 4-1. Radiation Doses for Involved and Noninvolved Workers Under the No Action Alternative

Worker Population	Activity	Time Period (years)	Collective Dose		Latent Cancer Fatalities	
			Annual (person-rem/yr)	Total (person-rem)	Annual	Total
Involved workers[a]	No Action Alternative activities	10	0.41	4.1	2.1×10^{-4}	2.1×10^{-3}
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	15	150	7.5×10^{-3}	0.075
All workers	Total	10	15	150	7.7×10^{-3}	0.077

Worker Population	Activity	Time Period (years)	Individual Dose		Latent Cancer Fatalities	
			Annual (mrem/yr)	Total (mrem)	Annual	Total
Involved workers[a]	No Action Alternative activities	10	68	680	3.4×10^{-5}	3.4×10^{-4}
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	59	590	3.0×10^{-5}	3.0×10^{-4}

a. Involved workers would be those individuals that actively participate in the No Action Alternative.

b. Noninvolved workers would be those individuals that would be onsite but would not actively participate in the No Action Alternative.

This radiation dose is well below the limit in 10 CFR 835 of 5 rem (5,000 mrem) per year and the WVDP administrative control level of 500 mrem per year (WVNS 2001), and would result in less than 1 (3.4×10^{-5}) latent cancer fatality or a chance of about 1 in 29,000 per year.

In addition to radiation doses from No Action Alternative activities, workers would be exposed to radiation doses from the ongoing operations of the WVDP site. When radiation doses are calculated for involved and noninvolved workers for both No Action Alternative activities and ongoing operations, the total collective radiation dose to the workers was estimated to be about 150 person-rem over the duration of the No Action Alternative or about 15 person-rem per year (Table 4-1). This dose is equivalent to less than 1 (0.077) latent cancer fatality within the worker population.

Nonradiological impacts to workers, based on Bureau of Labor Statistics and the required work effort estimated to complete the actions proposed under the No Action Alternative, are not expected to result in any non-lost workday injuries, lost workday injuries, or fatalities.

Public Impacts. Under the No Action Alternative, waste management activities currently in progress would continue for onsite storage of existing wastes and offsite disposal of a limited quantity of Class A LLW. Management of the waste storage tanks would also continue as under current operations. Radiation doses to the public would be similar to the radiation doses for ongoing operations at the WVDP (Table 4-2).

Table 4-2. Radiation Doses to the Public Under the No Action Alternative[a]

Activity	Maximally Exposed Individual: Individual Radiation Dose[b] Annual (mrem/yr)	Maximally Exposed Individual: Individual Radiation Dose[b] Total (mrem)	Maximally Exposed Individual: Probability of Latent Cancer Fatality Annual	Maximally Exposed Individual: Probability of Latent Cancer Fatality Total	Population Around WVDP Site: Collective Radiation Dose[c] Annual (person-rem/yr)	Population Around WVDP Site: Collective Radiation Dose[c] Total (person-rem)	Population Around WVDP Site: Probability of Latent Cancer Fatality Annual	Population Around WVDP Site: Probability of Latent Cancer Fatality Total
Ongoing operations at WVDP								
Airborne releases	0.021	0.21	1.3×10^{-8}	1.3×10^{-7}	0.17	1.7	1.0×10^{-4}	1.0×10^{-3}
Percent of EPA standard (10 mrem per year)	<1	NA[d]	NA	NA	NA	NA	NA	NA
Waterborne releases	0.041	0.41	2.5×10^{-8}	2.5×10^{-7}	0.083	0.83	5.0×10^{-5}	5.0×10^{-4}
All pathways	0.062	0.62	3.7×10^{-8}	3.7×10^{-7}	0.25	2.5	1.5×10^{-4}	1.5×10^{-3}
Percent of DOE standard (100 mrem per year)	<1	NA	NA	NA	NA	NA	NA	NA
Percent of natural background	<1	NA	NA	NA	<1	NA	NA	NA

a. The time period for the No Action Alternative is 10 years.
b. Individual background radiation doses are about 300 mrem per year.
c. The collective radiation dose to the 1.5-million-person population that surrounds the WVDP site from natural background is about 380,000 person-rem per year.
d. NA = not applicable.

Annual Dose. The collective radiation dose through all exposure pathways (air and water) to people living within 80 kilometers (50 miles) of the site would be about 0.25 person-rem per year. This is equivalent to less than 1 (1.5×10^{-4}) latent cancer fatality in the exposed population each year. The radiation dose through all exposure pathways to the maximally exposed individual living around the WVDP site would be about 0.062 mrem per year. This radiation dose is 0.062 percent of the DOE standard of 100 mrem per year (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*) and would result in less than 1 (3.7×10^{-8}) latent cancer fatality per year or a chance of about 1 in 27 million for the maximally exposed individual.

Total Dose. For the duration of the No Action Alternative (10 years), the total collective radiation dose through all exposure pathways to the population around the WVDP site would be about 2.5 person-rem. This is equivalent to less than 1 (1.5×10^{-3}) latent cancer fatality over the duration of the No Action Alternative.

4.3.2 Impacts from Facility Accidents (No Action Alternative)

DOE evaluated the potential impacts that could occur as a result of accidents at the WVDP site during the implementation of the No Action Alternative. Because only Class A LLW would be shipped under the No Action Alternative, these accidents were limited to those involving the handling of Class A LLW in preparation for shipping. In addition, accidents involving the ongoing management of Tanks 8D-1 and 8D-2 were evaluated. Accidents involving ongoing or continuing activities at the WVDP site that were not part of this EIS have been addressed in other documents such as the *Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley Final Environmental Impact Statement* (DOE 1982) and several facility safety analysis reports and environmental assessments. For example, accidents involving the High-Level Waste Vitrification Facility are characterized in the *Safety Analysis Report for Vitrification System Operations and High-Level Waste Interim Storage* (WVNS 2000b).

One potential handling accident involved the puncture of a drum containing Class A LLW. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-3. For a worker located at the site, this accident could result in a radiation dose of 7.1×10^{-6} rem. This accident could result in a radiation dose of 2.4×10^{-6} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.0075 person-rem; this is equivalent to a probability of a latent cancer fatality of 4.5×10^{-6}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 7.2×10^{-5} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-4).

A second potential accident involved a drop of a pallet containing six Class A LLW drums, all of which were assumed to rupture. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-3. For a worker located at the site, this accident could result in a radiation dose of 4.2×10^{-5} rem. This accident could result in a radiation dose of 1.4×10^{-5} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.044 person-rem; this is equivalent to a probability of a latent cancer fatality of 2.6×10^{-5}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 4.1×10^{-4} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-4).

Table 4-3. Radiological Consequences of Accidents Using 50-Percent Atmospheric Conditions under the No Action Alternative

Accident	Frequency (per year)	Worker		Maximally Exposed Individual		Population[a]	
		Radiation Dose (rem)	Latent Cancer Fatality	Radiation Dose (rem)	Latent Cancer Fatality	Radiation Dose (person-rem)	Latent Cancer Fatality
Class A drum puncture[b]	0.1 – 0.01	7.1×10^{-6}	3.6×10^{-9}	2.4×10^{-6}	1.4×10^{-9}	7.5×10^{-3}	4.5×10^{-6}
Class A pallet drop[b]	0.1 – 0.01	4.2×10^{-5}	2.1×10^{-8}	1.4×10^{-5}	8.4×10^{-9}	0.044	2.6×10^{-5}
Class A box puncture[b]	0.1 – 0.01	8.5×10^{-5}	4.3×10^{-8}	2.9×10^{-5}	1.7×10^{-8}	0.090	5.4×10^{-5}
Collapse of Tank 8D-2 (wet)[b]	$10^{-4} – 10^{-6}$	2.4×10^{-3}	1.2×10^{-6}	8.1×10^{-4}	4.9×10^{-7}	2.5	1.5×10^{-3}
Collapse of Tank 8D-2 (dry)[b]	$10^{-4} – 10^{-6}$	2.8×10^{-3}	1.4×10^{-6}	9.5×10^{-4}	5.7×10^{-7}	3.0	1.8×10^{-3}

a. Collective dose to the 1.5 million people living within 80 kilometers (50 miles) of the WVDP site.
b. Ground-level release.

Table 4-4. Radiological Consequences of Accidents Using 95-Percent Atmospheric Conditions under the No Action Alternative

Accident	Frequency (per year)	Worker		Maximally Exposed Individual		Population[a]	
		Radiation Dose (rem)	Latent Cancer Fatality	Radiation Dose (rem)	Latent Cancer Fatality	Radiation Dose (person-rem)	Latent Cancer Fatality
Class A drum puncture[b]	0.1 – 0.01	7.0×10^{-5}	3.5×10^{-8}	2.6×10^{-5}	1.6×10^{-8}	0.12	7.2×10^{-5}
Class A pallet drop[b]	0.1 – 0.01	4.2×10^{-4}	2.1×10^{-7}	1.5×10^{-4}	9.0×10^{-8}	0.69	4.1×10^{-4}
Class A box puncture[b]	0.1 – 0.01	8.4×10^{-4}	4.2×10^{-7}	3.2×10^{-4}	1.9×10^{-7}	1.4	8.4×10^{-4}
Collapse of Tank 8D-2 (wet)[b]	$10^{-4} – 10^{-6}$	0.024	1.2×10^{-5}	8.9×10^{-3}	5.3×10^{-6}	39	0.023
Collapse of Tank 8D-2 (dry)[b]	$10^{-4} – 10^{-6}$	0.028	1.4×10^{-5}	0.010	6.0×10^{-6}	46	0.028

a. Collective dose to the 1.5 million people living within 80 kilometers (50 miles) of the WVDP site.
b. Ground-level release.

A third potential accident involved the puncture of a box containing Class A LLW. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-3. For a worker located at the site, this accident could result in a radiation dose of 8.5×10^{-5} rem. This accident could result in a radiation dose of 2.9×10^{-5} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.090 person-rem; this is equivalent to a probability of a latent cancer fatality of 5.4×10^{-5}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 8.4×10^{-4} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-4).

DOE also analyzed accidents involving the ongoing management of Tanks 8D-1 and 8D-2. These accidents assumed that a severe earthquake occurred at the WVDP site, causing the roof of the vault and Tank 8D-2 to collapse into the tank. Two accidents were analyzed, one where the contents of the tank were kept wet and another where the contents of the tank were allowed to dry before the collapse. The frequencies of the accidents were estimated to be in the range of 10^{-4} to 10^{-6} per year.

The consequences of the accidents using 50-percent atmospheric conditions are presented in Table 4-3. If the contents of the tanks are kept wet, the accident could result in a radiation dose of 2.4×10^{-3} rem for the worker located at the site. This accident could result in a radiation dose of 8.1×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 2.5 person-rem; this is equivalent to a probability of a latent cancer fatality of 1.5×10^{-3}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.023 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-4).

If the contents of the tanks are kept dry, this accident could result in a radiation dose of 2.8×10^{-3} rem for the worker located at the site (Table 4-3). This accident could result in a radiation dose of 9.5×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 3.0 person-rem; this is equivalent to a probability of a latent cancer fatality of 1.8×10^{-3}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.028 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-4).

The highest consequence accident in Table 4-3 was the collapse of Tank 8D-2 while the contents of the tank were dry. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of the fractions of the biota concentration guides for this accident was less than 1. Therefore, the radioactive releases for this accident would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.3.3 Transportation (No Action Alternative)

Under the No Action Alternative analysis, about 4,100 cubic meters (145,000 cubic feet) of Class A LLW would be shipped for disposal either to NTS, Hanford, or a commercial disposal site such as Envirocare, under existing NEPA reviews. These shipments would take place over 10 years. All other newly generated and existing wastes would continue to be stored under this alternative. The waste transportation destinations proposed under the No Action Alternative are shown in Figure 4-1.

Transportation impacts were estimated assuming 100 percent of the Class A LLW would be shipped by truck and 100 percent of the Class A LLW would be shipped by rail. Table 4-5 lists the Class A LLW shipments proposed under the No Action Alternative.

4.3.3.1 Total Impacts from Transportation Activities

The transportation impacts of shipping radioactive waste would be from two sources: incident-free transportation and transportation accidents. Both radiological impacts and nonradiological impacts are included in the analysis. The total impacts from transportation would be the sum of the impacts from incident-free transportation and transportation accidents. Additional details on these analyses are provided in Appendix D.

