Office of
Fissile Materials Disposition

United States Department of Energy

Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement

Volume II - Part B

December 1996

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Attention: Storage and Disposition of Weapons-Usable Fissile Materials
Final Programmatic Environmental Impact Statement/Volume II - Part B

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COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy (DOE)

TITLE: *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE/EIS-0229)

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ABSTRACT: This document analyzes the potential environmental consequences of alternatives for the long-term storage (up to 50 years), including storage until disposition, and disposition of weapons-usable fissile materials from U.S. nuclear weapon dismantlements under the responsibility of the DOE. Long-term storage of nonsurplus inventories of weapons-usable plutonium (Pu) and highly enriched uranium (HEU) are required for national defense purposes, while the disposition of surplus weapons-usable Pu is necessary in order to implement our national nonproliferation policy. In addition to the No Action Alternative, this PEIS assesses three storage alternatives (that is, upgrade at multiple sites, consolidation of Pu, and collocation of Pu and HEU) at six DOE candidate sites located across the country. These sites are Hanford Site, Nevada Test Site, Idaho National Engineering Laboratory, Pantex Plant, Oak Ridge Reservation, and Savannah River Site. Although they are not candidate sites for storage, Rocky Flats Environmental Technology Site (RFETS) and Los Alamos National Laboratory are assessed for the No Action Alternative. For the disposition of surplus Pu, three alternative categories (that is, deep borehole, immobilization, and reactor) with nine primary alternatives are assessed at several DOE and representative sites for analysis purposes. Evaluations of impacts on site infrastructure, water resources, air quality and noise, socioeconomics, waste management, public and occupational health and safety, and environmental justice are included in the assessment. The intersite transportation of nuclear and hazardous materials is also assessed. DOE's Preferred Alternative is identified in this Final PEIS. The Preferred Alternative for storage is a combination of No Action and Upgrade Alternatives for the various DOE sites, and phaseout of Pu storage at RFETS. The Preferred Alternative for disposition of surplus Pu is to pursue a disposition strategy involving a combination of immobilization and reactor alternatives, including vitrification, ceramic immobilization, and existing reactors.

PUBLIC INVOLVEMENT: The DOE issued a Draft PEIS on March 8, 1996, and held a formal public comment period on the Draft through June 7, 1996. In preparing the Final PEIS, DOE considered comments received via mail, fax, electronic bulletin board (Internet), and transcripts of messages recorded by telephone. In addition, comments and concerns were recorded by notetakers during interactive public meetings held during March and April 1996 in Denver, CO, Las Vegas, NV, Oak Ridge, TN, Richland, WA, Idaho Falls, ID, Washington, DC, Amarillo, TX, and North Augusta, SC. Comments received and DOE's responses to those comments are found in Volume IV of the Final PEIS.

DOE/EIS-0229

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Office of Fissile Materials Disposition

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FOREWORD

This is the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (PEIS), prepared by the U.S. Department of Energy, Office of Fissile Materials Disposition. The document is composed of four volumes and a separate Summary. Changes made since the Draft PEIS are shown by change bar notation (vertical lines adjacent to the changes) in this Final PEIS for both text and tables. Deletion of one or more sentences is indicated by the phrase "Text deleted." in brackets. This Final PEIS includes the Preferred Alternative, which is a combination of alternatives. The Preferred Alternative is described in Section 1.6 and Chapter 2 of Volume I, and analyzed in Chapter 4 of Volume II. For all the alternatives, including the Preferred Alternative, a comparison of alternatives is presented in Section 2.5 of Volume I and a summary of impacts is presented in Section 4.6 of Volume II (Part B). Information from these sections is also presented in the Summary.

Volume I contains Chapters 1 through 3 of the PEIS. Chapter 1 includes a description of the history and background of the fissile materials disposition program, the purpose of and need for the proposed action, a summary of changes made to the Draft PEIS, and the Preferred Alternative. Chapter 2 gives a description of the proposed long-term storage and disposition alternatives, a description of how the alternatives were selected and why others were eliminated from further consideration, and a comparison of the alternatives in terms of their potential environmental impacts. Chapter 3 describes the affected environment at candidate long-term storage locations, and at sites and environmental settings for the disposition alternatives.

Volume II (Parts A and B) contains Chapters 4 through 10 of the PEIS. Chapter 4 describes the potential environmental impacts resulting from construction and operation of the proposed long-term storage and disposition alternatives, including the Preferred Alternative. Also contained in this chapter are intersite transportation impacts, a discussion of environmental justice issues, cumulative impacts due to the implementation of the proposed alternatives in addition to other actions at a site, avoided environmental impacts, and a summary of impacts. Chapter 5 provides a list of references used in the preparation of this document. Chapter 6 provides an index to the main text of the PEIS. Chapter 7 is a glossary of key terms used in the document. Chapter 8 is a list of preparers. Chapter 9 lists government agencies and organizations contacted during the preparation of this PEIS. Chapter 10 provides a distribution list for the document.

Volume III contains the appendices to this PEIS. Appendix A contains the fact sheet on the President's *Nonproliferation and Export Control Policy*, and the Joint Statement Between the United States and Russia on Nonproliferation. Appendix B provides specifications for key buildings within each facility complex analyzed in this PEIS. Appendix C describes requirements for construction and operation of the various facilities required to accomplish the storage and disposition activities essential to the alternatives described in this PEIS. Appendix D provides information on overall water usage for the storage and disposition facilities discussed in this PEIS. Appendix E gives a general overview of the Department of Energy (DOE) environmental restoration and waste management program, baseline waste management at DOE sites, and project-specific waste management activities associated with the proposed long-term storage and disposition alternatives. Appendix F provides detailed data supporting the air quality and noise analyses. Appendix G describes the methodology used for intersite transportation risk analysis and provides a summary of hazardous materials shipped to and from DOE sites, plus information on shipping containers. Appendix H evaluates various plutonium waste forms for potential disposal in a high-level waste repository. Appendix I describes operations of a Canadian Deuterium Uranium Reactor. Appendix J identifies the compliance requirements associated with the Proposed Action, as specified by the major Federal and State environmental, safety, and health statutes, regulations, and orders. Appendix K lists the scientific names of common nonthreatened and nonendangered animal and plant species identified in Chapters 3 and 4. Appendix L includes the supporting data used for assessing the No Action

Alternative in the socioeconomics sections of this PEIS. Appendix M presents detailed information on the potential health risks associated with releases of radioactivity and hazardous chemicals from the proposed storage and disposition alternatives during normal operations and from postulated accidents. Appendix N describes different concepts for, and provides cost and benefit information on, the multipurpose reactor. Appendix O provides a description of facilities and operations for a can-in-canister approach to plutonium immobilization at the Savannah River Site in South Carolina. Appendix P describes the potential environmental impacts of using the Manzano Weapons Storage Area in New Mexico for the long-term storage of plutonium pits. Appendix Q identifies the potential health impacts from the storage of Rocky Flats Environmental Technology Site plutonium pits at the Pantex Plant in Texas. Appendix R discusses the aircraft crash and radioactive release probabilities for proposed storage and disposition facilities at Pantex Plant in Texas. A separate Classified Appendix was also prepared, which provides detailed analysis results for intersite transportation risks based on classified inventories of materials stored at DOE sites.

Volume IV (Parts A and B) is the Comment Response Document. It contains an overview of the public comment process, the comments received on the Draft PEIS during the public review period, and the DOE responses to those comments, including identifying changes made to the Draft PEIS in response to public comments.

The Summary provides a brief overview of the PEIS. It includes the purpose of and need for the Proposed Action, a description of the storage and disposition alternatives including the Preferred Alternative, and the potential environmental impacts resulting from these alternatives.