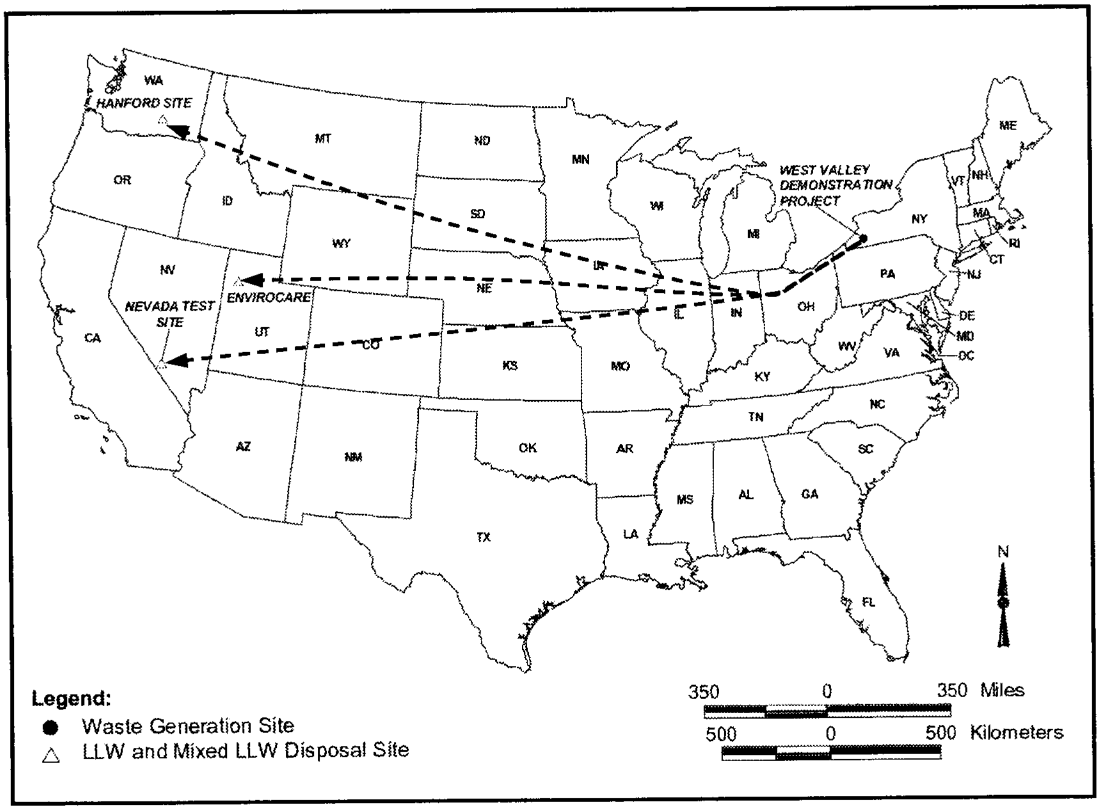

Figure 4-1. Waste Destinations Under the No Action Alternative

Table 4-5. LLW Shipped Under the No Action Alternative

Waste Type	Container Type	Waste Shipped (cubic feet)[a]	Number of Containers	Number of Shipments
Class A LLW	Boxes[b]	97,649	1,206	87 (truck) 44 (rail)
	Drums[b]	47,351	6,878	82 (truck) 41 (rail)
Total		145,000	8,084	169 (truck) 85 (rail)

a. To convert cubic feet to cubic meters, multiply by 0.028
b. Shipped in Type A shipping container

Table 4-6 lists the total transportation impacts by waste type and destination under the No Action Alternative. If either trucks or trains were used to ship the radioactive waste, less than 1 fatality would occur. For perspective, there would be about 400,000 traffic fatalities in the United States over the 10-year time period for the No Action Alternative (U.S. Bureau of the Census 1997).

4.3.3.2 Incident-Free Impacts for the Maximally Exposed Individual from Transportation Activities

Worker Impacts. If trucks were used to ship the waste, the maximally exposed worker would be a driver who would receive a radiation dose of about 250 mrem per year based on driving a truck containing radioactive waste for about 700 hours per year. This is equivalent to a probability of a latent cancer fatality of about 1.3×10^{-4}. If trains were used to ship the waste, the maximally exposed worker would be

Table 4-6. Transportation Impacts Under the No Action Alternative

Waste Type	Destination	Incident-Free Public (LCFs)	Incident-Free Worker (LCFs)	Radiological Accident Risk (LCFs)	Pollution Health Effects (Fatalities)	Traffic Fatalities	Total Fatalities
Truck							
Class A LLW	Envirocare	9.2×10^{-3}	0.011	6.9×10^{-5}	2.1×10^{-3}	0.011	0.034
	Hanford Site	0.011	0.014	7.4×10^{-5}	2.3×10^{-3}	0.014	0.041
	NTS	0.011	0.013	8.5×10^{-5}	2.8×10^{-3}	0.013	0.041
Total Truck Fatalities: 0.034 – 0.041							
Rail							
Class A LLW	Envirocare	0.016	0.012	2.7×10^{-4}	3.0×10^{-3}	9.8×10^{-3}	0.042
	Hanford Site	0.017	0.013	3.0×10^{-4}	3.1×10^{-3}	0.012	0.046
	NTS	0.017	0.016	2.7×10^{-4}	3.0×10^{-3}	0.012	0.049
Total Rail Fatalities: 0.042 – 0.049							

Acronyms: LCFs = latent cancer fatalities; NTS = Nevada Test Site. The range of total fatalities is based on the minimum and maximum total fatalities for each waste type.

an inspector. This worker would receive a radiation dose of about 1.9 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 9.5×10^{-7}.

Public Impacts. For truck shipments, the maximally exposed member of the public would be a person working at a service station who would receive a radiation dose of about 0.10 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 6.0×10^{-8}.

If shipments were made by rail, the maximally exposed member of the public would be a railyard worker who was not directly involved with handling the railcars. This person would receive a radiation dose of about 0.35 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 2.1×10^{-7}.

4.3.3.3 Impacts from the Maximum Reasonably Foreseeable Transportation Accidents

The maximally exposed individual would receive a radiation dose of 4.6 rem from the maximum reasonably foreseeable transportation accident involving a truck shipment of Class A LLW. This is equivalent to a probability of a latent cancer fatality of about 2.8×10^{-3}. The probability of this accident is about 5×10^{-7} per year. The population would receive a collective radiation dose of about 1,300 person-rem from this truck accident involving Class A LLW. This could result in about 1 latent cancer fatality.

For the maximum reasonably foreseeable transportation rail accident involving Class A LLW, the maximally exposed individual would receive a radiation dose of about 9.2 rem. This is equivalent to a probability of a latent cancer fatality of about 5.5×10^{-3}. The probability of this accident is about 2×10^{-6} per year. The population would receive a collective radiation dose of about 2,600 person-rem from this rail accident involving Class A LLW. This could result in about 2 latent cancer fatalities.

Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of fractions of the biota concentration guides for the Class A LLW accidents was less than 1. Therefore, the radioactive releases from the Class A LLW accidents would not be likely to cause persistent, measurable deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.3.4 Offsite Impacts (No Action Alternative)

Under the No Action Alternative, 4,060 cubic meters (145,000 cubic feet) of Class A LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. If the entire volume of WVDP Class A LLW were sent to one of these sites, the probability that a worker would incur a latent cancer fatality would range from 4.8×10^{-3} to 5.4×10^{-3}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 6.9×10^{-6} and 3×10^{-16}. Table 2-6 provides offsite human health impacts in detail; Appendix C, Section C.10, explains how these impacts were derived.

4.4 IMPACTS OF ALTERNATIVE A – OFFSITE SHIPMENT OF HLW, LLW, MIXED LLW, AND TRU WASTE TO DISPOSAL

Under **Alternative A (Preferred Alternative)**, DOE would ship Class A, B, and C LLW and mixed LLW to one of two DOE potential disposal sites (in Washington or Nevada) or to a commercial disposal site (such as the Envirocare facility in Utah); ship TRU waste to WIPP in New Mexico; and ship HLW to the proposed Yucca Mountain HLW Repository. LLW and mixed LLW would be shipped over the next 10 years. TRU waste shipments to WIPP could occur within the next 10 years if the TRU waste were determined to meet all the requirements for disposal in this repository. If some or all of WVDP's TRU waste did not meet these requirements, the Department would need to explore other alternatives for disposal of this waste.

Under DOE's current programmatic decisionmaking, offsite disposal of HLW would occur at the proposed Yucca Mountain HLW Repository sometime after 2025 assuming a license to operate is granted by NRC. Although this period would extend well beyond the 10 years required for all other proposed actions under this alternative, the impacts of transporting the HLW have been included in this EIS to fully inform the decisionmakers should an earlier opportunity to ship HLW present itself. The waste storage tanks would continue to be managed as described under the No Action Alternative.

4.4.1 Human Health Impacts (Alternative A)

This section characterizes the radiological impacts from Alternative A activities that could result from exposure of workers to direct radiation and contaminated material and exposure of the public to small quantities of radioactive material. Nonradiological injuries and fatalities have also been estimated using Bureau of Labor Statistics on incident rates for construction, manufacturing, and services.

Worker Impacts. Under Alternative A, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, RH-TRU, CH-TRU, and HLW. Management of the waste storage tanks would continue as under current operations. Table 4-7 presents the radiological impacts to involved and noninvolved workers for Alternative A. During the 10-year time period, the collective radiation dose to involved workers was estimated to be about 61 person-rem or about 6.1 person-rem per year from activities under Alternative A. Over this same time period, the individual radiation dose to the average involved worker would be about 260 mrem per year. This radiation dose is well below the limit in 10 CFR 835 of 5 rem (5,000 mrem) per year and the WVDP administrative control level of 500 mrem per year (WVNS 2001), and would result in less than 1 (1.3×10^{-4}) latent cancer fatality or a chance of about 1 in 7,700 per year.

In addition to radiation doses from Alternative A activities, workers would be exposed to radiation doses from the ongoing operations of the WVDP site. When radiation doses are calculated for involved and noninvolved workers for both Alternative A activities and ongoing operations, the total collective

4.3.4 Offsite Impacts (No Action Alternative)

Under the No Action Alternative, 4,060 cubic meters (145,000 cubic feet) of Class A LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. If the entire volume of WVDP Class A LLW were sent to one of these sites, the probability that a worker would incur a latent cancer fatality would range from 4.8×10^{-3} to 5.4×10^{-3}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 6.9×10^{-6} and 3×10^{-16}. Table 2-6 provides offsite human health impacts in detail; Appendix C, Section C.10, explains how these impacts were derived.

4.4 IMPACTS OF ALTERNATIVE A – OFFSITE SHIPMENT OF HLW, LLW, MIXED LLW, AND TRU WASTE TO DISPOSAL

Under **Alternative A (Preferred Alternative)**, DOE would ship Class A, B, and C LLW and mixed LLW to one of two DOE potential disposal sites (in Washington or Nevada) or to a commercial disposal site (such as the Envirocare facility in Utah); ship TRU waste to WIPP in New Mexico; and ship HLW to the proposed Yucca Mountain HLW Repository. LLW and mixed LLW would be shipped over the next 10 years. TRU waste shipments to WIPP could occur within the next 10 years if the TRU waste were determined to meet all the requirements for disposal in this repository. If some or all of WVDP's TRU waste did not meet these requirements, the Department would need to explore other alternatives for disposal of this waste.

Under DOE's current programmatic decisionmaking, offsite disposal of HLW would occur at the proposed Yucca Mountain HLW Repository sometime after 2025 assuming a license to operate is granted by NRC. Although this period would extend well beyond the 10 years required for all other proposed actions under this alternative, the impacts of transporting the HLW have been included in this EIS to fully inform the decisionmakers should an earlier opportunity to ship HLW present itself. The waste storage tanks would continue to be managed as described under the No Action Alternative.

4.4.1 Human Health Impacts (Alternative A)

This section characterizes the radiological impacts from Alternative A activities that could result from exposure of workers to direct radiation and contaminated material and exposure of the public to small quantities of radioactive material. Nonradiological injuries and fatalities have also been estimated using Bureau of Labor Statistics on incident rates for construction, manufacturing, and services.

Worker Impacts. Under Alternative A, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, RH-TRU, CH-TRU, and HLW. Management of the waste storage tanks would continue as under current operations. Table 4-7 presents the radiological impacts to involved and noninvolved workers for Alternative A. During the 10-year time period, the collective radiation dose to involved workers was estimated to be about 61 person-rem or about 6.1 person-rem per year from activities under Alternative A. Over this same time period, the individual radiation dose to the average involved worker would be about 260 mrem per year. This radiation dose is well below the limit in 10 CFR 835 of 5 rem (5,000 mrem) per year and the WVDP administrative control level of 500 mrem per year (WVNS 2001), and would result in less than 1 (1.3×10^{-4}) latent cancer fatality or a chance of about 1 in 7,700 per year.

In addition to radiation doses from Alternative A activities, workers would be exposed to radiation doses from the ongoing operations of the WVDP site. When radiation doses are calculated for involved and noninvolved workers for both Alternative A activities and ongoing operations, the total collective

Table 4-7. Radiation Doses for Involved and Noninvolved Workers Under Alternative A

Worker Population	Activity	Time Period (years)	Collective Dose		Latent Cancer Fatalities	
			Annual (person-rem/yr)	Total (person-rem)	Annual	Total
Involved workers[a]	Alternative A activities	10	6.1	61	3.1×10^{-3}	0.031
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	15	150	7.5×10^{-3}	0.075
All workers	Total	10	21	210	0.011	0.11
Worker Population	**Activity**	**Time Period (years)**	**Individual Dose**		**Latent Cancer Fatalities**	
			Annual (mrem/yr)	**Total (mrem)**	**Annual**	**Total**
Involved workers[a]	Alternative A activities	10	260	2,600	1.3×10^{-4}	1.3×10^{-3}
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	59	590	3.0×10^{-5}	3.0×10^{-4}

a. Involved workers would be those individuals that actively participate in Alternative A.
b. Noninvolved workers would be those individuals that would be onsite but would not actively participate in Alternative A.

radiation dose to the workers was estimated to be about 210 person-rem over the duration of Alternative A or about 21 person-rem per year (Table 4-7). This dose is equivalent to less than 1 (0.11) latent cancer fatality within the worker population.