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LIST OF ACRONYMS AND ABBREVIATIONS

AADT	Average Annual Daily Traffic
ACEC	Area of Critical Environmental Concern
ACGIH	American Conference of Governmental Industrial Hygienists
AEA	*Atomic Energy Act*
AEC	Atomic Energy Commission
AGV	automated guided vehicle
ALARA	as low as reasonably achievable
ALE	Arid Lands Ecology Reserve
ANL-W	Argonne National Laboratory-West
APSF	Actinide Packaging and Storage Facility
AQCR	Air Quality Control Region
ARA	Auxiliary Reactor Area
ARIES	Advanced Recovery and Integrated Extraction System
BEA	Bureau of Economic Analysis
BEIR	biological effects of ionizing radiation
BLM	Bureau of Land Management
BOP	balance-of-plant
BPA	Bonneville Power Administration
BWR	boiling water reactor
CAA	*Clean Air Act*
CANDU	Canadian deuterium uranium
CAS	Chemical Abstracts Service
CCDF	complimentary cumulative distribution function
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CGTO	Consolidated Group of Tribes and Organizations
CI	confidence interval
CIC	can-in-canister
CLUP	Comprehensive Land-Use Plan
CMR	Chemistry and Metallurgy Research

COE	Corps of Engineers
Complex	Nuclear Weapons Complex
CRD	Comment Response Document
CRT	Cargo Restraint Transporters
CWA	*Clean Water Act*
D&D	decontamination and decommissioning
DAF	Device Assembly Facility
DCG	derived concentration guide
DHLW	defense high-level waste
DNB	departure of nucleate boiling
DNFSB	Defense Nuclear Facilities Safety Board
DNL	day and night average sound levels
DNWR	Desert National Wildlife Range
DoD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DP	Office of Defense Programs
DRCOG	Denver Regional Council of Governments
DWPF	Defense Waste Processing Facility
EA	environmental assessment
EBR	Experimental Breeder Reactor
EDNA	Environmental Design for Noise Abatement
EIA	Energy Information Administration
EIS	environmental impact statement
EM	Office of Environmental Management
EPA	Environmental Protection Agency
ERR	excess relative risk
ES&H	Office of Environment, Safety, and Health
ESA	*Endangered Species Act*
ETF	effluent treatment facility
FAIR	Forest, Agriculture, Industry, and Research
FCF	Fuel Cycle Facility
FEMA	Federal Emergency Management Agency
FFCA	Federal Facility Compliance Agreement
FFTF	Fast Flux Test Facility

FLPMA	*Federal Land Planning Management Act*
FMEF	Fuels and Materials Examination Facility
FMF	Fuel Manufacturing Facility
FONSI	Finding of No Significant Impact
FR	Federal Register
FSAR	Final Safety Analysis Report
GBZ	Glass-bonded zeolite
GESMO	Generic Environmental Statement on Mixed Oxide
GIS	Geographical Information System
GMA	*Growth Management Act*
GMODS	Glass Material Oxidation Dissolution System
HAD	hazard analysis document
Hanford	Hanford Site
HE	high explosives
HEAST	Health Effects Summary Table
HEPA	high-efficiency particulate air
HEU	highly enriched uranium
HEU EIS	*Disposition of Surplus Highly Enriched Uranium Environmental Impact Statement*
HFEF	Hot Fuel Examination Facility
HI	Hazard Index
HLW	high-level waste
HQ	Hazard Quotient
HRA EIS	*Hanford Remedial Action Environmental Impact Statement and Comprehensive Land Use Plan*
HVAC	Heating Ventilation and Air Conditioning
HWR	Heavy Water Reactor
IAEA	International Atomic Energy Agency
ICPP	Idaho Chemical Processing Plant
ICRP	International Commission of Radiological Protection
INEL	Idaho National Engineering Laboratory
IRIS	Integrated Risk Information System
ISCST2	Industrial Source Complex Short-Term Model Version 2
ISO	International Standards Organization
IWG	Interagency Working Group
K-25	K-25 Site

L/ER	Energy Research Program Office
LA	Limited Area
LAA	Limited Access Area
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Scattering Center
LCF	latent cancer fatalities
LDR	Land Disposal Restriction
LEU	low-enriched uranium
LIGO	Laser Interferometer Gravitational-Wave Observatory
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste
LOB	Laboratory Office Building
LWR	Light Water Reactor
MAA	Material Access Area
MACCS	Melcor Accident Consequence Code System
MC&A	Material Control and Accountability
MD	Office of Fissile Materials Disposition
MEI	maximally exposed individual
MHR	Modular Helium Reactor
MMI	Modified Mercalli Intensity
MOX	mixed oxide
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NAGPRA	*Native American Graves Protection and Repatriation Act*
NAS	National Academy of Sciences
NCDC	National Climatic Data Center
NCRP	National Commission of Radiological Protection
NEIC	National Earthquake Information Center
NEPA	*National Environmental Policy Act*
NERP	National Environmental Research Park
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFS	Nuclear Fuel Services Fuel Fabrication Plant
NHPA	*National Historic Preservation Act*
NIOSH	National Institute of Occupational Safety and Health
NMSF	Nuclear Material Storage Facility

NMSM	Nuclear Materials and Stockpile Management
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NRF	Naval Reactors Facility
NRHP	National Register of Historic Places
NTS	Nevada Test Site
NTS EIS	*Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada*
NWI	National Wetlands Inventory
NWPA	*Nuclear Waste Policy Act*
NWS	National Weather Service
OCRWM	Office of Civilian Radioactive Waste Management
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
PA	Protected Area
Pantex	Pantex Plant
Pantex EIS	*Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components*
PBF	Power Burst Facility
PCV	Primary Containment Vessel
PEIS	programmatic environmental impact statement
PEL	Permissible Exposure Level
PFP	Plutonium Finishing Plant
PFP EIS	*Plutonium Finishing Plant Stabilization Environmental Impact Statement*
PIDAS	Perimeter Intrusion Detection and Alarm System
PNNL	Pacific Northwest National Laboratory
PPA	Property Protection Area
PRA	probabilistic risk assessment
PSAR	Preliminary Safety Analysis Report
PSD	Prevention of Significant Deterioration

PUREX	Plutonium-Uranium Extraction Plant
PWR	pressurized water reactor
R&D	Research and Development
RCRA	*Resource Conservation and Recovery Act*
REA	regional economic area
RIA	reactivity insertion accident
RFETS	Rocky Flats Environmental Technology Site
RIMS II	Regional Input-Output Modeling System
RL	Richland Operations Office
ROD	Record of Decision
ROI	region of influence
RSWF	Radioactive Scrap and Waste Facility
RWMC	Radioactive Waste Management Complex
RWMS	Radioactive Waste Management Site
SAR	Safety Analysis Report
SARA	*Superfund Amendments and Reauthorization Act*
sd	standard deviation
SDWA	*Safe Drinking Water Act*
SEB	Security Equipment Building
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SISMP	Site Integrated Stabilization and Management Plan
SMR	Standardized Mortality Ratio
SNF	spent nuclear fuel
SNL	Sandia National Laboratories
SRR	standardize rate ratio
SRS	Savannah River Site
Stockpile Stewardship and Management PEIS	*Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*
Storage and Disposition PEIS	*Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement*
SST	safe secure trailer
START	Strategic Arms Reduction Talks

TA	Technical Area
TAN	Test Area North
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environmental Conservation
TDS	total dissolved solids
TI	transport index
TLV	Threshold Limit Values
TNRCC	Texas Natural Resources Conservation Commission
TRA	Test Reactor Area
TRU	transuranic
TSCA	*Toxic Substance Control Act*
TSD	Transportation Safeguards Division
TSP	total suspended particulates
TSR PEIS	*Tritium Supply and Recycling Programmatic Environmental Impact Statement*
TVA	Tennessee Valley Authority
USFWS	United States Fish and Wildlife Services
USGS	United States Geological Survey
VOC	volatile organic compound
VRM	Visual Resource Management
WAC	Waste Acceptance Criteria
Waste Management PEIS	*Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*
WIPP	Waste Isolation Pilot Plant
WMIS	Waste Management Information System
WNP	Washington Nuclear Power
WPPSS	Washington Public Power Supply System
WSA	Weapons Storage Area
WSCC	Western Systems Coordinating Council
WSCF	Waste Sampling and Characterization Facility
Y–12	Y–12 Plant
Y–12 EA	*Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Level at the Y–12 Plant, Oak Ridge, Tennessee*
YMSCO	Yucca Mountain Site Characterization Office
ZPPR	Zero Power Physics Reactor

Chemicals and Units of Measure

°C	degrees Celsius
Ci	curie
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
Co-60	cobalt-60
Cs	cesium
Cs-137	cesium-137
CsCl	cesium chloride
Cu	copper
dB	decibel
dBA	decibel A-weighted
°F	degrees Fahrenheit
ft	feet
ft^2	square feet
ft^3	cubic feet
g	gram
G	gravitational acceleration
gal	gallon
Gd	gadolinium
GWd	gigawatt-days
ha	hectare
H_2	hydrogen
HF	hydrogen fluoride
HNO_3	nitric acid
hr	hour
I-129	iodine-129
in	inch
k_{eff}	effective neutron multiplication factor
kg	kilogram
km	kilometer
km^2	square kilometer

Kr	krypton
kV	kilovolt
l	liter
lb	pound
m	meter
m^2	square meter
m^3	cubic meter
mCi	millicurie
mg	milligram
mi	mile
mi^2	square miles
min	minute
mph	miles per hour
mrem	millirem (one thousandth of a rem)
MW	megawatt
MWe	megawatt electric
N_2	nitrogen
nCi	nanocurie (one-billionth of a Curie)
Ni	nickel
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
oz	ounce
Pb	lead
PCB	polychlorinated biphenyl
pCi	picocurie (one-trillionth of a Curie)
PM_{10}	particulate matter less than or equal to 10 microns
ppm	parts per million
Pu	plutonium
PuCl	plutonium chloride
PuO_2	plutonium dioxide
rad	radiation absorbed dose
rem	roentgen equivalent man
RfC	Reference Concentration
RfD	Reference Dose

s	second
SO_2	sulfur dioxide
Sr-90	strontium-90
t	metric ton
Tc-99	technetium-99
ton	short ton
U	uranium
U-233	uranium-233
U-234	uranium-234
U-235	uranium-235
U-236	uranium-236
U-238	uranium-238
UF_6	uranium hexafluoride
UNH	uranyl nitrate hexahydrate
UO_2	uranium dioxide
U_3O_8	triuranium octaoxide
VOC	volatile organic compound
yd	yard
yr	year
μg	microgram (one-millionth of a gram)

Metric Conversion Chart

To Convert Into Metric			To Convert Out of 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	30.48	centimeters	centimeters	0.0328	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.0936	yards
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
sq. inches	6.4516	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.092903	sq. meters	sq. meters	10.7639	sq. feet
sq. yards	0.8361	sq. meters	sq. meters	1.196	sq. yards
acres	0.40469	hectares	hectares	2.471	acres
sq. miles	2.58999	sq. kilometers	sq. kilometers	0.3861	sq. miles
Volume					
fluid ounces	29.574	milliliters	milliliters	0.0338	fluid ounces
gallons	3.7854	liters	liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	grams	0.03527	ounces
pounds	0.45360	kilograms	kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

Metric Prefixes

Prefix	Symbol	Multiplication Factor
exa-	E	1 000 000 000 000 000 000 = 10^{18}
peta-	P	1 000 000 000 000 000 = 10^{15}
tera-	T	1 000 000 000 000 = 10^{12}
giga-	G	1 000 000 000 = 10^{9}
mega-	M	1 000 000 = 10^{6}
kilo-	k	1 000 = 10^{3}
hecto-	h	100 = 10^{2}
deka-	da	10 = 10^{1}
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}
femto-	f	0.000 000 000 000 001 = 10^{-15}
atto-	a	0.000 000 000 000 000 001 = 10^{-18}

4.3 PLUTONIUM DISPOSITION ALTERNATIVES AND RELATED ACTIVITIES

This section describes the potential environmental impacts associated with the disposition of surplus Pu. A key to locating information on the disposition alternatives for deep borehole, immobilization, and reactors categories; common activities; and sites and environmental setting analyzed is shown in Table 4–2. Pit disassembly/conversion and Pu conversion are activities common to all of the disposition alternatives, while MOX fuel fabrication is an activity common to only the reactor alternatives. All three of these activities are analyzed individually in this section. Because at this programmatic stage of NEPA review and decisionmaking, DOE is analyzing and anticipates selecting a technology strategy and not specific locations or facilities at a specific site, representative and generic sites are used for analysis. The representative DOE sites are Hanford, NTS, INEL, Pantex, ORR, and SRS. Additionally, some disposition alternatives (specifically those involving deep borehole placement, MOX fuel fabrication at a commercial facility, and the use of existing or partially completed reactor facilities) do not lend themselves to specific site analysis at this time.Therefore, generic and representative site characteristics have been used for the environmental analysis of these alternatives and activities. For the CANDU Reactor Alternative, common disposition-related activities in the United States are analyzed in this section. [Text deleted.] A description of operational and key environmental issues regarding the use of CANDU reactors for burning MOX fuel is provided in Appendix I.

4.3.1 PIT DISASSEMBLY/CONVERSION FACILITY

The environmental impacts described in the following sections are based on the analysis of the pit disassembly/conversion facility as described in Section 2.4.1. The representative sites analyzed for this facility are: Hanford, NTS, INEL, Pantex, ORR, and SRS. These sections describe the construction and operational impacts of the pit disassembly/conversion facility on the following potentially affected areas: land resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomics, public and occupational health and safety, and waste management.

In accordance with the Preferred Alternative for surplus Pu disposition, the pit disassembly/conversion facility could be located at either Hanford, INEL, Pantex, or SRS. Further tiered NEPA review will be conducted to examine alternative locations including new and existing facilities at these four sites should the Preferred Alternative be selected at the ROD. Although new facilities are analyzed in Section 4.3.1.1 through 4.3.1.10, DOE would preserve the option for using existing facilities to the extent practical pursuant to subsequent tiered NEPA review.

4.3.1.1 Land Resources

At all sites, the pit disassembly/conversion facility would disturb 14 ha (35 acres) of land during construction, of which 12 ha (30 acres) would be used for the operating facility. The facility would be sited in a 1.6-km (1-mi) buffer zone contained within the site boundary except at ORR, where the buffer zone is less than 1.6 km (1 mi). With the 1.6-km (1-mile) buffer zone, total land requirement would be 1,853 ha (4,580 acres). This section describes the construction and operational impacts of the pit disassembly/conversion facility on land resources for each representative site.

As discussed in Section 4.3.1.8, historic housing construction rates at all sites would be sufficient to absorb the increase in population caused by the in-migration of operational workers. No in-migration would occur during construction. No offsite land use would be affected; therefore, no indirect impacts would occur.

Hanford Site

Land Use. The potential site for the pit disassembly/conversion facility would be vacant land in the 200 Area adjacent to 200 East. Construction and operation of the pit disassembly/conversion facility would conform with existing and future land use as described in the current *Hanford Site Development Plan* and with ongoing discussions in the comprehensive land use planning process. According to the *Hanford Site Development Plan*, 200 Area land use is identified as waste operations, which includes radioactive material management, processing, and storage (HF DOE 1993c:13,14). [Text deleted.]

Construction and operation would not affect other Hanford or offsite land uses. No prime farmlands exist onsite. Construction and operation would be consistent with State and local (Benton, Franklin, and Grant Counties and the city of Richland) land-use plans, policies, and controls since Hanford provides information to these jurisdictions for use in their efforts to comply with the GMA (HF DOE 1993c:17).

Visual Resources. [Text deleted.] Construction and operation would be consistent with the industrialized landscape character of the 200 Area. Construction and operation would be consistent with the current VRM Class 5 designation.

Nevada Test Site

Land Use. The potential location for the pit disassembly/conversion facility would be on undeveloped land in Area 6 adjacent to the DAF. Construction and operation of the facility in Area 6 would not be in conformance with the current *Nevada Test Site Development Plan*, which designates the southeast area of NTS as a nonnuclear test area. However, Area 6 is a potential site for long-term storage and disposition of weapons-usable fissile materials as part of the NTS defense program materials disposition activities considered under the Expanded Use Alternative (part of the Preferred Alternative) of the NTS EIS (NT DOE 1996c:3-8—3-9); NT DOE 1996e:A-18.

Construction and operation would not affect other NTS or offsite land uses. No prime farmlands exist onsite. The alternative would not be in conflict with land-use plans, policies, or controls of adjacent jurisdictions since none of these counties or municipalities currently undertake land-use planning.

Visual Resources. [Text deleted.] Construction and operation of the facility would be compatible with the industrial landscape character of the adjacent DAF and the current VRM Class 5 designation of Area 6. Views of the proposed action would be blocked from sensitive viewpoints accessible to the public by mountainous terrain.

Idaho National Engineering Laboratory

Land Use. The pit disassembly/conversion facility would be located on undeveloped land within the ICPP security area that is part of the central core area/Prime Development Zone of INEL (IN DOE 1992g:12). The potential action would be consistent with the current *Idaho National Engineering Laboratory Site Development Plan*, which designates the future land use of the ICPP as receiving and storing spent nuclear fuels and radioactive wastes (IN DOE 1994d:9-8). [Text deleted.]

Construction would not affect other INEL or offsite land uses. No prime farmlands exist onsite. Construction and operation would not be in conflict with land use plans, policies, and controls of adjacent counties and the city of Idaho Falls since they do not address the potential site.

Visual Resources. [Text deleted.] Construction and operation of the facility would be consistent with the existing industrialized landscape character of the ICPP. The alternative would not change the existing VRM Class 5 designation of the area.

Pantex Plant

Land Use. Zone 12 is the potential location for the pit disassembly/conversion facility. The potential action would be consistent with the current *Pantex Site Development Plan* master plan, which designates Zone 12 for weapons assembly/disassembly (PX DOE 1995g:16), although vacant land would be used. [Text deleted.]

Construction and operation would not affect other Pantex or offsite land uses. There would be no impacts to prime farmland. The alternative would not be in conflict with the city of Amarillo's land-use plans, policies, and controls since they do not address Pantex.

Visual Resources. [Text deleted.] The visual environment would be consistent with the existing industrialized landscape character. The current VRM Class 5 designation of Zone 12 would not change.

Oak Ridge Reservation

Land Use. The pit disassembly/conversion facility is proposed to be sited on undeveloped land at Y–12. Weapons component manufacturing and development is among the future land uses designated for Y–12 by the future land use plan of the current *Oak Ridge Reservation Site Development and Facilities Utilization Plan* (OR DOE 1989a:5-6,5-7). The proposal is compatible with the Plan.