Nonradiological impacts to workers, based on Bureau of Labor Statistics and the required work effort estimated to complete the actions proposed under Alternative A, are not expected to result in any non-lost workday injuries, lost workday injuries, or fatalities.

Public Impacts. Under Alternative A, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, RH-TRU, CH-TRU, and HLW. Management of the waste storage tanks would also continue as under current operations. Radiation doses to the public would be similar to the radiation doses for ongoing operations at the WVDP and thus would be the same as under the No Action Alternative (Table 4-8).

Annual Dose. The collective radiation dose through all exposure pathways (air and water) to people living within 80 kilometers (50 miles) of the site would be about 0.25 person-rem per year. This is equivalent to less than 1 (1.5×10^{-4}) latent cancer fatality in the exposed population each year. The radiation dose through all exposure pathways to the maximally exposed individual living around the WVDP site would be about 0.062 mrem per year. This radiation dose is 0.062 percent of the DOE standard of 100 mrem per year (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*) and would result in less than 1 (3.7×10^{-8}) latent cancer fatality per year or a chance of about 1 in 27 million for the maximally exposed individual.

Total Dose. For the duration of the Alternative A (10 years), the total collective radiation dose through all exposure pathways to the population around the WVDP site would be about 2.5 person-rem. This is equivalent to less than 1 (1.5×10^{-3}) latent cancer fatality for the duration of the alternative.

Table 4-8. Radiation Doses to the Public Under Alternative A[a]

Activity	Maximally Exposed Individual				Population Around WVDP Site			
	Individual Radiation Dose[b]		Probability of Latent Cancer Fatality		Collective Radiation Dose[c]		Probability of Latent Cancer Fatality	
	Annual (mrem/yr)	Total (mrem)	Annual	Total	Annual (person-rem/yr)	Total (person-rem)	Annual	Total
Ongoing operations at WVDP								
Airborne releases	0.021	0.21	1.3×10^{-8}	1.3×10^{-7}	0.17	1.7	1.0×10^{-4}	1.0×10^{-3}
Percent of EPA standard (10 mrem per year)	<1	NA[d]	NA	NA	NA	NA	NA	NA
Waterborne releases	0.041	0.41	2.5×10^{-8}	2.5×10^{-7}	0.083	0.83	5.0×10^{-5}	5.0×10^{-4}
All pathways	0.062	0.62	3.7×10^{-8}	3.7×10^{-7}	0.25	2.5	1.5×10^{-4}	1.5×10^{-3}
Percent of DOE standard (100 mrem per year)	<1	NA	NA	NA	NA	NA	NA	NA
Percent of natural background	<1	NA	NA	NA	<1	NA	NA	NA

a. The time period for Alternative A is 10 years.
b. Individual background radiation doses are about 300 mrem per year.
c. The collective radiation dose to the 1.5-million-person population that surrounds the WVDP site from natural background is about 380,000 person-rem per year.
d. NA = not applicable.

4.4.2 Impacts from Facility Accidents (Alternative A)

DOE evaluated the potential impacts that could occur as result of accidents at the WVDP site during the implementation of Alternative A. Because all waste types (Class A, B, C, LLW, mixed LLW, RH-TRU, CH-TRU, and HLW) would be shipped under Alternative A, accidents involving the handling of all waste types were evaluated. As with the No Action Alternative, accidents involving the ongoing management of Tanks 8D-1 and 8D-2 were evaluated. Accidents involving ongoing or continuing activities at the WVDP site that were not part of this EIS have been addressed in other documents such as the *Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley Final Environmental Impact Statement* (DOE 1982) and several facility safety analysis reports and environmental assessments. For example, accidents involving the High-Level Waste Vitrification Facility are characterized in the *Safety Analysis Report for Vitrification System Operations and High-Level Waste Interim Storage* (WVNS 2000b).

One potential accident involved dropping two drums containing solidified Class C LLW from the Drum Cell. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 4.7×10^{-5} rem. This accident could result in a radiation dose of 1.6×10^{-5} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.050 person-rem; this is equivalent to a probability of a latent cancer fatality of 3.0×10^{-5}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 4.7×10^{-4} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

Table 4-9. Radiological Consequences of Accidents Using 50-Percent Atmospheric Conditions under Alternative A

Accident	Frequency (per year)	Worker Radiation Dose (rem)	Worker Latent Cancer Fatality	Maximally Exposed Individual Radiation Dose (rem)	Maximally Exposed Individual Latent Cancer Fatality	Population[a] Radiation Dose (person-rem)	Population[a] Latent Cancer Fatality
Drum cell drop	0.1 – 0.01	4.7×10^{-5}	2.4×10^{-8}	1.6×10^{-5}	9.6×10^{-9}	0.050	3.0×10^{-5}
Class C drum puncture[b]	0.1 – 0.01	1.2×10^{-4}	6.0×10^{-8}	3.9×10^{-5}	2.3×10^{-8}	0.12	7.2×10^{-5}
Class C pallet drop[b]	0.1 – 0.01	6.9×10^{-4}	3.5×10^{-7}	2.4×10^{-4}	1.4×10^{-7}	0.74	4.4×10^{-4}
Class C box puncture[b]	0.1 – 0.01	1.2×10^{-3}	6.0×10^{-7}	3.9×10^{-4}	2.3×10^{-7}	1.2	7.2×10^{-4}
HIC[c] drop	0.1 – 0.01	1.5×10^{-3}	7.5×10^{-7}	5.2×10^{-4}	3.1×10^{-7}	1.6	9.6×10^{-4}
CH-TRU drum puncture	0.1 – 0.01	0.038	1.9×10^{-5}	0.013	7.8×10^{-6}	41	0.025
RHWF[d] fire	$10^{-4} – 10^{-6}$	0.13	6.5×10^{-5}	0.044	2.6×10^{-5}	140	0.084
Collapse of Tank 8D-2 (wet)[b]	$10^{-4} – 10^{-6}$	2.4×10^{-3}	1.2×10^{-6}	8.1×10^{-4}	4.9×10^{-7}	2.5	1.5×10^{-3}
Collapse of Tank 8D-2 (dry)[b]	$10^{-4} – 10^{-6}$	2.8×10^{-3}	1.4×10^{-6}	9.5×10^{-4}	5.7×10^{-7}	3.0	1.8×10^{-3}

a. Collective dose to the 1.5 million people living within 80 kilometers (50 miles) of the WVDP site.
b. Ground-level release.
c. HIC= High integrity container.
d. RHWF= Remote-Handled Waste Facility.

Table 4-10. Radiological Consequences of Accidents Using 95-Percent Atmospheric Conditions under Alternative A

Accident	Frequency (per year)	Worker Radiation Dose (rem)	Worker Latent Cancer Fatality	Maximally Exposed Individual Radiation Dose (rem)	Maximally Exposed Individual Latent Cancer Fatality	Population[a] Radiation Dose (person-rem)	Population[a] Latent Cancer Fatality
Drum cell drop	0.1 – 0.01	4.7×10^{-4}	2.4×10^{-7}	1.8×10^{-4}	1.1×10^{-7}	0.79	4.7×10^{-4}
Class C drum puncture[b]	0.1 – 0.01	1.2×10^{-3}	6.0×10^{-7}	4.3×10^{-4}	2.6×10^{-7}	1.9	1.1×10^{-3}
Class C pallet drop[b]	0.1 – 0.01	6.8×10^{-3}	3.4×10^{-6}	2.6×10^{-3}	1.6×10^{-6}	12	7.2×10^{-3}
Class C box puncture[b]	0.1 – 0.01	0.012	6.0×10^{-6}	4.3×10^{-3}	2.6×10^{-6}	19	0.011
HIC[c] drop	0.1 – 0.01	0.015	7.5×10^{-6}	5.6×10^{-3}	3.4×10^{-6}	25	0.015
CH-TRU drum puncture	0.1 – 0.01	0.38	1.9×10^{-4}	0.14	8.4×10^{-5}	630	0.38
RHWF[d] fire	$10^{-4} – 10^{-6}$	1.3	6.5×10^{-4}	0.47	2.8×10^{-4}	2,100	1.3
Collapse of Tank 8D-2 (wet)[b]	$10^{-4} – 10^{-6}$	0.024	1.2×10^{-5}	8.9×10^{-3}	5.3×10^{-6}	39	0.023
Collapse of Tank 8D-2 (dry)[b]	$10^{-4} – 10^{-6}$	0.028	1.4×10^{-5}	0.010	6.0×10^{-6}	46	0.028

a. Collective dose to the 1.5 million people living within 80 kilometers (50 miles) of the WVDP site.
b. Ground-level release.
c. HIC= High integrity container.
d. RHWF= Remote-Handled Waste Facility.

A second potential accident involved the puncture of a drum containing Class C LLW. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 1.2×10^{-4} rem. This accident could result in a radiation dose of 3.9×10^{-5} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.12 person-rem; this is equivalent to a probability of a latent cancer fatality of 7.2×10^{-5}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 1.1×10^{-3} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A third potential accident involved a drop of a pallet containing six Class C LLW drums, all of which were assumed to rupture. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 6.9×10^{-4} rem. This accident could result in a radiation dose of 2.4×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 0.74 person-rem; this is equivalent to a probability of a latent cancer fatality of 4.4×10^{-4}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 7.2×10^{-3} for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A fourth potential accident involved the puncture of a box containing Class C LLW. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 1.2×10^{-3} rem. This accident could result in a radiation dose of 3.9×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 1.2 person-rem; this is equivalent to a probability of a latent cancer fatality of 7.2×10^{-4}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.011 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A fifth potential accident involved dropping a high integrity container containing radioactive sludge and resin. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 1.5×10^{-3} rem. This accident could result in a radiation dose of 5.2×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 1.6 person-rem; this is equivalent to a probability of a latent cancer fatality of 9.6×10^{-4}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.015 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A sixth potential accident involved the puncture of a drum containing CH-TRU waste. The frequency of this accident was estimated to be in the range of 0.1 to 0.01 per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 0.038 rem. This accident could result in a radiation dose of 0.013 rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 41 person-rem; this is equivalent to a probability of a latent cancer fatality of 0.025. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.38 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

A seventh potential accident involved a diesel fuel fire in the RHWF as a result of a leak in the fuel tank or fuel line of a truck. This fire would involve CH-TRU and RH-TRU waste. The frequency of this accident was estimated to be in the range of 10^{-4} to 10^{-6} per year. The consequences of this accident using 50-percent atmospheric conditions are presented in Table 4-9. For a worker located at the site, this accident could result in a radiation dose of 0.13 rem. This accident could result in a radiation dose of 0.044 rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 140 person-rem; this is equivalent to a probability of a latent cancer fatality of 0.084. Using 95-percent atmospheric conditions, this accident could result in about 1 latent cancer fatality for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

Although an accident involving dropping a HLW canister while loading a shipping cask could occur, the canisters are designed to resist breaching and tested to withstand a 7-meter (23-foot) drop onto an unyielding surface and it is unlikely that a canister would rupture if it were dropped during loading. Therefore, Tables 4-9 and 4-10 do not include analysis of this type of accident.

As in the No Action Alternative, DOE also analyzed accidents involving the ongoing management of Tanks 8D-1 and 8D-2, and determined that the consequences would be the same under both alternatives. These accidents assumed that a severe earthquake occurred at the WVDP site, causing the roof of the vault and Tank 8D-2 to collapse into the tank. Two accidents were analyzed, one where the contents of the tank were kept wet, and another were the contents of the tank were allowed to dry. The frequencies of the accidents were estimated to be in the range of 10^{-4} to 10^{-6} per year.

The consequences of the accidents using 50-percent atmospheric conditions are presented in Table 4-9. If the contents of the tanks are kept wet, the accident could result in a radiation dose of 2.4×10^{-3} rem for the worker located at the site. This accident could result in a radiation dose of 8.1×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 2.5 person-rem; this is equivalent to a probability of a latent cancer fatality of 1.5×10^{-3}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.023 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

If the contents of the tanks are kept dry, this accident could result in a radiation dose of 2.8×10^{-3} rem for the worker located at the site (Table 4-9). This accident could result in a radiation dose of 9.5×10^{-4} rem to the maximally exposed individual living near the WVDP site. For the population living within 80 kilometers (50 miles) of the site, this accident could result in a radiation dose of 3.0 person-rem; this is equivalent to a probability of a latent cancer fatality of 1.8×10^{-3}. Using 95-percent atmospheric conditions, this accident could result in a probability of a latent cancer fatality of 0.028 for the population living within 80 kilometers (50 miles) of the WVDP site (Table 4-10).

The highest consequence accident in Table 4-9 was the fire at the RHWF. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of the fractions of the biota concentration guides for this accident was less than 1. Therefore, the radioactive releases for this accident would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.4.3 Transportation (Alternative A)

Under Alternative A, about 21,000 cubic meters (742,000 cubic feet) of radioactive waste would be shipped for disposal. These shipments would take place over 10 years. Although HLW would not be shipped to a geologic repository until sometime after 2025, HLW transportation impacts were included in Alternative A. Class A LLW would be shipped either to NTS, Hanford, or a commercial disposal site such as Envirocare. Class B and Class C LLW would be shipped either to the NTS or the Hanford Site. Mixed LLW, meeting disposal site waste acceptance criteria, would be shipped to Hanford, NTS, or a commercial disposal site such as Envirocare. TRU waste would be shipped to the WIPP site for disposal. HLW would be shipped to a geologic repository (assumed to be the proposed Yucca Mountain Repository for the purposes of evaluation in this EIS). The waste transportation destinations proposed under Alternative A are shown in Figure 4-2.