Construction and operation of the pit disassembly/conversion facility would not affect other ORR or offsite land uses. Construction and operation would not be in conflict with the city of Oak Ridge land-use plans, policies, and controls since the current *Oak Ridge Area Land Use Plan* designates the potential site for industrial land use.

Visual Resources. [Text deleted.] The visual environment would be consistent with the existing industrial landscape character. The current VRM Class 5 designation would not change.

Savannah River Site

Land Use. Vacant land in the F-Area would be used for the pit disassembly/conversion facility. The proposed action would conform with existing and future land use as designated by the current *Savannah River Site Development Plan*. According to the Plan, current F-Area land use is designated industrial operations, while the future land-use category is primary industrial mission (SR DOE 1994d:11,12). [Text deleted.]

Construction and operation would not affect other SRS or offsite land uses. There is no prime farmland on SRS. Construction and operation would not be in conflict with land-use plans, policies, and controls of adjacent counties and cities since they do not address SRS.

Visual Resources. [Text deleted.] The visual environment would be consistent with the industrial landscape character. The current VRM Class 5 designation of the F-Area would not change.

[Text deleted.]

4.3.1.2 Site Infrastructure

This section discusses the impacts upon site infrastructure needed to support the pit disassembly/conversion facility at each of the six representative sites. Construction and operation of the facility would impact infrastructure at each site differently, depending on current operating resources.

The pit disassembly/conversion facility would consist of a Pu processing structure with shipping and receiving, disassembly and conversion, residue recovery, solid waste treatment, liquid waste treatment, analytical laboratory, and interim storage. The following support facilities would be in adjacent structures: offices, change rooms, central control room, operator training/process demonstration, mechanical shops, emergency generator, warehouse, guard stations, entry portals, and parking. Buildings would be either steel frame/metal skin or concrete construction. For each of the representative sites, Table 4.3.1.2–1 presents infrastructure resources needed annually for construction as well as site availability and consumption without the facility. Comparative impact of average annual resource needs for operation are presented in Table 4.3.1.2–2.

Hanford Site

Resources needed for construction are well within site availability. These resources would represent a small fraction of those needed to operate the site. [Text deleted.] The planned pit disassembly/conversion facility would use natural gas as the primary utility fuel, and the total requirement for natural gas during operations would be higher than the site currently has available. [Text deleted.] The additional amount could be procured through normal contractual means.

Nevada Test Site

Resources needed for construction would be within site availability for everything except oil. The additional oil could be procured through normal contractual means. Operations impacts would be small except for utility fuel. The planned pit disassembly/conversion facility would use natural gas as the primary utility fuel. Since NTS uses fuel oil as its primary utility fuel, use of natural gas in lieu of fuel oil would require additional infrastructure. The final facility design could be converted to use fuel oil. Fuel oil requirements would exceed current site availability, but can be procured through normal contractual means.

Idaho National Engineering Laboratory

Resources needed for construction would be within site availability. The planned pit disassembly/conversion facility would use natural gas as the primary utility fuel. Since INEL does not use natural gas, this facility would be designed to burn fuel oil if INEL were selected as the pit disassembly/conversion facility site.

Pantex Plant

Resources needed for construction would be within site availability. [Text deleted.] Operations impacts would be small. Adequate electrical energy would be available from the regional power grid.

Oak Ridge Reservation

Except for fuel oil, resources required for construction would be within site capacities. Additional fuel oil for construction could be procured through normal contractual means. These resources would represent a small fraction of those needed to operate the site. There would be minimal site infrastructure impacts for operation.

Savannah River Site

Resources needed for construction would be within site availability for everything except oil. The additional oil for construction would be procured through normal contractual means. Operational impacts would be small except for utility fuel and natural gas. The planned pit disassembly/conversion facility would use natural gas as the primary utility fuel. Since SRS uses fuel oil as its primary utility fuel, use of natural gas in lieu of fuel oil would require additional infrastructure. The final facility design would be adapted to use fuel oil. Fuel oil requirements would exceed current site availability, but could be procured through normal contractual means.

Table 4.3.1.2–1. Additional Site Infrastructure Needed for the Construction of the Pit Disassembly/ Conversion Facility (Annual)

	Electrical		Fuel		
	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
Facility Requirement	2,500	5	126,200	0	0
Hanford					
Site availability	1,678,700	281	14,775,000	21,039,531	91,708
Projected usage (without facility)	345,500	58	9,334,800	21,039,531	0
Projected usage (with facility)	348,000	63	9,461,000	21,039,531	0
Amount required in excess to site availability	0	0	0	0	0
NTS					
Site availability	176,844	45	5,716,000	0	0
Projected usage (without facility)	124,940	25	5,716,000	0	0
Projected usage (with facility)	127,440	30	5,847,200	0	0
Amount required in excess to site availability	0	0	126,200	0	0
INEL					
Site availability	394,200	124	16,000,000	0	11,340
Projected usage (without facility)	232,500	42	5,820,000	0	11,340
Projected usage (with facility)	235,000	47	5,946,200	0	11,340
Amount required in excess to site availability	0	0	0	0	0
Pantex					
Site availability	201,480	23	1,775,720	289,000,000	0
Projected usage (without facility)	46,266	10	795,166	7,200,000	0
Projected usage (with facility)	48,766	15	921,366	7,200,000	0
Amount required in excess to site availability	0	0	0	0	0

Table 4.3.1.2–1. Additional Site Infrastructure Needed for the Construction of the Pit Disassembly/ Conversion Facility (Annual)—Continued

	Electrical		Fuel		
	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m³/yr)	Coal (t/yr)
Facility Requirement	2,500	5	126,200	0	0
ORR					
Site availability	13,880,000	2,100	416,000	250.760,000	16,300
Projected usage (without facility)	726,000	110	379,000	95,000,000	16,300
Projected usage (with facility)	728,500	115	505,200	95,000,000	16,300
Amount required in excess to site availability	0	0	89,200[a]	0	0
SRS					
Site availability	1,672,000	330	28,390,500	0	244,000
Projected usage (without facility)	794,000	116	28,390,500	0	221,352
Projected usage (with facility)	796,500	121	28,516,700	0	221,352
Amount required in excess to site availability	0	0	126,200[a]	0	0

[a] Fuel oil requirements in excess to site availability could be procured through normal contractual means.
Source: HF 1995a:1; INEL 1995a:1; LANL 1996d; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; PX DOE 1995g; SRS 1995a:2.

Table 4.3.1.2–2. Additional Site Infrastructure Needed for the Operation of the Pit Disassembly/ Conversion Facility (Annual)

	Transportation		Electrical		Fuel		
	Roads (km)	Rail (km)	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m³/yr)	Coal (t/yr)
Facility Requirement	<5	0	20,000	5	28,000	3,398,000	0
Hanford							
Site availability	420	204	1,678,700	281	14,775,000	21,039,531	91,708
Projected usage (without facility)	420	204	345,500	58	9,334,800	21,039,531	0
Projected usage (with facility)	425	204	365,500	63	9,362,800	24,437,531	0
Amount required in excess to site availability	<5	0	0	0	0	3,398,000[a]	0
NTS							
Site availability	1,100[b]	0	176,844	45	5,716,000	0	0
Projected usage (without facility)	645	0	124,940	25	5,716,000	0	0
Projected usage (with facility)	650	0	144,940	30	5,744,000	3,398,000	0

Table 4.3.1.2–2. Additional Site Infrastructure Needed for the Operation of the Pit Disassembly/ Conversion Facility (Annual)—Continued

	Transportation		Electrical		Fuel		
	Roads (km)	Rail (km)	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m³/yr)	Coal (t/yr)
Facility Requirement	<5	0	20,000	5	28,000	3,398,000	0
Amount required in excess to site availability	0	0	0	0	28,000[c]	3,398,000[a]	0
INEL							
Site availability	445	48	394,200	124	16,000,000	0	11,340
Projected usage (without facility)	445	48	232,500	42	5,820,000	0	11,340
Projected usage (with facility)	450	48	252,500	47	5,848,000	3,398,000	11,340
Amount required in excess to site availability	<5	0	0	0	0	3,398,000[a]	0
Pantex							
Site availability	76	27	201,480	23	1,775,720	289,000,000	0
Projected usage (without facility)	76	27	46,266	10	795,166	7,200,000	0
Projected usage (with facility)	81	27	66,266	15	823,166	10,598,000	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
ORR							
Site availability	71	27	13,880,000	2,100	416,000	250,760,000	16,300
Projected usage (without facility)	71	27	726,000	110	379,000	95,000,000	16,300
Projected usage (with facility)	76	27	746,000	115	407,000	98,398,000	16,300
Amount required in excess to site availability	<5	0	0	0	0	0	0
SRS							
Site availability	230	103	1,672,000	330	28,390,500	0	244,000
Projected usage (without facility)	230	103	794,000	116	28,390,500	0	221,352
Projected usage (with facility)	235	103	814,000	121	28,418,500	3,398,000	221,352
Amount required in excess to site availability	<5	0	0	0	28,000[c]	3,398,000[a]	0

[a] Facility would be adapted to use fuel oil instead of natural gas.
[b] Includes both paved and unpaved roads.
[c] Fuel oil requirements in excess to site availability could be procured through normal contractual means.
Source: HF 1995a:1; INEL 1995a:1; LANL 1996d; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; PX DOE 1995g; SRS 1995a:2.