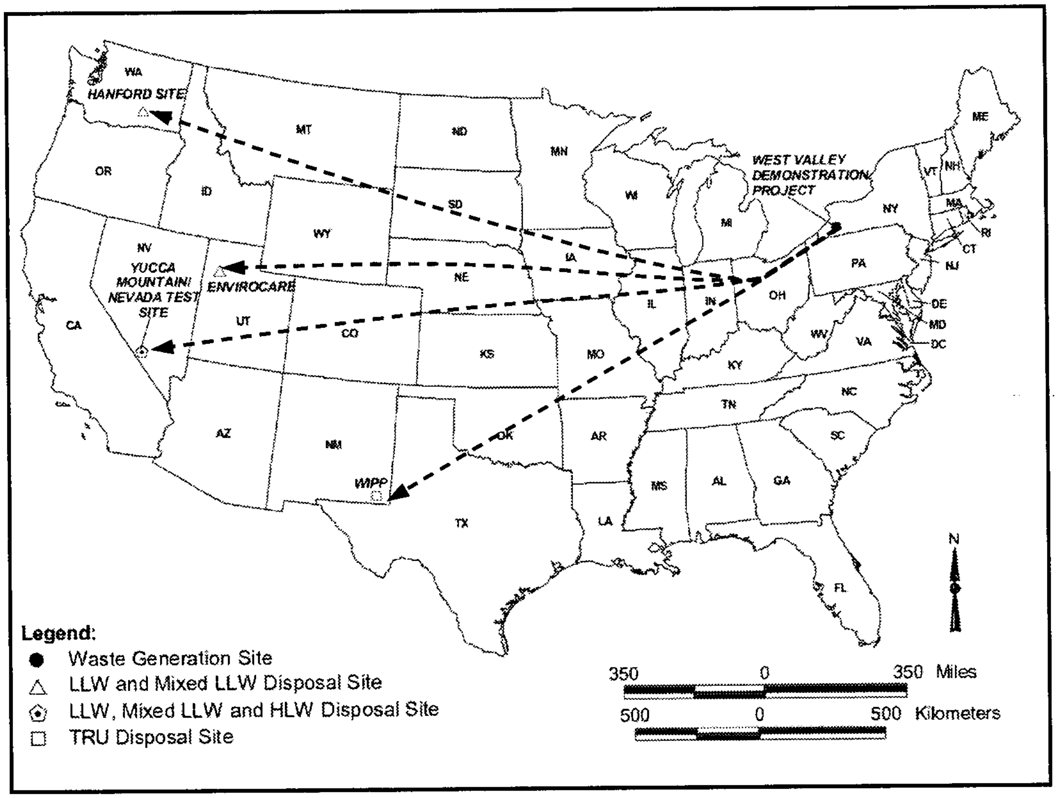

Figure 4-2. Waste Destinations Under Alternative A

Transportation impacts were estimated assuming 100 percent of the waste would be shipped by truck and 100 percent of the waste would be shipped by rail. Table 4-11 lists the waste shipments associated with Alternative A. These shipments would take place over 10 years.

4.4.3.1 Total Impacts from Transportation Activities

The transportation impacts of shipping radioactive waste would be from two sources: incident-free transportation and transportation accidents. Both radiological impacts and nonradiological impacts are included in the analysis. The total impacts from transportation would be the sum of the impacts from incident-free transportation and transportation accidents. Additional details on these analyses are provided in Appendix D.

Table 4-11. Waste Shipped Under Alternative A or B

Waste Type	Container Type	Waste Shipped (cubic feet)[a]	Number of Containers	Alternative A Shipments	Alternative B Shipments
Class A LLW	Boxes[b]	351,586	4,341	311 (truck) 156 (rail)	311 (truck) 156 (rail)
	Drums[b]	83,014	12,058	144 (truck) 72 (rail)	144 (truck) 72 (rail)
Class B LLW	HIC[c]	38,500	428	428 (truck) 107 (rail)	428 (truck) 107 (rail)
	Drums[b]	194	29	1 (truck) 1 (rail)	1 (truck) 1 (rail)
Class C LLW	HIC[c]	12,618	141	141 (truck) 36 (rail)	141 (truck) 36 (rail)
	55-gallon drums[c]	6,198	901	91 (truck) 23 (rail)	91 (truck) 23 (rail)
	71-gallon drums[b]	193,405	20,377	850 (truck) 213 (rail)	850 (truck) 213 (rail)
CH-TRU	Drums[c]	40,000	5,810	139 (truck) 139 (rail)	278 (truck)[d] 278 (rail)[d]
RH-TRU	Drums[c]	9,000	1,308	131 (truck) 33 (rail)	262 (truck)[e] 66 (rail)[f]
MLLW	Drums[b]	7,889	1,146	14 (truck) 7 (rail)	14 (truck) 7 (rail)
HLW	Canisters[c]		300[g]	300 (truck) 60 (rail)	600 (truck)[h] 120 (rail)[i]
Total		742,404	46,839	2,550 (truck) 847 (rail)	3,120 (truck)[j] 1,079 (rail)[k]

Acronyms: LLW = low-level radioactive waste; HIC = high-integrity container; CH-TRU = contact-handled transuranic waste; RH-TRU = remote-handled transuranic waste; MLLW = mixed low-level waste; HLW = high-level radioactive waste

a. To convert cubic feet to cubic meters, multiply by 0.028.
b. Shipped in Type A shipping container.
c. Shipped in Type B shipping container.
d. 139 CH-TRU shipments from WVDP to interim storage, 139 CH-TRU shipments from interim storage to disposal.
e. 131 RH-TRU shipments from WVDP to interim storage, 131 RH-TRU shipments from interim storage to disposal.
f. 33 RH-TRU shipments from WVDP to interim storage, 33 RH-TRU shipments from interim storage to disposal.
g. Assumed to be 300 for purposes of analysis; actual number of canisters is 275.
h. 300 HLW shipments from WVDP to interim storage, 300 HLW shipments from interim storage to disposal.
i. 60 HLW shipments from WVDP to interim storage, 60 HLW shipments from interim storage to disposal.
j. Includes 270 TRU waste, and 300 HLW, truck shipments from interim storage to disposal. Alternative B would load the same number of truck shipments (2,550) at WVDP for shipment offsite as Alternative A.
k. Includes 172 TRU waste, and 60 HLW, rail shipments from interim storage to disposal. Alternative B would load the same number of rail shipments (847) at WVDP for shipment offsite as Alternative A.

Table 4-12 lists the total transportation impacts by waste type and destination expected under Alternative A. If either trucks or trains were used to ship the radioactive waste, less than 1 fatality would occur. For perspective, there would be about 400,000 traffic fatalities in the United States over the 10-year time period under Alternative A (U.S. Bureau of the Census 1997).

4.4.3.2 Incident-Free Impacts for the Maximally Exposed Individual from Transportation Activities

Worker Impacts. If trucks were used to ship the waste, the maximally exposed worker would be the truck driver. This worker would receive a radiation dose of about 2,000 mrem per year based on driving

Table 4-12. Transportation Impacts Under Alternative A

Waste Type	Destination	Incident-Free Public (LCFs)	Incident-Free Worker (LCFs)	Radiological Accident Risk (LCFs)	Pollution Health Effects (Fatalities)	Traffic Fatalities	Total Fatalities
Truck							
Class A LLW	Envirocare	0.025	0.031	1.4×10^{-4}	5.7×10^{-3}	0.030	0.092
	Hanford Site	0.030	0.037	1.5×10^{-4}	6.3×10^{-3}	0.038	0.11
	NTS	0.031	0.036	1.7×10^{-4}	7.6×10^{-3}	0.036	0.11
Class B LLW	Hanford Site	1.4×10^{-3}	0.028	0.065	5.9×10^{-3}	0.035	0.13
	NTS	1.6×10^{-3}	0.029	0.062	7.1×10^{-3}	0.034	0.13
Class C LLW	Hanford Site	0.087	0.20	5.5×10^{-7}	0.018	0.11	0.41
	NTS	0.089	0.19	6.5×10^{-7}	0.022	0.10	0.41
CH-TRU	WIPP	8.3×10^{-3}	0.010	7.5×10^{-4}	2.3×10^{-3}	0.012	0.033
RH-TRU	WIPP	6.5×10^{-3}	0.013	7.5×10^{-9}	2.2×10^{-3}	0.011	0.033
MLLW	Envirocare	7.7×10^{-4}	9.5×10^{-4}	1.0×10^{-5}	1.8×10^{-4}	9.2×10^{-4}	2.8×10^{-3}
	Hanford Site	9.2×10^{-4}	1.1×10^{-3}	1.1×10^{-5}	1.9×10^{-4}	1.2×10^{-3}	3.4×10^{-3}
	NTS	9.5×10^{-4}	1.1×10^{-3}	1.3×10^{-5}	2.3×10^{-4}	1.1×10^{-3}	3.4×10^{-3}
HLW	Repository	0.020	0.044	9.8×10^{-7}	5.8×10^{-3}	0.024	0.094
							Total Truck Fatalities: 0.79 – 0.82
Rail							
Class A LLW	Envirocare	0.044	0.033	5.3×10^{-4}	8.0×10^{-3}	0.026	0.11
	Hanford Site	0.045	0.035	5.8×10^{-4}	8.2×10^{-3}	0.034	0.12
	NTS	0.046	0.044	5.3×10^{-4}	8.1×10^{-3}	0.033	0.13
Class B LLW	Hanford Site	0.042	0.033	3.4×10^{-6}	3.9×10^{-3}	0.016	0.095
	NTS	0.043	0.045	3.1×10^{-6}	3.8×10^{-3}	0.017	0.11
Class C LLW	Hanford Site	0.13	0.10	1.2×10^{-6}	0.012	0.049	0.29
	NTS	0.13	0.14	1.1×10^{-6}	0.012	0.053	0.34
CH-TRU	WIPP	8.3×10^{-3}	8.1×10^{-3}	2.0×10^{-4}	3.4×10^{-3}	0.018	0.038
RH-TRU	WIPP	6.6×10^{-3}	6.4×10^{-3}	2.4×10^{-8}	8.0×10^{-4}	4.2×10^{-3}	0.018
MLLW	Envirocare	1.3×10^{-3}	1.0×10^{-3}	4.1×10^{-5}	2.4×10^{-4}	8.1×10^{-4}	3.4×10^{-3}
	Hanford Site	1.4×10^{-3}	1.1×10^{-3}	4.5×10^{-5}	2.5×10^{-4}	1.0×10^{-3}	3.8×10^{-3}
	NTS	1.4×10^{-3}	1.3×10^{-3}	4.1×10^{-5}	2.5×10^{-4}	1.0×10^{-3}	4.0×10^{-3}
HLW	Repository	7.6×10^{-3}	0.014	3.0×10^{-7}	4.2×10^{-3}	0.019	0.045
							Total Rail Fatalities: 0.60 – 0.68

Acronyms: LCFs = latent cancer fatalities; CH-TRU = contact-handled transuranic waste; RH-TRU = remote-handled transuranic waste; MLLW = mixed low-level waste; HLW = high-level radioactive waste; NTS = Nevada Test Site; WIPP = Waste Isolation Pilot Plant. The range of total fatalities is based on the minimum and maximum total fatalities for each waste type.

the truck containing radioactive waste for 1,000 hours per year. This is equivalent to a probability of a latent cancer fatality of about 1.0×10^{-3}.

If trains were used to ship the waste, the maximally exposed worker would be an inspector. This worker would receive a radiation dose of about 190 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 9.5×10^{-5}.

Public Impacts. If trucks were used to ship the waste, the maximally exposed member of the public would be a person working at a service station who would receive a radiation dose of about 19 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 1.1×10^{-5}.

If trains were used to ship the waste, the maximally exposed member of the public would be a railyard worker who was not directly involved with handling the railcars. This person would receive a radiation dose of about 35 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 2.1×10^{-5}.

4.4.3.3 Impacts from the Maximum Reasonably Foreseeable Transportation Accidents

For waste shipped under Alternative A, the maximum reasonably foreseeable truck or rail transportation accident with the highest consequences would involve CH-TRU waste. Since one TRUPACT-II shipping container was assumed to be involved in either the truck or rail accident, the consequences for the truck or rail accident are the same. The probabilities of the truck and rail accidents are slightly different. The probability of the truck accident was 6×10^{-7} per year. For rail, the probability of the accident was 1×10^{-7} per year. The maximally exposed individual would receive a radiation dose of about 25 rem from this accident, which is equivalent to a latent cancer fatality risk of 0.015. The population would receive a collective radiation dose of approximately 6,600 person-rem from this accident. This could result in about 4 latent cancer fatalities. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of fractions of the biota concentration guides for the CH-TRU accident was less than 1. Therefore, the radioactive releases from the CH-TRU accident would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.4.4 Offsite Impacts (Alternative A)

Under Alternative A, 19,200 cubic meters (685,515 cubic feet) of LLW and 221 cubic meters (7,889 cubic feet) of mixed LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. If the entire volume of WVDP LLW and mixed LLW inventory were sent to one of these sites, the probability that a worker would incur a latent cancer fatality would range from 3.2×10^{-2} to 3.6×10^{-2}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 5.1×10^{-5} and 2.1×10^{-15}.