4.3.1.3 Air Quality and Noise

Construction and operation of the pit disassembly/conversion facility would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts, criteria and toxic/hazardous concentrations from this facility have been compared with Federal and State standards and guidelines for each site. Impacts for radiological airborne emissions are discussed in Section 4.3.1.9.

Noise impacts during either construction or operation are expected to be low. Air quality and noise impacts are described separately. Supporting data for the air quality and noise analysis are presented in Appendix F.

AIR QUALITY

Construction and operation of the pit disassembly/conversion facility would result in the emission of some pollutants at each of the sites. Emissions would typically not exceed Federal, State, or local air quality regulations or guidelines.

The principal sources of emissions during construction include the following:

- Fugitive dust from land clearing, site preparation, excavation, wind erosion of exposed ground surfaces, and possible operation of a concrete batch plant
- Exhaust and road dust generated by construction equipment, vehicles delivering construction materials, and vehicles carrying construction workers

The PM_{10} and TSP concentrations are expected to increase during the peak construction period. Appropriate control measures would be followed. It is expected that the sites will continue to comply with applicable Federal and State ambient air quality standards during construction.

The pit disassembly/conversion process involves pure Pu materials that would not require chemical processing. The emissions estimates for the facility are based on data from similar processes at LANL's TA-55 facility. The ventilation system for the pit disassembly/conversion facility would be used specifically for contamination control and would use a large volume of air to assure contamination control. Primary confinement would be provided by a glove box system and associated zone air-handling system. There would be four stages of HEPA filters on the glovebox exhaust that would eliminate (or reduce below detection limits) a minimum of 99.95 percent of nonradioactive particulates. Radioactive particulate emissions are discussed in Section 4.3.1.9. The glovebox exhaust would be mixed with room air exhaust, which also has two stages of HEPA filters. The use of HEPA filters would not reduce VOC emissions because VOCs are not in a particulate form. There would also be process-specific scrubbers, vacuum traps, and filters that reduce the chance of criteria or toxic/hazardous pollutants releases from occurring. Because of the processing technology (which does not create some of the criteria pollutants), the defense-in-depth for Pu processing systems, and the extensive HEPA filtration (which removes the remaining criteria pollutants), emissions for criteria pollutants other than VOCs are expected to be below detection limits. VOC emissions of 1,500 kg/yr (3,300 lb/yr) are shown in Table F.1.3–4, and would give trace concentrations at the site boundaries.

NOISE

The location of the facilities associated with pit disassembly/conversion facility relative to the site boundary and sensitive receptors was examined for each of the six sites to evaluate the potential contribution to noise levels

at these locations and the potential for onsite and offsite noise impacts. Noise sources during construction may include heavy-construction equipment and increased traffic. Increased traffic would occur onsite and along offsite major transportation routes used to bring construction material and workers to the site.

Non-traffic noise sources associated with operation of these facilities include ventilation systems, cooling systems, and material handling equipment. These noise sources would be located at sufficient distance from offsite areas that the contribution to offsite noise levels would continue to be small. Due to the size of the sites, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may result in impacts such as disturbance of wildlife.

4.3.1.4 Water Resources

The construction and operation of a pit disassembly/conversion facility would affect water resources. Water resource requirements, and discharges provided in Tables C.1.1.2–1 and C.2.1.2–1 and Table E.3.2.1–1 were used to assess impacts to surface and groundwater. A discussion of impacts is provided for each site separately. Table 4.3.1.4–1 presents No Action surface and groundwater uses and discharges at each site, and the potential changes resulting from construction and operation of the pit disassembly/conversion facility.

Hanford Site

Surface Water. Surface water obtained from the Columbia River would be used as the water source for construction and operation of the pit disassembly/conversion facility. During construction, the quantity of water required would be approximately 1.9 million l/yr (0.5 million gal/yr), which represents a 0.01-percent increase over the existing annual surface water withdrawal. These additional withdrawals would cause negligible impacts. During operation, water requirements for the new pit disassembly/conversion facility would be approximately 94.6 million l/yr (25 million gal/yr), which would represent a 0.7-percent increase over the existing surface water withdrawal.

[Text deleted.]

During construction of the pit disassembly/conversion facility, sanitary wastewater (1.9 million l/yr [0.5 million gal/yr]) would be generated and discharged to the existing wastewater treatment system at the 200-Area. [Text deleted.] During operation, approximately 85.2 million l/yr (22.5 million gal/yr) of sanitary and other wastewater would be discharged to this wastewater treatment system, then to lined evaporation ponds or recycled. This would represent a 34.6-percent increase in the effluent discharged at Hanford. All discharges would be monitored to comply with discharge requirements.

Water from heating the facility would be recycled to the heating unit. Steam plant blowdown would be discharged through the sanitary wastewater system. Steam condensate from heating, condensation from air conditioning, and other distillates would be monitored for radioactivity, and if uncontaminated, discharged to natural drainage channels or evaporation/infiltration ponds. Fire sprinkler water and truck hosedown water would be collected, monitored, sampled, and treated as process wastewater, when required. It would be monitored for radioactivity, and if uncontaminated, discharged to storm drains that discharge to local drainage channels.

The pit disassembly/conversion facility would be located in the 200 Area which is above the 100-year, 500-year, and probable maximum floods; flooding from dam failures; and flooding from a landslide resulting in river blockage.

Groundwater. No groundwater would be used for any project-related water requirements; therefore, groundwater availability would not be affected.

No wastewater would be discharged directly to groundwater; therefore, groundwater quality would not be affected. Some stormwater runoff and other discharges routed to storm drains could percolate into the subsurface. These discharges would be monitored and, therefore, no impacts to groundwater quality would be expected.

Nevada Test Site

Surface Water. No surface water would be withdrawn for construction or operation activities associated with the facility; groundwater would be used as the water source for the pit disassembly/conversion facility. Therefore, there would be no impacts to surface water availability.

Table 4.3.1.4–1. ***Potential Changes to Water Resources Resulting from Pit Disassembly/Conversion Facility***

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Water source	Surface	Ground	Ground	Ground	Surface	Ground
No Action water requirements (million l/yr)	13,511	2,400	7,570	249	14,760	13,247
No Action wastewater discharges (million l/yr)	246	82	540	141	2,277	700
Construction						
Water availability and use						
Total water requirement (million l/yr)	1.9	1.9	1.9	1.9	1.9	1.9
Percent increase in projected water use[a]	0.01	0.08	0.03	0.8	0.01	0.01
Water quality						
Total wastewater discharge (million l/yr)	1.9	1.9	1.9	1.9	1.9	1.9
Percent change in wastewater discharge[b]	0.8	2.3	0.4	1.3	0.08	0.3
Percent change in streamflow	neg	NA	NA	NA	0.004[c]	0.04[d]
Operation						
Water availability and use						
Total water requirement (million l/yr)	94.6	94.6	94.6	94.6	94.6	94.6
Percent increase in projected water use[e]	0.7	3.9	1.2	38.0	0.6	0.7
Water quality						
Total wastewater discharge (million l/yr)	85.2	85.2	85.2	85.2	85.2	85.2
Percent change in wastewater discharge[f]	34.6	103.9	15.8	60.4	3.7	12.2
Percent change in streamflow	neg	NA	NA	NA	0.2[c]	1.7[d]

Table 4.3.1.4–1. Potential Changes to Water Resources Resulting from Pit Disassembly/Conversion Facility—Continued

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Floodplain						
Is action in 100-year floodplain?	No	No	No	No	No	No
Is critical action in 500-year floodplain?	No	Uncertain	Uncertain	No	No	Unlikely

[a] Percent increases in water requirements during construction of the pit/disassembly conversion facility are calculated by dividing water requirements for the facility (1.9 million l/yr) with that for No Action water requirements at each site: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

[b] Percent increases in wastewater discharged during construction of a pit disassembly/conversion facility are calculated by dividing wastewater discharges for the facility (1.9 million l/yr) with that for No Action water requirements at each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

[c] Percent change in stream flow from wastewater discharges is calculated from the average flow of Clinch River (132 m^3/s) and East Fork Poplar Creek (1.5 m^3/s). The comparison for the East Fork Poplar Creek is shown in the table.

[d] Percent change in stream flow from wastewater discharges is calculated from the minimum flow of the Fourmile Branch (0.16 m^3/s).