In addition, approximately 1,372 cubic meters (49,000 cubic feet) of TRU waste would be disposed of at WIPP. Disposal of this waste volume at WIPP would result in a probability that a worker would incur a latent cancer fatality of 1.0×10^{-2}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of 3.0×10^{-9}. The population within 80 kilometers (50 miles) of the site would have a probability of incurring a latent cancer fatality of 3.0×10^{-6}.

Disposal of 300 canisters of WVDP HLW[2] at a geologic repository at Yucca Mountain would result in a probability that a worker would incur a latent cancer fatality of 6.8×10^{-2}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of 3.1×10^{-7}. The population within 80 kilometers (50 miles) of the site would have a probability of incurring a latent cancer fatality of 2.0×10^{-2}.

Table 2-6 provides offsite human health impacts in detail; Appendix C, Section C.10, explains how these impacts were derived.

[2] For purposes of analysis, DOE assumed that vitrification of HLW at WVDP would result in the production of 300 canisters. Vitrification is now complete and has resulted in the production of 275 canisters. Therefore, the impacts associated with the 275 canisters actually produced would be lower than the impacts analyzed.

4.5 IMPACTS OF ALTERNATIVE B – OFFSITE SHIPMENT OF LLW AND MIXED LLW TO DISPOSAL AND SHIPMENT OF HLW AND TRU WASTE TO INTERIM STORAGE

Under **Alternative B**, LLW and mixed LLW would be shipped offsite for disposal at the same locations as Alternative A. TRU wastes would be shipped for interim storage at one of five DOE sites: Hanford Site; INEEL; ORNL; SRS; or WIPP. TRU wastes would subsequently be shipped to WIPP (or would remain at WIPP) for disposal. HLW would be shipped to SRS or Hanford for interim storage, with subsequent shipment to Yucca Mountain for disposal.

It is assumed that the shipment of LLW and mixed LLW to disposal would occur within the next 10 years, and that TRU waste and HLW would be shipped to interim storage during that same 10 years. Ultimate disposal of TRU wastes and HLW wastes would be subject to the same constraints described under Alternative A; however, the impacts of transporting these wastes to their ultimate disposal sites have been included in the impact analyses for this alternative. The waste storage tanks and their surrounding vaults would be managed as under the No Action Alternative.

4.5.1 Human Health Impacts (Alternative B)

This section characterizes the radiological impacts from Alternative B activities that could result from exposure of workers to direct radiation and contaminated material and exposure of the public to small quantities of radioactive material from controlled releases to the environment. Nonradiological injuries and fatalities have also been estimated using Bureau of Labor Statistics on incident rates for construction, manufacturing, and services.

Worker Impacts. Under Alternative B, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, and offsite interim storage of RH-TRU, CH-TRU, and HLW prior to disposal. Management of the waste storage tanks would continue as under current operations. Table 4-13 presents the radiological impacts to involved and noninvolved workers for Alternative B. During the 10-year time period, the collective radiation dose to involved workers was estimated to be about 61 person-rem or about 6.1 person-rem per year from activities under Alternative B. Over this same time period, the individual radiation dose to the average involved worker would be about 260 mrem per year. This radiation dose is well below the limit in 10 CFR 835 of 5 rem (5,000 mrem) per year and the WVDP administrative control level of 500 mrem per year (WVNS 2001), and would result in less than 1 (1.3×10^{-4}) latent cancer fatality or a chance of about 1 in 7,700 per year.

In addition to radiation doses from Alternative B activities, workers would be exposed to radiation doses from the ongoing operations of the WVDP site. When radiation doses are calculated for involved and noninvolved workers for both Alternative B activities and ongoing operations, the total collective radiation dose to the workers was estimated to be about 210 person-rem over the duration of Alternative B or about 21 person-rem per year (Table 4-13). This dose is equivalent to less than 1 (0.11) latent cancer fatality within the worker population.

Nonradiological impacts to workers, based on Bureau of Labor Statistics and the required work effort estimated to complete the actions proposed under Alternative B, are not expected to result in any non-lost workday injuries, lost workday injuries, or fatalities.

Public Impacts. Under Alternative B, waste management activities would involve offsite transportation and disposal of Class A, B, C, mixed LLW, RH-TRU, CH-TRU, and HLW. Management of the waste storage tanks would continue as under current operations. Radiation doses to the public would be similar

Table 4-13. Radiation Doses for Involved and Noninvolved Workers Under Alternative B

Worker Population	Activity	Time Period (years)	Collective Dose: Annual (person-rem/yr)	Collective Dose: Total (person-rem)	Latent Cancer Fatalities: Annual	Latent Cancer Fatalities: Total
Involved workers[a]	Alternative B activities	10	6.1	61	3.1×10^{-3}	0.031
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	15	150	7.5×10^{-3}	0.075
All workers	Total	10	21	210	0.011	0.11
Worker Population	**Activity**	**Time Period (years)**	**Individual Dose: Annual (mrem/yr)**	**Individual Dose: Total (mrem)**	**Latent Cancer Fatalities: Annual**	**Latent Cancer Fatalities: Total**
Involved workers[a]	Alternative B activities	10	260	2,600	1.3×10^{-4}	1.3×10^{-3}
Noninvolved workers[b]	Ongoing operations of WVDP[b]	10	59	590	3.0×10^{-5}	3.0×10^{-4}

a. Involved workers would be those individuals that actively participate in Alternative B.
b. Noninvolved workers would be those individuals that would be onsite but would not actively participate in Alternative B.

to the radiation doses for ongoing operations at the WVDP and thus would be the same as under the No Action Alternative and Alternative A. Annual and total radiation doses to the public (maximally exposed individual and collective population) are listed in Table 4-14.

Annual Dose. The collective radiation dose through all exposure pathways (air and water) to people living within 80 kilometers (50 miles) of the site would be about 0.25 person-rem per year. This is equivalent to less than 1 (1.5×10^{-4}) latent cancer fatality in the exposed population each year. The radiation dose through all exposure pathways to the maximally exposed individual living around the WVDP site would be about 0.062 mrem per year. This radiation dose is 0.062 percent of the DOE standard of 100 mrem per year (DOE Order 5400.5, *Radiation Protection of the Public and the Environment*) and would result in less than 1 (3.7×10^{-8}) latent cancer fatality per year or a chance of about 1 in 27 million for the maximally exposed individual.

Total Dose. For the duration of the No Action Alternative (10 years), the total collective radiation dose through all exposure pathways to the population around the WVDP site would be about 2.5 person-rem. This is equivalent to less than 1 (1.5×10^{-3}) latent cancer fatality over the duration of Alternative B.

4.5.2 Impacts from Facility Accidents (Alternative B)

The onsite activities proposed under Alternative B would be the same as those proposed under Alternative A. The facility accidents characterized previously in Section 4.4.2 would be representative of Alternative B and would have the same consequences. Therefore, the potential facility accidents characterized in Section 4.4.2 and their consequences will not be repeated here. As with the No Action Alternative and Alternative A, accidents involving ongoing or continuing activities at the WVDP site that were not part of this EIS have been addressed in other documents such as the *Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West*

Table 4-14. Radiation Doses to the Public Under Alternative B[a]

Activity	Maximally Exposed Individual: Individual Radiation Dose[b] Annual (mrem/yr)	Total (mrem)	Probability of Latent Cancer Fatality: Annual	Total	Population Around WVDP Site: Collective Radiation Dose[c] Annual (person-rem/yr)	Total (person-rem)	Probability of Latent Cancer Fatality: Annual	Total
Ongoing operations at WVDP								
Airborne releases	0.021	0.21	1.3×10^{-8}	1.3×10^{-7}	0.17	1.7	1.0×10^{-4}	1.0×10^{-3}
Percent of EPA standard (10 mrem per year)	<1	NA[d]	NA	NA	NA	NA	NA	NA
Waterborne releases	0.041	0.41	2.5×10^{-8}	2.5×10^{-7}	0.083	0.83	5.0×10^{-5}	5.0×10^{-4}
All pathways	0.062	0.62	3.7×10^{-8}	3.7×10^{-7}	0.25	2.5	1.5×10^{-4}	1.5×10^{-3}
Percent of DOE standard (100 mrem per year)	<1	NA	NA	NA	NA	NA	NA	NA
Percent of natural background	<1	NA	NA	NA	<1	NA	NA	NA

a. The time period for Alternative B is 10 years.
b. Individual background radiation doses are about 300 mrem per year.
c. The collective radiation dose to the 1.5-million-person population that surrounds the WVDP site from natural background is about 380,000 person-rem per year.
d. NA = not applicable.

Valley Final Environmental Impact Statement (DOE 1982) and several facility safety analysis reports and environmental assessments. For example, accidents involving the High-Level Waste Vitrification Facility are characterized in the *Safety Analysis Report for Vitrification System Operations and High-Level Waste Interim Storage* (WVNS 2000b).

4.5.3 Transportation (Alternative B)

Under Alternative B, about 21,000 cubic meters (742,000 cubic feet) of radioactive waste would be shipped for disposal. These are the same volumes that would be shipped under Alternative A. These shipments would take place over 10 years. Although HLW would not be shipped to a geologic repository until sometime after 2025, HLW transportation impacts were included in Alternative B. As was the case for Alternative A, under Alternative B Class A LLW would be shipped either to NTS, Hanford, or a commercial disposal site such as Envirocare; Class B and Class C LLW would be shipped either to the NTS or the Hanford Site; and mixed LLW would be shipped to Hanford, NTS, or a commercial disposal site such as Envirocare. In contrast to Alternative A, TRU waste would be shipped first to Hanford, INEEL, ORNL, or SRS for storage, then to WIPP for disposal. TRU waste could also be shipped to WIPP for interim storage prior to disposal there. HLW would be shipped first to the SRS or Hanford for storage, then to a geologic repository for disposal (again, assumed to be the proposed Yucca Mountain Repository for the purposes of evaluation in this EIS). The waste transportation destinations proposed under Alternative B are shown in Figure 4-3.

Transportation impacts were estimated assuming that 100 percent of the waste would be shipped by truck and that 100 percent of the waste would be shipped by rail. Table 4-11 lists the waste shipments

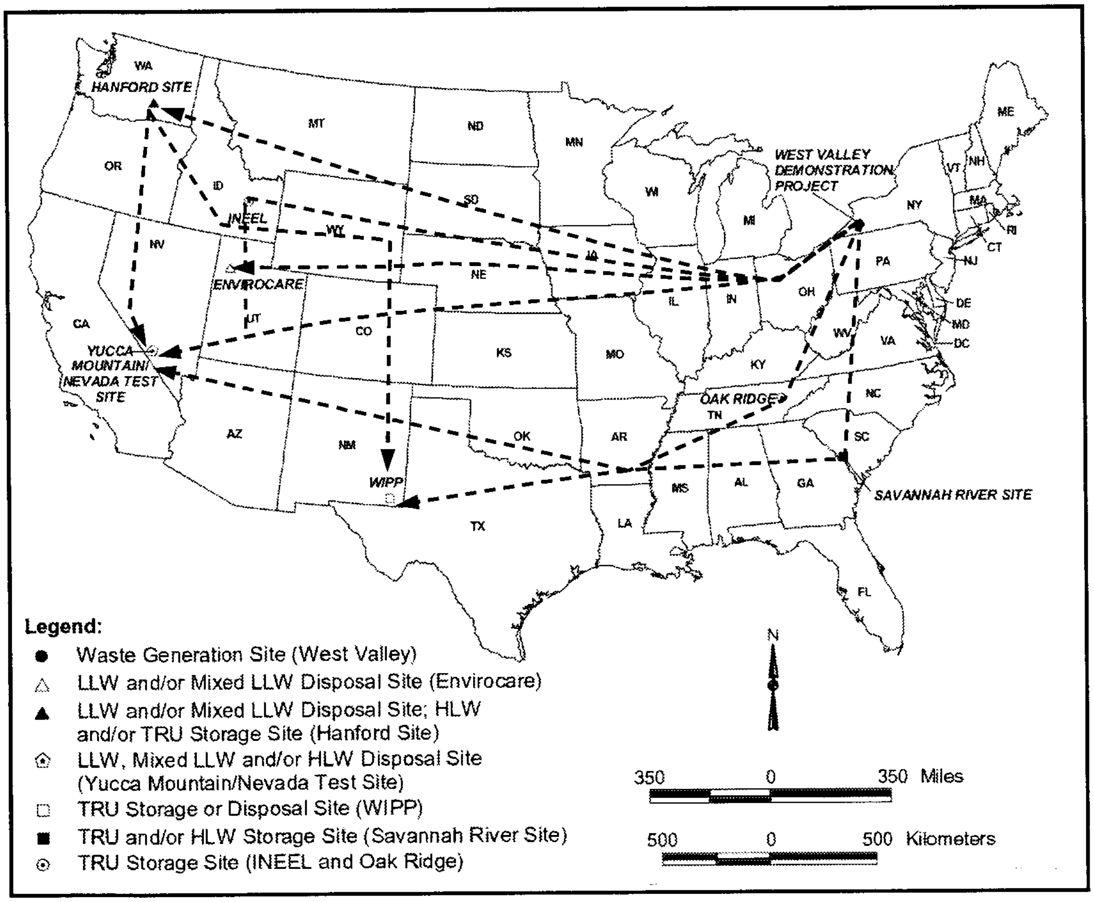

Figure 4-3. Waste Destinations Under Alternative B

associated with Alternative B. Because only the destinations for TRU waste and HLW vary between Alternatives A and B, the reader will see very little difference among the impacts to workers or the public for these alternatives.

4.5.3.1 Total Impacts from Transportation Activities

Table 4-15 lists the total transportation impacts by waste type and destination expected under Alternative B. If either trucks or trains were used to ship the radioactive waste, less than one fatality would occur. For perspective, there would be about 400,000 traffic fatalities in the United States during the 10-year time period under Alternative B (U.S. Bureau of the Census 1997).

4.5.3.2 Incident-Free Impacts for the Maximally Exposed Individual from Transportation Activities

Worker Impacts. If trucks were used to ship the waste, the maximally exposed worker would be the truck driver. This worker would receive a radiation dose of about 2,000 mrem per year based on driving the truck containing radioactive waste for 1,000 hours per year. This is equivalent to a probability of a latent cancer fatality of about 1.0×10^{-3}.

If trains were used to ship the waste, the maximally exposed worker would be an inspector. This worker would receive a radiation dose of about 190 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 9.5×10^{-5}.

Table 4-15. Transportation Impacts Under Alternative B

Waste Type	Destination	Incident-Free Public (LCFs)	Incident-Free Worker (LCFs)	Radiological Accident Risk (LCFs)	Pollution Health Effects	Traffic Fatalities	Total Fatalities
Truck							
Class A LLW	Envirocare	0.025	0.031	1.4×10^{-4}	5.7×10^{-3}	0.030	0.092
	Hanford Site	0.030	0.037	1.5×10^{-4}	6.3×10^{-3}	0.038	0.11
	NTS	0.031	0.036	1.7×10^{-4}	7.6×10^{-3}	0.036	0.11
Class B LLW	Hanford Site	0.028	0.065	8.2×10^{-7}	5.9×10^{-3}	0.035	0.13
	NTS	0.029	0.062	9.4×10^{-7}	7.1×10^{-3}	0.034	0.13
Class C LLW	Hanford Site	0.087	0.20	5.5×10^{-7}	0.018	0.11	0.41
	NTS	0.089	0.19	6.5×10^{-7}	0.022	0.10	0.41
CH-TRU	SRS → WIPP	8.8×10^{-3}	0.012	1.0×10^{-3}	2.7×10^{-3}	0.015	0.040
	INEEL → WIPP	0.011	0.016	6.7×10^{-4}	2.5×10^{-3}	0.016	0.046
	ORNL → WIPP	7.7×10^{-3}	0.012	6.4×10^{-4}	2.2×10^{-3}	0.012	0.034
	Hanford → WIPP	0.013	0.019	7.8×10^{-4}	3.0×10^{-3}	0.020	0.056
RH-TRU	SRS → WIPP	6.9×10^{-3}	0.015	1.0×10^{-8}	2.5×10^{-3}	0.014	0.039
	INEEL → WIPP	8.4×10^{-3}	0.021	7.3×10^{-9}	2.4×10^{-3}	0.015	0.046
	ORNL → WIPP	6.1×10^{-3}	0.014	6.4×10^{-9}	2.0×10^{-3}	0.011	0.034
	Hanford → WIPP	0.010	0.025	8.4×10^{-9}	2.8×10^{-3}	0.019	0.057
MLLW	Envirocare	7.7×10^{-4}	9.5×10^{-4}	1.0×10^{-5}	1.8×10^{-4}	9.2×10^{-4}	2.8×10^{-3}
	Hanford Site	9.2×10^{-4}	1.1×10^{-3}	1.1×10^{-5}	1.9×10^{-4}	1.2×10^{-3}	3.4×10^{-3}
	NTS	9.5×10^{-4}	1.1×10^{-3}	1.3×10^{-5}	2.3×10^{-4}	1.1×10^{-3}	3.4×10^{-3}
HLW	SRS → Repository	0.032	0.067	2.6×10^{-6}	9.6×10^{-3}	0.047	0.16
	Hanford Site → Repository	0.030	0.069	1.4×10^{-6}	8.0×10^{-3}	0.037	0.14
						Total Truck Fatalities:	0.84 – 0.93
Rail							
Class A LLW	Envirocare	0.044	0.033	5.3×10^{-4}	8.0×10^{-3}	0.026	0.11
	Hanford Site	0.045	0.035	5.8×10^{-4}	8.2×10^{-3}	0.034	0.12
	NTS	0.046	0.044	5.3×10^{-4}	8.1×10^{-3}	0.033	0.13
Class B LLW	Hanford Site	0.042	0.033	3.4×10^{-6}	3.9×10^{-3}	0.016	0.095
	NTS	0.043	0.045	3.1×10^{-6}	3.8×10^{-3}	0.017	0.11
Class C LLW	Hanford Site	0.13	0.10	1.2×10^{-6}	0.012	0.049	0.29
	NTS	0.13	0.14	1.1×10^{-6}	0.012	0.053	0.34
CH-TRU	SRS → WIPP	0.014	0.015	2.9×10^{-4}	5.8×10^{-3}	0.037	0.072
	INEEL → WIPP	0.014	0.016	3.4×10^{-4}	5.8×10^{-3}	0.023	0.059
	ORNL → WIPP	0.012	0.015	2.5×10^{-4}	5.1×10^{-3}	0.022	0.055
	Hanford → WIPP	0.016	0.017	4.3×10^{-4}	6.7×10^{-3}	0.032	0.073
RH-TRU	SRS → WIPP	0.011	0.012	3.1×10^{-8}	1.4×10^{-3}	8.8×10^{-3}	0.033
	INEEL → WIPP	0.011	0.013	4.0×10^{-8}	5.4×10^{-3}	0.021	0.050
	ORNL → WIPP	9.8×10^{-3}	0.011	2.9×10^{-8}	4.8×10^{-3}	0.021	0.047
	Hanford → WIPP	0.013	0.014	5.0×10^{-8}	6.3×10^{-3}	0.030	0.063
MLLW	Envirocare	1.3×10^{-3}	1.0×10^{-3}	4.1×10^{-5}	2.4×10^{-4}	8.1×10^{-4}	3.4×10^{-3}
	Hanford Site	1.4×10^{-3}	1.1×10^{-3}	4.5×10^{-5}	2.5×10^{-4}	1.0×10^{-3}	3.8×10^{-3}
	NTS	1.4×10^{-3}	1.3×10^{-3}	4.1×10^{-5}	2.5×10^{-4}	1.0×10^{-3}	4.0×10^{-3}
HLW	SRS → Repository	0.010	0.021	3.0×10^{-7}	6.1×10^{-3}	0.035	0.072
	Hanford Site → Repository	9.4×10^{-3}	0.021	3.9×10^{-7}	5.3×10^{-3}	0.030	0.066
						Total Rail Fatalities:	0.66 – 0.79

Acronyms: LCFs = latent cancer fatalities; CH-TRU = contact-handled transuranic waste; RH-TRU = remote-handled transuranic waste; MLLW = mixed low-level waste; HLW = high-level radioactive waste; SRS = Savannah River Site; NTS = Nevada Test Site; WIPP = Waste Isolation Pilot Plant; INEEL = Idaho National Engineering and Environmental Laboratory; ORNL = Oak Ridge National Laboratory. The range of total fatalities is based on the minimum and maximum total fatalities for each waste type.

Public Impacts. If trucks were used to ship the waste, the maximally exposed member of the public would be a person working at a service station who would receive a radiation dose of about 19 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 1.1×10^{-5}.

If trains were used to ship the waste, the maximally exposed member of the public would be a rail yard worker who was not directly involved with handling the railcars. This person would receive a radiation dose of about 35 mrem per year. This is equivalent to a probability of a latent cancer fatality of about 2.1×10^{-5}.

4.5.3.3 Impacts from the Maximum Reasonably Foreseeable Transportation Accidents

As is the case for Alternative A, for waste shipped under Alternative B, the maximum reasonably foreseeable truck or rail transportation accident with the highest consequences would involve CH-TRU waste. Because one TRUPACT-II shipping container was assumed to be involved in either the truck or rail accident, the consequences for the truck or rail accident are the same. However, the probability of the truck and rail accidents are slightly different. The probability of the truck accident was 8×10^{-7} per year. For rail, the probability of the accident was 3×10^{-7} per year. The maximally exposed individual would receive a radiation dose of about 25 rem from this accident, which is equivalent to a latent cancer fatality risk of 0.015. The population would receive a collective radiation dose of approximately 6,600 person-rem from this accident. This could result in about 4 latent cancer fatalities. Using the screening procedure in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002), the sum of fractions of the biota concentration guides for the CH-TRU accident was less than 1. Therefore, the radioactive releases from the CH-TRU accident would not be likely to cause persistent, measurable, deleterious changes in populations or communities of terrestrial or aquatic plants or animals.

4.5.4 Offsite Impacts (Alternative B)

Under Alternative B, LLW and mixed LLW would be disposed of at Hanford, NTS, or a commercial disposal site such as Envirocare. If the entire volume of WVDP LLW and mixed LLW inventory were sent to one of these sites, the probability that a worker would incur a latent cancer fatality would range from 3.2×10^{-2} to 3.6×10^{-2}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 5.1×10^{-5} and 2.1×10^{-15}.

In addition, approximately 1,372 cubic meters (49,000 cubic feet) of TRU waste would be stored at Hanford, INEEL, ORNL, SRS, or WIPP. Interim storage of this waste volume would result in a probability that a worker would incur a latent cancer fatality of between 2.5×10^{-3} and 1.6×10^{-4}. The maximally exposed individual member of the public would have a probability of incurring a latent cancer fatality of between 6.9×10^{-7} and 2.1×10^{-10}. The populations within 80 kilometers (50 miles) of the sites would have a probability of incurring a latent cancer fatality of between 2.6×10^{-3} and 2.3×10^{-5}.

HLW currently stored at WVDP would be stored at Hanford or SRS. Interim storage of 300 canisters of WVDP HLW at these sites would result in a probability that a worker would incur a latent cancer fatality of between 2.0×10^{-2} and 3.6×10^{-2}.

Table 2-6 provides offsite human health impacts in detail; Appendix C, Section C.10, explains how these impacts were derived.

4.6 ENVIRONMENTAL JUSTICE IMPACTS

In February 1994, the President issued Executive Order 12898, titled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* [59 Fed. Reg. 7629-7633 (1994)]. This Order directs federal agencies to incorporate environmental justice as part of their missions. As such, federal agencies are specifically directed to identify and address as appropriate disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

The Council on Environmental Quality has issued guidance (CEQ 1997) to federal agencies to assist them with their NEPA procedures so that environmental justice concerns are effectively identified and addressed. In this guidance, the Council encouraged federal agencies to supplement the guidance with their own specific procedures tailored to particular programs or activities of an agency. DOE has prepared the *Draft Guidance on Incorporating Environmental Justice Considerations into the Department of Energy's National Environmental Policy Act Process* (DOE 2000) based on Executive Order 12898 and the Council on Environmental Quality environmental justice guidance.

Among other things, the DOE draft guidance states that even for actions that are at the low end of the sliding scale with respect to the significance of environmental impacts, some consideration (which could be qualitative) is needed to show that DOE considered environmental justice concerns. DOE needs to demonstrate that it considered apparent pathways or uses of resources that are unique to a minority or low-income community before determining whether, even in light of these special pathways or practices, there are disproportionately high and adverse impacts on the minority or low-income population. The DOE draft guidance also defines "minority population" as a populace where either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population.

For this Waste Management EIS, DOE applied the environmental justice guidance to determine whether there could be any disproportionately high and adverse human health or environmental impacts on minority or low-income populations surrounding the WVDP site as a result of the implementation of any of the alternatives analyzed. Analysis of environmental justice concerns was based on an assessment of the impacts reported in Sections 4.3 through 4.5. Although no high and adverse impacts were identified to any receptor from either the proposed onsite waste management actions or the offsite shipments of wastes, DOE considered whether minority or low-income populations would be disproportionately affected by the ongoing management of the WVDP site, particularly taking into account subsistence fishing on the part of some residents of the Cattaraugus Reservation of the Seneca Nation of Indians.

Subsistence Consumption of Fish. Consumption of food and water is a major source of exposure to potentially hazardous substances for U.S. residents. These pathways are also expected to be the primary routes through which a resident of the Cattaraugus Reservation of the Seneca Nation could be exposed to releases from the WVDP site. Because a member of the Seneca Nation may consume more fish from local waters than other members of the population around the WVDP site, DOE performed an additional dose assessment for increased fish consumption.

Specifically, DOE evaluated the potential human health impacts that could occur from the consumption by one individual of up to 62 kilograms (137 pounds) of game fish per year, compared to 21 kilograms (46 pounds) of game fish assumed for the maximally exposed individual in the WVDP Annual Site Environmental Reports. The 62-kilogram consumption rate represents the 95th percentile fish consumption rate for Native Americans from the *Exposure Factors Handbook* (EPA 1997).