[e] Percent increases in water requirements during operation of a pit disassembly/conversion facility are calculated by dividing water requirements for the facility (94.6 million l/yr) with that for No Action water requirements at each site: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

[f] Percent increases in wastewater discharged during operation of a pit disassembly/conversion facility are calculated by dividing wastewater discharges for the facility (85.2 million l/yr) with that for No Action discharge at each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

Note: NA=not applicable; neg=negligible. Construction impacts are considered to be temporary, lasting only throughout the construction period. Impacts from operations would occur continuously.

Source: HF 1995a:1; INEL 1995a:1; LANL 1996d; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; PX DOE 1995g; SRS 1995a:2.

[Text deleted.]

During construction of the pit disassembly/conversion facility, approximately 1.9 million l/yr (0.5 million gal/yr) of sanitary wastewater would be generated. During operation, approximately 85.2 million l/yr (22.5 million gal/yr) of sanitary and other wastewater would be discharged to a new wastewater treatment system. After treatment, all wastewater generated during construction and operation would be available for recycle.

Water from heating the facility would be recycled to the heating unit. Steam plant blowdown would be discharged through the sanitary wastewater system. Steam condensate from heating, condensation from air conditioning, and other distillates would be monitored for radioactivity, and if uncontaminated, recycled or discharged to local drainage channels. Fire sprinkler water and truck hosedown water would be collected, monitored, sampled, and treated as process wastewater, when required. It would be monitored for radioactivity, and if uncontaminated, discharged to local drainage channels or be available for recycle.

Because there are no continuously flowing streams on NTS and no designated floodplains, there are no studies to assess the 500-year floodplain boundaries. Studies of the 100-year floodplain showed it to be confined to the Jackass Flats and Frenchman Lake areas. The proposed site for the pit disassembly/conversion facilities is not located in either of these areas. However, since the NTS is in a region where most flooding occurs by locally intense thunderstorms that can create brief (less than 6 hours) flash floods, the facility would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater via the existing supply system. The Lower and Upper Carbonate, the Volcanic, and the Valley-Fill Aquifers are the source of water for operations at NTS.

Total construction water requirements for the facilities (1.9 million l/yr [0.5 million gal/yr]) represent 0.003-percent of the minimum estimated annual recharge to the regional aquifer under the entire NTS. This is based on two studies conducted in recent years which estimated recharge to be 38 to 57 billion l (10 to 15 billion gal) (NT DOE 1992b:41-43; NT USGS 1988a). As shown in Table 4.3.1.4–1, the quantity of water required for construction of the facility represents approximately a 0.08-percent increase over the total projected No Action groundwater usage. Operating the facilities at NTS would require 94.6 million l/yr (25 million gal/yr), which is approximately a 3.9-percent increase in the projected groundwater usage. This additional withdrawal represents a 0.2-percent of the minimum estimated annual recharge. Minimal impacts to groundwater availability would be expected from these additional water withdrawals.

Construction and operation of the pit disassembly/conversion facilities would not result in direct discharges to groundwater. Treated wastewater discharged to disposal ponds, however, could percolate downward into the groundwater of the Valley-Fill Aquifer. This water would be monitored and would not be discharged until contaminant levels were within the limits specified in the State of Nevada permit. Impacts to groundwater quality are therefore not expected. In addition, other factors contributing to a lessening of potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Idaho National Engineering Laboratory

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the facility; groundwater would be used as the water source for the pit disassembly/conversion facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the pit disassembly/conversion facility, sanitary wastewater (total of approximately 1.9 million l/yr [0.5 million gal/yr]) would be generated and after treatment discharged to

evaporation/percolation ponds or be available for recycle. During operation, approximately 85.2 million l/yr (22.5 million gal/yr) of sanitary and other wastewater would be generated and handled similarly. All discharges would be monitored to comply with discharge limit.

Water from heating the facility would be recycled to the heating unit. Steam plant blowdown would be discharged through the sanitary wastewater system. Steam condensate from heating, condensation from air conditioning, and other distillates would be monitored for radioactivity, and if uncontaminated, discharged to evaporation/infiltration ponds or to local drainage channels. Fire sprinkler water and truck hosedown water would be collected, monitored, sampled, and treated as process wastewater, when required. It would be monitored for radioactivity, and if uncontaminated, discharged to local drainage channels or be available for recycle.

The potential site for the new pit disassembly/conversion facilities is not located in an area historically prone to flooding, but is within the flood zone which could occur as a result of the failure of the MacKay Dam during a maximum probable flood. This flood event would be more critical than either the 100- or 500-year flood. Because INEL is in a region where flash floods could occur, the facilities would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater from the Snake River Plain Aquifer. As shown in Table 4.3.1.4–1, water requirements for operation of the pit disassembly/conversion facility (94.6 million l/yr [25 million gal/yr]) would fall within INEL's current allotment and represent a 1.2-percent increase over the projected annual groundwater usage. As discussed in Section 3.4.4, a groundwater allotment not to exceed 43,000 million l/yr (11,360 million gal/yr), has been negotiated by DOE with the Idaho Department of Water Resources (DOE 1991c:4-73). Construction water requirements for the facility are much less than those for operation. These withdrawals would increase the total site projected amount to be pumped at INEL to 17.8 percent of the allotment during operation. This increase (and that due to construction) should not affect groundwater availability.

Construction and operation of the pit disassembly/conversion facilities would not result in direct discharges to groundwater and would not be expected to contribute to existing near surface contamination. Treated wastewater which does not evaporate, however, could percolate downward toward the groundwater of the Snake River Plain Aquifer. This water would be monitored and would not be discharged until contaminant levels were within the limits specified. Impacts to groundwater quality are therefore not expected. In addition, other factors contributing to a lessening of potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Pantex Plant

Surface Water. No surface water would be withdrawn for construction or operation activities associated with the facility; groundwater (or possibly reclaimed wastewater from the Hollywood Road Wastewater Treatment Plant) would be used as the water source for the pit disassembly/conversion facility. Therefore, there would be no impacts to surface water availability.

[Text deleted]

During construction of the pit disassembly/conversion facility, approximately 1.9 million l/yr (0.5 million gal) of sanitary wastewater would be generated and discharged to the existing wastewater treatment systems north of Zone 12. During operation, a maximum of approximately 85.2 million l/yr (22.5 million gal/yr) of sanitary wastewater and other wastewater would be discharged to either of these wastewater treatment systems. After treatment, all wastewater generated during construction and operation would either be discharged to the playa lakes or would be available for recycle. The expected quantity of additional wastewater potentially discharged to the playas (approximately 0.23 million l/day [61,670 gal/day]) should not cumulatively cause any exceedances of the monthly average limit of 2.46 million l/day (650,000 gal/day). This is based on Pantex's

1994 discharges, which averaged approximately 1.4 million l/day (370,000 gal/day) and are expected to decline in the future.

Water from heating the facility will be recycled to the heating unit. Steam plant blowdown would be discharged through the sanitary wastewater system. Steam condensate from heating, condensation from air conditioning, and other distillates would be monitored for radioactivity, and if uncontaminated, discharged to playas or local drainage channels. Fire sprinkler water and truck hosedown water would be collected, monitored, sampled, and treated as process wastewater, when required. It would be monitored for radioactivity, and if uncontaminated, discharged to playas or local drainage channels, or be available for recycle.

The pit disassembly/conversion facility would be located in Zone 12. Since no 100-year, 500-year, or standard project flood boundaries have been delineated in Zone 12, there would be no impacts to flood plains. However, flooding at Pantex could occur due to the runoff associated with precipitation and ponding in local playas (LLNL 1988a:XVI).

Groundwater. All water required for construction and operation would probably be supplied from groundwater using the existing supply system. Construction water requirements for the pit disassembly/conversion facilities are small relative to the recoverable water in aquifer storage, which for the year 2010 was estimated to be 287 trillion l (76 trillion gal) (PX WDB 1993a:1). As shown in Table 4.3.1.4–1, construction of the proposed pit disassembly/conversion facility would require 1.9 million l/yr (0.5 million gal/yr) of water, which represents a 0.8-percent increase over the projected annual groundwater usage and 0.1 percent of the total groundwater system capacity (1,900 million l/yr [502 million gal/yr]). [Text deleted.] Previous studies have shown that when the Amarillo City Well Field pumped 18.5 billion l/yr (4.9 billion gal/yr) from the Ogallala Aquifer, an average of 1.8-m/yr (5.9-ft/yr) decline in the water table occurred over a 10-year period in the local well field area. This water level decline caused a shift in the groundwater flow direction beneath Pantex. Operating the pit disassembly/conversion facility at Pantex would require 94.6 million l/yr (25 million gal/yr), resulting in a small drawdown. This additional groundwater withdrawal would add to the existing decline in water levels of the Ogallala Aquifer. However, this very small decline would not affect regional groundwater levels and would represent approximately 5.0 percent of the available groundwater. The total site groundwater withdrawal including this facility would be 343.6 million l/yr (90.8 million gal/yr) which, because of expected cutbacks in other programs, would be 59 percent less than the 836 million l/yr (221 million gal/yr) currently being withdrawn from wells at Pantex.

Construction and operation of the new facilities would not result in direct discharges to groundwater. Treated wastewater discharged to playas, could percolate downward into the groundwater of the near surface aquifer. However, water discharged to playas would be monitored and would not be discharged until contaminant levels are within the limits specified by the TNRCC. [Text deleted.]

Although the expected drawdowns caused by withdrawing the water required for this alternative are small, the overall decline in groundwater levels in the Amarillo area is of concern. Possible groundwater conservation measures at Pantex that could be considered including decreasing research farm irrigation demands through dry farming, installing dripless faucets, and process water reuse. In addition, to alleviate some of the effects from pumping groundwater from the Ogallala Aquifer, the city of Amarillo is considering supplying treated wastewater to Pantex from the Hollywood Road Wastewater Treatment Plant for industrial use. However, details of this measure have not been determined.

Oak Ridge Reservation

Surface Water. Water required for construction and operation of the pit disassembly/conversion facilities would be provided via existing distribution systems. The source of this water is the Clinch River and its tributaries. [Text deleted.] During construction, the total quantity of water required would be approximately 1.9 million l/yr (0.5 million gal/yr), which would represent a 0.01-percent increase over the existing projected annual surface

water withdrawal. This additional withdrawal would cause negligible impacts to surface water availability. During operation, water requirements would be approximately 94.6 million l/yr (25 million gal/yr) annually. This represents a 0.6-percent increase in the projected annual surface water withdrawal and is 0.001-percent of the average flow of the Clinch River (132 m^3/s [4,647 ft^3/s]). These additional water withdrawals from the Clinch River would not impact availability.

During construction of the pit disassembly/conversion facilities, sanitary wastewater (total of 1.9 million l/yr [0.5 million gal/yr]) would be generated and discharged to the existing wastewater treatment system in the Y–12 area. This would cause a very minor increase in the effluent from this facility. During operation, a total of 85.2 million l/yr (22.5 million gal/yr) of wastewater would be generated by the facility. This would cause a 3.7-percent increase in the effluent discharged from the Y–12 Area. All discharges would be monitored to comply with discharge requirements. Fire sprinkler water and truck hosedown water would be collected in tanks, monitored for radioactivity, and then transferred to a treatment facility as required. Uncontaminated water would be pumped to storm drains.

Since the pit disassembly/conversion facilities would be located outside both the 500- and 100-year floodplains, there would be no impacts to floodplains.

Groundwater. No groundwater would be used for any project-related water requirements and no wastewater would be discharged directly to groundwater; therefore, neither groundwater quality nor availability would be affected.

Savannah River Site

Surface Water. No surface water would be used for project requirements during construction or operation of the facility. [Text deleted.] During construction of the pit disassembly/conversion facility, sanitary wastewater (total of 1.9 million l/yr [0.5 million gal/yr]) would be generated and discharged to the sitewide wastewater treatment system, which would not require any modifications. This would represent less than a 0.2-percent increase in the effluent from SRS. During operation, approximately 85.2 million l/yr (22.5 million gal/yr) of sanitary wastewater would be discharged to this wastewater treatment system. This would represent a 12.2-percent increase in the effluent discharged from SRS and would be 1.7 percent of Fourmile Branch's minimum flow. Since this facility can regulate its effluent flow and all discharges would be monitored to comply with discharge requirements, no impacts are expected. Fire sprinkler water and truck hose-down water would be collected in tanks, monitored for radioactivity, and then transferred to a treatment facility as required. Uncontaminated water would be pumped to storm drains.

The potential location of the pit disassembly/conversion facility would be located outside the 100-year floodplain. Information on the location of the 500-year floodplain at SRS is currently available only for a limited number of specific project areas. However, the pit disassembly/conversion facility at SRS would not likely affect, or be affected by the 500-year floodplain of either the Fourmile Branch or Upper Three Runs Creek because the facility would be located at an elevation of about 91 m (300 ft) above MSL and is approximately 33 m (107 ft) and 64 m (210 ft) above these streams and at distances from these steams of 0.8 km (0.5 mi) to 1.5 km (0.94 mi), respectively. The maximum flow that has occurred on the Upper Three Runs Creek was in 1990, with a flow rate of about 58 m^3/s (2,040 ft^3/s). At that time the creek reached an elevation of almost 30 m (98 ft) above MSL (SR USGS 1996a:1). The elevations of the buildings in F-Area are more than 62 m (202 ft) above the highest flow elevation of the Upper Three Runs Creek. The maximum flow that has occurred on the Fourmile Branch was in 1991 with a rate of approximately 5 m^3/s (186 ft^3/s), and an elevation of about 61 m (199 ft) above MSL (SR USGS 1996a:1). Elevations of the buildings in F-Area are more than approximately 31 m (101 ft) higher than the maximum flow level that has occurred.

Groundwater. During construction, water requirements would be approximately 1.9 million l/yr (0.5 million gal/yr), which would represent less than a 0.01-percent increase over the projected annual

groundwater withdrawal. This additional withdrawal should cause negligible impacts to groundwater availability. During operation, water used for cooling system makeup would be obtained from existing supply systems in the F-Area. The water for these systems is groundwater from the Cretaceous Aquifer. The total annual water requirements shown in Table 4.3.1.4–1 would represent a 0.7-percent increase in the projected No Action groundwater usage at SRS. The water withdrawals from groundwater would not impact regional groundwater levels. Previous studies using numerical simulations of groundwater withdrawals over 20 times greater than that required for the pit disassembly/conversion facility from the Cretaceous Aquifer indicate that drawdown could be almost 2 m (7 ft) at the well head, but would be smaller in overlying aquifers and would not extend beyond SRS boundaries in any aquifer (DOE 1991c:5-196). Therefore, it is expected that withdrawals attributed to the pit disassembly/conversion facility would have a minor drawdown at the well head and would not affect any aquifers in the area. No wastewater would be discharged directly to groundwater; therefore, groundwater quality would not be affected.

[Text deleted.]

4.3.1.5 Geology and Soils

This section describes the environmental impacts to the geologic and soil resource as related to the construction and operation of the pit disassembly/conversion facility at any of the six sites analyzed: Hanford, NTS, INEL, Pantex, ORR, and SRS. A pit disassembly/conversion facility would involve some ground-disturbing construction activities (14 ha [35 acres]) that would affect the soil erosion potential. The key factors affecting soil erosion potential are the amount of land disturbed and climate. The relative amount of annual precipitation (rainfall) is greater at ORR and SRS, than Pantex, Hanford, INEL, and NTS. Combining these key factors together, the relative soil erosion potential for a site can be categorized as slight, moderate, or severe.

No apparent direct or indirect effects on the geologic resource are anticipated. Neither facility construction and operational activities nor site infrastructure improvements would restrict access to potential geologic resources.

The soil erosion potential from direct (facility construction) and indirect (site infrastructure improvements) impacts associated with construction and operational activities is low for Pantex, Hanford, INEL, and NTS. The soil erosion potential for ORR and SRS during construction and operational activities is moderate due primarily to the greater relative annual precipitation. Soil disturbance would occur primarily from ground-disturbing construction (foundation preparation) and activities associated with building construction laydown areas that can expose the soil profile and lead to a possible increase in soil erosion as a result of wind and water action. Soil loss would depend on the frequency and severity of rain, wind velocities (as wind velocities and duration increase, soil erosion potential increases), and the size, location, and duration of ground-breaking activities with respect to local drainage and wind patterns.

Operational effects to the soil resource would be minimal assuming typical landscaping and ground cover improvements were employed. Net soil disturbance during operation would be considerably less than that during construction, because areas previously without ground cover would have some type of improvement (buildings, roads, and landscaping). Although erosion from stormwater runoff and wind action could occasionally occur during operation, it is anticipated to be minimal. Indirect effects to the soil resource from infrastructure improvements would have a similar impact to the soil profile and erosion potential.

[Text deleted.]

4.3.1.6 Biological Resources

Construction of the pit disassembly/conversion facility would disturb 14 ha (35 acres) of land at each of the DOE sites analyzed. This includes areas on which plant facilities would be constructed, as well as areas used for construction laydown. Consultation with USFWS and State agencies would be conducted at the site-specific level, as appropriate, to avoid potential impacts to threatened and endangered species, and other protected species and habitat.

Hanford Site

It is assumed that the pit disassembly/conversion facility would be located west of the 200 East Area. Impacts to terrestrial resources, wetlands, aquatic resources, and threatened species are discussed below.

Terrestrial Resources. Construction and operation of the pit disassembly/conversion facility would result in the disturbance of terrestrial habitat equaling about 0.01 percent of Hanford. This includes areas on which plant facilities would be constructed, as well as areas revegetated following construction. Vegetation within the assumed project site would be destroyed during land clearing operations. The facility location falls within the sagebrush/cheatgrass or Sandberg's bluegrass community. Sagebrush communities are well represented on Hanford, but they are relatively uncommon regionally because of widespread conversion of shrub-steppe habitats to agriculture. Disturbed areas are generally recolonized by cheatgrass, a nonnative species, at the expense of native plants.