Over the period 1995 through 1999, the average radiation dose from fish consumption reported in the WVDP Annual Site Environmental Reports (WVNS 1996, 1997, 1998, 1999, 2000c) was 0.016 mrem per year, based on eating 21 kilograms (46 pounds) of fish per year. The radiation dose from eating 62 kilograms (137 pounds) of fish per year was 0.05 mrem per year. These radiation doses are less than 0.1 percent of the DOE standard of 100 mrem per year from DOE Order 5400.5 and would result in less than 1 (3.0×10^{-8}) latent cancer fatality. Based on this analysis, DOE concludes that implementation of any of the alternatives would not result in disproportionately high and adverse impacts on the minority or low-income population in the region, even in light of possible increased exposure through subsistence fishing. Additional information concerning the assessment of human health impacts is provided in Appendix C.

Transportation. The transportation of radioactive waste would use the nation's existing highways and railroads. As described in previous sections, the total impacts from transportation would be very low (less than 1 fatality over 10 years) and therefore would not present a large health or safety risk to the population as a whole, or to workers or individuals along transportation routes. Based on this analysis, DOE concludes that implementation of any of the alternatives would not result in disproportionately high and adverse impacts on the minority or low-income populations along transportation routes.

Only a severe accident that resulted in a considerable release of radioactive material could cause high and adverse impacts in the affected populations. Because the risk of these accidents applies to the entire population along transportation routes, it would not apply disproportionately to any minority or low-income populations along the routes.

Additional information concerning the assessment of transportation impacts is provided in Appendix D.

Offsite Activities. The potential that low-income or minority populations could experience disproportionately high and adverse environmental consequences at sites where waste management activities would occur was addressed in earlier NEPA documents (see Section 1.7.1). No such potential impacts were identified for any site. For LLW, mixed LLW, and HLW, the potential for adverse human health impacts as a result of waste management activities is low, and no disproportionately high and adverse health effects would be expected for any particular segment of the population, including low-income or minority populations.

With respect to TRU waste, the WM PEIS concluded that the potential for disproportionately high and adverse human health effects as a result of TRU waste treatment operations was low for all sites except INEEL and WIPP (WM PEIS, Section 8.10.1). At those sites, the maximally exposed individual member of the public would be located in a census tract that contained a low-income or minority population. WVDP TRU waste, however, would be stored on these sites on an interim basis and would not be treated. Therefore, DOE does not anticipate that the interim storage of WVDP TRU waste at either of these sites would pose disproportionately high and adverse impacts on low-income or minority populations.

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CHAPTER 5
CUMULATIVE IMPACTS

> This chapter addresses the potential for cumulative environmental impacts resulting from the implementation of Alternatives A or B and other past, present, and reasonably foreseeable future actions in the region around the West Valley Demonstration Project site.

Council on Environmental Quality regulations implementing the procedural provisions of NEPA require federal agencies to consider the cumulative impacts of a proposal (40 CFR 1508.25(c)). A cumulative impact on the environment is the impact that results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). This type of an assessment is important because significant cumulative impacts can result from several smaller actions that by themselves do not have significant impacts.

The Western New York Nuclear Service Center is located in a rural area with no other major industrial or commercial centers surrounding it. Land use within 8 kilometers (5 miles) of the site is predominantly agricultural (active and inactive) and forestry uses. The industries near the site are light industrial and commercial (either retail or service-oriented). A field review of an 8-kilometer (5-mile) radius did not indicate the presence of any industrial facilities that would present a hazard in terms of safe operation of the site or would have any potential to impact the environment around WVDP (see Section 3.5). Thus, there is no potential for cumulative impacts from other present or reasonably foreseeable future actions, other than from activities at the site.

The WVDP site and the surrounding area in Cattaraugus County are in attainment with the National Primary and Secondary Ambient Air Quality Standards and New York State air quality standards. WVDP's current emissions of criteria pollutants are well below the New York State Department of Environmental Conservation's annual emission. The estimate of future emissions of criteria pollutants under all alternatives demonstrates that the site will continue to operate within its permit limits, with emissions that, even when conservatively combine with Buffalo background levels, would all be below federal and New York State standards (see Section 3.3.2).

Past fuel processing and radioactive waste disposal operations at the Center have resulted in airborne and liquid releases, some soil and groundwater contamination, limited sediment contamination in the creeks, and some detectible contamination off the site. The net impact from these past operations to the regional population near the Center has been estimated to be approximately 13 person-rem. During reprocessing operations, the estimated cumulative exposure to the workforce was about 4,200 person-rem (JAI 1980). As demonstrated in Section 4.0, the potential radiation dose to workers and the public, within 80 kilometers (50 miles), from the implementation of the No Action Alternative, Alternatives A or B, would be far lower than that experienced in the past (2.5 person-rem), and the resulting cumulative impact would be very small (less than one projected latent cancer fatality). There are ongoing operations at the WVDP site. These activities are those included in the No Action Alternative and Alternatives A and B and involve active hazardous waste management, operational support, surveillance, and oversight and other routine operations. These activities result in exposure of workers and the public to very low doses of radiation above background levels each year (0.1 percent of natural background annual exposure for the maximally exposed member of the public). The dose from ongoing operations, when added to the expected dose from the implementation of Alternatives A or B, would remain very low.

All ongoing operations that would contribute to potential impacts have been incorporated into the impact analyses provided in this EIS that demonstrate very small impacts. There are no other ongoing or currently planned activities at the WVDP site that would contribute to site cumulative impacts. In the future, DOE or the New York State Energy Research and Development Authority may propose decommissioning and/or long-term stewardship activities that could impose environmental impacts at the site. However, at this time it is not known or reasonable to speculate what, if any, contributions future decontamination and/or long-term stewardship actions may make to cumulative impacts.

It is reasonably foreseeable that waste generated as part of decommissioning and/or long-term stewardship activities would also be shipped offsite. Although the specific volume cannot be known at this time and would vary depending on the alternative selected, it is expected that the volume to be shipped offsite would be analyzed in the Decommissioning and/or Long-Term Stewardship EIS.

The shipment of radioactive wastes from the WVDP site to the disposal sites has the potential to affect people nationwide located along the highway and rail corridors between the site and the offsite disposal facilities. These potential impacts include the direct effect of radiation exposure to people using, working, and residing along the selected corridors and traffic accidents. Transportation workers and the general public using, working, and residing along the selected transportation corridors could also be affected by shipments of radioactive waste or materials from other sites. This situation would be particularly true for individuals residing along the major interstate highways used as access routes to the waste disposal sites. However, the potential cumulative impacts would be small, less than one projected latent cancer fatality in the affected population for the 10-year duration of the proposed actions (see Section 4.0). Further, there would be relatively few shipments of radioactive waste, (average of 25 trucks and/or 8 railcars per year) from the WVDP site, in comparison to other radioactive waste and materials shipments and truck shipments. Additionally, the actions contemplated in this EIS are also addressed in other NEPA documents such as the WM PEIS (DOE 1997a) and WIPP Supplemental EIS II (DOE 1997b) as listed in Section 1.7. These documents include analyses of impacts associated with transportation of waste to the receiving sites identified in this EIS and potential cumulative impacts at those sites.

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CHAPTER 6

UNAVOIDABLE IMPACTS, SHORT-TERM USES AND LONG-TERM PRODUCTIVITY, AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

In addition to a discussion of the environmental impacts of the proposed action and a discussion of alternatives, NEPA requires that an EIS contain information on any adverse environmental effects that could not be avoided if the proposed action were implemented, the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources that would be involved in the proposed action should it be implemented (NEPA, Section 102(2)(C); 42 U.S.C. 4332(C)). This chapter provides this information for Alternatives A and B.

6.1 UNAVOIDABLE ADVERSE IMPACTS

Under Alternative A or B, there would be a very slight increase in radiation doses to the public and workers as a result of waste management activities, which could result in a very slight increase in excess cancer risk. The highest *total* risk of a latent cancer fatality for the maximally exposed member of the public would be very low at 3.1×10^{-7} (about 3 chances in 10 million) under all alternatives, including the No Action Alternative. Offsite transportation of waste under Alternatives A or B could result in slight worker and public radiation exposure and the potential for traffic accident fatalities. The total estimate of fatalities from waste shipments is less than one for all alternatives.

6.2 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

Implementation of Alternative A or B would not create a conflict between the local, short-term uses of the environment and long-term productivity. All activities would occur in existing or planned facilities or would use existing or planned infrastructure resources such as roads and railways. Environmental resources such as land use, plants and animals, and wetlands would not be affected by implementation of either of the action alternatives.

6.3 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Utilization of utilities such as electricity, natural gas, and water would continue at the same rates as current operations under all alternatives. The only additional irreversible or irretrievable commitment of resources that would occur if Alternative A or B were implemented is the use of fossil fuels in the shipment of waste off the site and the use of land for the disposal of radioactive wastes. Approximately 2,550 truck or 847 rail shipments would be required to ship all LLW, mixed LLW, TRU waste and HLW off the site under Alternative A or B. Both rail and truck shipments would require the consumption of diesel fuel and other fossil fuels such as gasoline and lubricants.

Implementation of Alternatives A or B would also involve the use of offsite land previously committed for radioactive waste disposal facilities. As described in Section 1.7, the land use requirements for the offsite disposal of LLW, mixed LLW, and TRU waste have been addressed in the WM PEIS (DOE 1997a) and the WIPP Supplemental EIS II (DOE 1997b). Land use requirements for the offsite disposal of HLW are addressed in the *Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE 2002).

6.4 REFERENCES

DOE (U.S. Department of Energy), 1997a. *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (Volumes 1 through 5)*, DOE/EIS-0200-F, Washington, DC, May.

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CHAPTER 7
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This chapter identifies the individuals who were principal preparers of this document. Daniel Sullivan directed its preparation. Thomas L. Anderson managed the project and provided technical support. Lucinda Swartz served as technical reviewer for conformity to the National Environmental Policy Act, the Council on Environmental Quality, and U.S. Department of Energy regulations and guidance. Following the list of preparers is the "NEPA Disclosure Statement for Preparation of the West Valley Demonstration Project Waste Management Environmental Impact Statement."

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NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE WEST VALLEY DEMONSTRATION PROJECT WASTE MANAGEMENT ENVIRONMENTAL IMPACT STATEMENT

CEQ Regulations at 40 CFR 1506.5(c), which have been adopted by the DOE (10 CFR 1021), require a contractor who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial or other interest in the outcome of the project" for purposes of this disclosure, is defined in the March 23, 1981, guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 18026-18038 at Questions 71a and b.

"Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)" 46 FR 18026-18038 at 18031.

In accordance with these requirements, **Battelle Memorial Institute** hereby certifies as follows: check either (a) or (b).

(a) **X** **Battelle Memorial Institute** has no financial or other interest in the outcome of the referenced EIS projects.

(b) ____ ________________________________ has the following financial or other interest in the outcome of the referenced EIS projects hereby agree to divest themselves of such interest prior to the start of the work.

Financial or Other Interest

1.
2.
3.

Certified by:

Signature

Ralph K. Henricks
Name

Contracting Officer
Title

25 October 2000
Date

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CHAPTER 8

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Joe Patti
John Pfeffer
Lana Redeye
Larry Rubin
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Warren Schmidt
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Ray Vaughan
Eric Wohlers
Pete Cooney, alternate
Gayla Gray, alternate
Mark Mitskovski, alternate
Bob Potter, alternate
CTF General Mailing Distribution

OTHER
Ed Ahrens
Peter Allan
Janet Anderson
Jay Beech
Willis Bixby
Tom Blackburn
David Bradshaw
Melinda Brown
Joyce Cardwell
Wesley Churchill
Cristin Clarke
Ron Cook
Captain Scott M. Crosier
Leonard Davis
Bill Dibble
George A. Gilpin
Sam Kaiser
Stephen J. Krzes
John J. Lake
Dave Lechel
Steve Maheras
Laura McDade
J. Stephen Montgomery
Wille Most
Norman Mulvenon
Dr. Kathleen Murphy
James Oliver
Marcus Page
Elizabeth Peele
Charles Pfeffer
Lee Poe
Richard Powell
Jeffrey Rikhoss
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CHAPTER 9
GLOSSARY

50 percent atmospheric conditions — Atmospheric conditions that are not exceeded 50 percent of the time and provide a realistic estimate of the likely atmospheric conditions that would exist during an accident.

95 percent atmospheric conditions — Atmospheric conditions that are not exceeded 95 percent of the time and provide an upper bound on the atmospheric conditions that would exist during an accident.

air quality — The cleanliness of the air as measured by the levels of pollutants relative to standards or guideline levels established to protect human health and welfare. Air quality is often expressed in terms of the pollutant for which concentrations are the highest percentage of a standard (e.g., air quality may be unacceptable if the level of one pollutant is 150 percent of its standard, even if levels of other pollutants are well below their respective standards).

air-quality standards — The legally prescribed level of constituents in the outside air that cannot be exceeded during a specified time in a specified area.

background radiation — Radiation from (1) cosmic sources, (2) naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material), and (3) global fallout as it exists in the environment (e.g., from the testing of nuclear explosive devices).

Center — The Western New York Nuclear Service Center; the site abbreviation as used in this EIS.

characterization — The determination of waste composition and properties, whether by review of process knowledge, nondestructive examination or assay, or sampling and analysis, generally done for the purpose of determining appropriate storage, treatment, handling, transport, and disposal practices to meet regulatory requirements.

cloudshine — Direct external dose from the passing cloud of dispersed radioactive material.

collective dose — The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem or person-sievert.

concentration — The quantity of a substance in a unit quantity of a sample (for example, milligrams per liter or micrograms per kilogram).

contact-handled waste — Radioactive waste or waste packages whose external dose rate is low enough to permit handling by humans during normal waste management activities. Also defined as transuranic waste with a surface dose rate not greater than 200 millirem per hour.

contamination — Unwanted chemical elements, compounds, or radioactive material on structures, areas, environmental media, objects, or personnel.

criteria pollutant — An air pollutant that is regulated by National Ambient Air Quality Standards (NAAQS). The Environmental Protection Agency must describe the characteristics and potential health and welfare effects that form the basis for setting, or revising, the standard for each regulated pollutant. Criteria pollutants currently are: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter (less than 10 micrometers [0.0004 inch] in diameter and less than 2.5 micrometers [0.0001 inch] in diameter. New pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available. *Note: Sometimes pollutants regulated by state laws are also called criteria pollutants.*

cumulative impacts — Impacts on the environment that result when the incremental impact of a proposed action is added to the impacts from other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes the other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

decommissioning — Removing facilities such as processing plants, waste tanks, and burial grounds from service and reducing or stabilizing radioactive contamination. Includes the following concepts: the decontamination, dismantling, and return of an area to its original condition without restrictions on use or occupancy; partial decontamination, isolation of remaining residues, and continued surveillance and restrictions on use or occupancy.

decontamination — The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive contamination from facilities, soil, or equipment by washing, chemical action, mechanical cleaning, or other techniques.

dermal — Relating to the skin.

disposal — Emplacement of waste so as to ensure isolation from the biosphere without maintenance and with no intent of retrieval, and requiring deliberate action to gain access after emplacement.

disposal area — A place for burying unwanted (that is, radioactive) materials in which the earth acts as a receptacle to prevent the dispersion of wastes in the environment and the escape of radiation.

disposal facility A man-made structure in which waste is disposed.

DOE orders Requirements internal to the U.S. Department of Energy (DOE) that establish DOE policy and procedures, including those for compliance with applicable laws.

dose (radiological) A generic term meaning absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or committed equivalent dose, as defined in the *Glossary of Terms Used in DOE NEPA Documents* (September 1998).

endangered species Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR 424). *Note: Some states also list species as endangered. Thus, in certain cases, a state definition would also be appropriate.*

environmental impact statement (EIS) The detailed written statement that is required by section 102(2)(C) of the National Environmental Policy Act (NEPA) for a proposed major federal action significantly affecting the quality of the human environment. A DOE EIS is prepared in accordance with applicable regulations in 40 CFR 1500-1508, and the Department of Energy NEPA regulations in 10 CFR Part 1021.

The statement includes, among other information, discussions of the environmental impacts of the proposed action and all reasonable alternatives, adverse environmental effects that can not be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources.

environmental justice The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and Tribal programs and policies. Executive Order 12898 directs federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations.

exposure The condition of being subject to the effects or acquiring a dose of a potential stressor such as a hazardous chemical agent or ionizing radiation; also, the process by which an organism acquires a dose of a chemical such as mercury or a physical agent such as ionizing radiation. Exposure can be quantified as the amount of the agent available at various boundaries of the organism (e.g., skin, lungs, gut) and available for absorption.

FONSI (Finding of no significant impact) A public document issued by a federal agency briefly presenting the reasons why an action for which the agency has prepared an environmental assessment has no potential to have a significant effect on the human environment and, thus, will not require preparation of an environmental impact statement. [See environmental impact statement.]

geologic repository A system that is intended to be used for, or may be used for, the disposal of radioactive waste or spent nuclear fuel in excavated geologic media. A geologic repository includes (a) the geologic repository operations area, and (b) the portion of the geologic setting that provides isolation. A near-surface disposal area is not a geologic repository.

groundwater Water below the ground surface in a zone of saturation.

Subsurface water is all water that exists in the interstices of soil, rocks, and sediment below the land surface, including soil moisture, capillary fringe water, and groundwater. That part of subsurface water in interstices completely saturated with water is called groundwater.

groundshine Direct external dose from radioactive material that has deposited on the ground after being dispersed from the accident site.

hazardous waste A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 40 CFR 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the Environmental Protection Agency in 40 CFR 261.31 through 40 CFR 261.33.

Source, special nuclear, or by-product materials as defined by the Atomic Energy Act are not hazardous waste because they are not solid waste under RCRA. (See Resource Conservation and Recovery Act and waste characterization.)

high-efficiency particulate air filter (HEPA) An air filter capable of removing at least 99.97 percent of particles 0.3 micrometers (about 0.00001 inch) in diameter. These filers include a pleated fibrous medium (typically fiberglass) capable of capturing very small particles.

high-level (radioactive) waste (HLW)
Defined by statute (the Nuclear Waste Policy Act) to mean the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products nuclides in sufficient concentrations; and other highly radioactive material that the U.S. Nuclear Regulatory Commission (NRC), consistent with existing law, determines by rule requires permanent isolation. The NRC has not defined "sufficient concentrations" of fission products or identified "other highly radioactive material that requires permanent isolation." The NRC defines high-level radioactive waste (HLW) to mean irradiated (spent) reactor fuel, as well as liquid waste resulting from the operation of the first cycle solvent extraction system, the concentrated wastes from subsequent extraction cycles in a facility for reprocessing irradiated reactor fuel, and solids into which such liquid wastes have been converted.

involved worker
Worker who would participate in a proposed action.

lag storage
In the context of this EIS, temporary onsite storage of waste at WVDP facilities.

latent cancer fatality (LCF)
Deaths from cancer resulting from, and occurring some time after, exposure to ionizing radiation or other carcinogens.

Low-income population
Low-income populations, defined in terms of Bureau of the Census annual statistical poverty levels (Current Population Reports, Series P-60 on Income and Poverty), may consist of groups or individuals who live in geographic proximity to one another or who are geographically dispersed or transient (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. (See environmental justice.)

low-level (radioactive) waste (LLW)
Radioactive waste that is not high-level waste, transuranic waste, spent nuclear fuel, or by-product tailings from processing of uranium or thorium ore. (See radioactive waste.)

maximally exposed individual (MEI)
A hypothetical individual whose location and habits result in the highest total radiological or chemical exposure (and thus dose) from a particular source for all exposure routes (e.g., inhalation, ingestion, direct exposure).

millirem
One-thousandth of a rem (Also see *rem*).

mitigative measures
Those actions that avoid impacts altogether, minimized impacts, rectify impacts, reduce or eliminate impacts, or compensate for the impact.

mixed waste
Waste that contains both hazardous waste, as defined under the Resource Conservation and Recovery Act, and source, special nuclear, or by-product material subject to the Atomic Energy Act.

NAAQS (National Ambient Air Quality Standards)
Standards defining the highest allowable levels of certain pollutants in the ambient air (i.e., the outdoor air to which the public has access). Because the Environmental Protection Agency must establish the criteria for setting these standards, the regulated pollutants are called *criteria* pollutants. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter, less than 10 micrometers (0.0004 inch) in diameter, and less than 2.5 micrometers (0.0001 inch) in diameter. Primary standards are established to protect public health; secondary standards are established to protect public welfare (e.g., visibility, crops, animals, buildings). (See criteria pollutant.)

NEPA (National Environmental Policy Act of 1969)
NEPA is the basic national charter for protection of the environment. It establishes policy, sets goals (in Section 101), and provides means (in Section 102) for carrying out the policy. Section 102(2) contains "action-enforcing" provisions to ensure that federal agencies follow the letter and spirit of the Act. For major federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of NEPA requires federal agencies to prepare a detailed statement that includes the environmental impacts of the proposed action and other specified information.

NESHAPs (National Emissions Standards for Hazardous Air Pollutants)
Emissions standards set by the Environmental Protection Agency for air pollutants which are not covered by the Nation Ambient Air Quality Standards (NAAQS) and which may, at sufficiently high levels, cause increased fatalities, irreversible health effects, or incapacitating illness. These standards are given in 40 CFR Parts 61 and 63. NESHAPs are given for many specific categories of sources (e.g., equipment leaks, industrial process cooling towers, dry cleaning facilities, petroleum refineries).

noninvolved worker
A worker who would be on the site of an action but would not participate in the action. (See involved worker.)

occupational dose
Whole-body radiation dose received by workers participating in a given task.

person-rem
The unit of collective radiation dose applied to populations or groups of individuals (see collective dose); that is, a unit for expressing the dose when summed across all persons in a specified population or group. One person-rem equals 0.01 person-sieverts.

probability of occurrence
The chance that an accident might occur during the conduct of an activity.

radioactive waste	In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or by-product material is subject to regulation as radioactive waste under the Atomic Energy Act. Also, waste material that contains accelerator-produced radioactive material or a high concentration of naturally occurring radioactive material may be considered radioactive waste.
radionuclide	An unstable isotope that undergoes spontaneous transformation, emitting radiation.
Record of Decision (ROD)	A concise public document that records a federal agency's decision(s) concerning a proposed action for which the agency has prepared an environmental impact statement (EIS). The ROD is prepared in accordance with the requirements of the Council on Environmental Quality NEPA regulations (40 CFR 1505.2). A ROD identifies the alternatives considered in reaching the decision, the environmentally preferable alternatives(s), factors balanced by the agency in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not. [See environmental impact statement (EIS).]
release fraction	The fraction of the radioactivity that could be released to the atmosphere in a given accident.
rem	A unit of dose equivalent. The dose equivalent in rem equals the absorbed dose in rads in tissue multiplied by the appropriate quality factor and possibly other modifying factors. Derived from "roentgen equivalent man," referring to the dosage of ionizing radiation that will cause the same biological effect as one roentgen of X-ray or gamma-ray exposure. One rem equals 0.01 sievert.
remote-handled waste	Packaged waste whose external surface dose rate exceeds 200 millirem per hour.
repository	A permanent deep geologic disposal facility for high-level or transuranic wastes and spent nuclear fuel.
Resource Conservation and Recovery Act (RCRA)	A law that gives the Environmental Protection Agency the authority to control hazardous waste from "cradle to grave" (i.e., from the point of generation to the point of ultimate disposal), including its minimization, generation, transportation, treatment, storage, and disposal. RCRA also sets forth a framework for the management of non-hazardous solid wastes. (See hazardous waste.)
risk	The probability of a detrimental effect from exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of that event (i.e., the product of these two factors). However, separate presentation of probability and consequence is often more informative.

scientific notation — A notation adopted by the scientific community to deal with very large and very small numbers by moving the decimal point to the right or left so that only one number above zero is to the left of the decimal point. Scientific notation uses a number times 10 and either a positive or negative exponent to show how many places to the left or right the decimal places has been moved. For example, in scientific notation, 120,000 would be written as 1.2×10^5, and 0.000012 would be written as 1.2×10^{-5}.

scoping — An early and open process for determining the scope of issues to be addressed in an environmental impact statement (EIS) and for identifying the significant issues related to a proposed action.

The scoping period begins after publication in the Federal Register of a Notice of Intent (NOI) to prepare an EIS. The public scoping process is that portion of the process where the public is invited to participate. DOE also conducts an early internal scoping process for environmental assessments or EISs. For EISs, this internal scoping process precedes the public scoping process. DOE's scoping procedures are found in 10 CFR 1021.311.

source term — The amount of a specific pollutant (e.g., chemical, radonuclide) emitted or discharged to a particular environmental medium (e.g., air, water) from a source or group of sources. It is usually expressed as a rate (i.e., amount per unit time).

storage (waste) — The collection and containment of waste in a retrievable manner, requiring surveillance and institutional control, as not to constitute disposal.

surface water — All bodies of water on the surface of the earth and open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

thalweg — The line joining the deepest points of a stream channel, often used as a synonym for valley profile.

threatened species — Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the Endangered Species Act and its implementing regulations (50 CFR 424). (See endangered species.)

transuranic (TRU) waste — Radioactive waste that is not classified as high-level radioactive waste and that contains more than 100 nanocuries (3700 becquerels) per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years.

TRUPACT-II TRUPACT-II is the package designed to transport contact-handled transuranic waste to the Waste Isolation Pilot Plant site. It is a cylinder with a flat bottom and a domed top that is transported in the upright position. The major components of the TRUPACT-II are an inner, sealed, stainless steel containment vessel within an outer, sealed, stainless steel containment vessel. Each containment vessel is nonvented and capable of withstanding 345 kilopascals (50 pounds per square inch) of pressure. The inner containment vessel cavity is 1.8 meters (6 feet) in diameter and 2 meters (6.75 feet) tall, with a capability of transporting fourteen 0.21-cubic-meter (55-gallon) drums, two standard waste boxes, or one 10-drum overpack.

waste characterization The identification of waste composition and properties by reviewing process knowledge, nondestructive examination, nondestructive assay, or sampling and analysis. Characterization provides the basis for determining appropriate storage, treatment, handling, transportation, and disposal methods to meet regulatory requirements.

worker Any worker whose day-to-day activities are controlled by process safety management programs and a common emergency response plan associated with a facility or facility area. This definition includes any individual within a facility/facility area who would participate or support activities required for implementation of the alternatives.

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CHAPTER 10

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