Construction of the pit disassembly/conversion facility would affect animal populations. Less mobile animals within the project area, such as reptiles and small mammals, would not be expected to survive. Construction activities and noise would cause larger mammals and birds in the construction and adjacent areas to move to similar habitat nearby. If the area to which they moved was below its carrying capacity, these animals would be expected to survive. However, if the area was already supporting the maximum number of individuals, the additional animals would compete for limited resources which could lead to habitat degradation and eventual loss of the excess population. Nests and young animals living within the assumed site may not survive. The site would be surveyed as necessary for the nests of migratory birds prior to construction. Areas disturbed by construction, but not occupied by facility structures, would be of minimal value to wildlife because they would be maintained as landscaped areas.

Activities associated with facility operations, such as noise and human presence, could affect wildlife living immediately adjacent to the pit disassembly/conversion facility. These disturbances may cause some species to move from the area. Disturbances to wildlife living adjacent to the facility would be minimized by preventing workers from entering undisturbed areas.

Wetlands. Construction and operation of the pit disassembly/conversion facility would not affect wetlands since no wetlands exist near the assumed facility location. Since water would be withdrawn from the Columbia River through an existing intake structure and wastewater would be discharged to evaporation/infiltration ponds, wetlands bordering the river would not be affected by placement of intake and discharge structures.

Aquatic Resources. Construction of a pit disassembly/conversion facility at Hanford would not impact aquatic resources, because there are no surface water bodies near the assumed facility location. During both construction and operation, water would be withdrawn from the Columbia River through an existing intake structure so impacts to aquatic resources from impingement and entertainment would be minimal. Since the volume of water included represents a small percentage of the flow of the river, flow-related impacts to aquatic resources would be minimal. Wastewater would be discharged to evaporation/infiltration ponds, so aquatic resources would not be affected.

Threatened and Endangered Species. It is unlikely that federally listed threatened and endangered species would be affected by construction and operation of the pit disassembly/conversion facility; however, sagebrush habitat would be disturbed. The sagebrush community is also important nesting/breeding and foraging habitat for several State-listed and candidate species, such as the ferruginous hawk, loggerhead shrike, western burrowing owl, pygmy rabbit, western sage grouse, sage sparrow, and sage thrasher. Preactivity surveys would be conducted as appropriate before construction to determine the occurrence of plant species or animal species in the area to be disturbed.

Nevada Test Site

It is assumed that the pit disassembly/conversion facility would be located in the Frenchman Flat area of NTS. Impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species are discussed below.

Terrestrial Resources. Construction and operation of the pit disassembly/conversion facility at NTS would result in the disturbance of terrestrial resources equaling less than 0.01 percent of NTS. This includes areas on which facilities would be constructed, as well as areas used for construction laydown. Vegetative cover within the assumed project area, which is primarily creosote bush (Figure 3.3.6–1), would be destroyed during land-clearing operations. Creosote bush communities are well represented on NTS.

Construction of the pit disassembly/conversion facility would affect some animal populations. Less mobile animals, such as reptiles and small mammals, within the project area would not be expected to survive. Construction activities and noise would cause larger mammals and birds in the construction and adjacent areas to move to similar habitat nearby. If the area to which they moved was below its carrying capacity, these animals would be expected to survive. However, if the area was already supporting the maximum number of individuals, the additional animals would compete for limited resources which could lead to habitat degradation and eventual loss of the excess population. Nests and young animals living within the assumed site may not survive. Before construction, the site would be surveyed as necessary for the nests of migratory birds. Areas disturbed by construction, but not occupied by facility structures, would be of minimal value to wildlife because of the difficulty in establishing vegetative cover in a desert environment.

Activities associated with operation, such as noise and human presence, could affect wildlife living immediately adjacent to the facility. These disturbances may cause some species to move from the area. Disturbance to wildlife living adjacent to the facility would be minimized by preventing workers from entering undisturbed areas.

Wetlands. Construction and operation of the pit disassembly/conversion facility would not affect wetlands, because there are no wetlands near the assumed facility location.

Aquatic Resources. Construction and operation of the pit disassembly/conversion facility would not affect aquatic resources because there are no permanent surface water bodies near the assumed facility location.

Threatened and Endangered Species. The threatened desert tortoise is a federally listed species that could be affected by construction of the pit disassembly/conversion facility at NTS. Construction activities, such as land-clearing operations, trenches, and excavation could pose a threat to any tortoises residing within the disturbed area. An increase in vehicular traffic is an additional hazard to the tortoise. Measures designed to avoid impacts to the desert tortoise from previous projects at NTS have been implemented as a result of a Biological Opinion issued by the USFWS (NT DOI 1992b:8-15). Recommended mitigation measures included providing worker training, putting restrictions on vehicle speeds and off-road movement, conducting clearance surveys prior to surface disturbance, approving stop work authority if tortoises are found within work areas, removing tortoises from roadways and work areas, placing permanent and temporary tortoise-proof fencing around trenches, landfills, and treatment ponds, inspecting trenches, and having biologists survey when heavy

equipment is in use. The USFWS would be consulted, and USFWS recommendations would be implemented if NTS were selected as the location for the pit disassembly/conversion facility.

[Text deleted.] Any listed plant species (Table 3.3.6–1) located within the construction area would be lost during land-clearing activities. Preactivity surveys would be conducted as appropriate before construction to determine the occurrence of these species in the area to be disturbed.

During facility operation, vehicular traffic would pose a hazard to the desert tortoise similar to the hazard caused by current traffic. Extensive measures, including personnel training, are presently being taken to ensure that drivers on NTS avoid the tortoise. [Text deleted.] Groundwater levels in Devils Hole cavern are not expected to change due to operation of the pit disassembly/conversion facility (Section 4.3.1.4); therefore, impacts to the Devils Hole pupfish are not expected. Similarly, other rare endemic aquatic species found in the Ash Meadows area would not be affected.

Idaho National Engineering Laboratory

It is assumed that the pit disassembly/conversion facility would be constructed within an undeveloped portion of the ICPP area. The ICPP area falls within the big sagebrush/thickspike wheatgrass/needle-and-thread grass community. Impacts to wildlife would be limited to small mammals and some birds and reptiles which could be displaced or suffer mortality. Large mammals are excluded from the assumed facility location by the perimeter fence and thus would not be impacted. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the area would have already adapted to similar disturbances. Due to the lack of wetlands or aquatic resources at the assumed facility location, these resources would not be affected by construction or operation of the pit disassembly/conversion facility. Since the facility would be located within the ICPP security area, impacts to threatened and endangered species would not be expected.

Pantex Plant

It is assumed that the pit disassembly/conversion facility would be located in Zone 12 which is a developed area that lacks natural vegetation. Disturbance to wildlife would be limited due to the disturbed nature of the assumed site; however, small mammals and some birds and reptiles could be displaced by construction. Since the area does not contain any wetlands or aquatic resources, these resources would not be affected by construction of the pit disassembly/conversion facility. During operation, wastewater would be discharged to a site playa through an NPDES-regulated outfall. The additional wastewater could lead to a minor increase in open water near the outfall, as well as a slight change in plant species composition. No federally listed threatened or endangered species would be affected by construction or operation of the pit disassembly/conversion facility. Although the assumed site has been disturbed, it is possible that the State-listed Texas horned lizard could be present. Before construction, preactivity surveys would be conducted as appropriate.

Oak Ridge Reservation

It is assumed that the pit disassembly/conversion facility would be constructed on a disturbed area within Y–12. Impacts to terrestrial resources would be minimal. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal, since animals living adjacent to Y–12 would have already adapted to similar disturbances. There would be minimal direct impacts to wetlands or aquatic resources from construction of the facility. Secondary impacts from stormwater runoff would be controlled by implementation of a soil erosion and sediment control plan. Operational impacts to wetlands and aquatic resources would be minimal, since water would be taken from existing sources and discharged via NPDES-permitted outfalls and would involve minor volumes. Construction and operation of the pit disassembly/conversion facility would not be expected to impact threatened and endangered species due to the developed nature of the assumed facility location. Impacts to the Tennessee dace (State deemed in need of

management) would not be expected since erosion would be controlled and discharges would be through permitted outfalls.

Savannah River Site

It is assumed that the pit disassembly/conversion facility would be constructed within the F-Area, which is one of the highly developed industrial areas of the SRS. Impacts to terrestrial resources would be minimal. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the F-Area would have already adapted to similar disturbances. There would be minimal direct impacts to wetlands or aquatic resources from construction of the facility. Secondary impacts from stormwater runoff would be controlled by implementation of a soil erosion and sediment control plan. Operational impacts to wetlands and aquatic resources would be minimal since minor volumes of water would be taken from existing sources and discharged via NPDES permitted outflows. Impacts from construction and operation of the pit disassembly/conversion facility would not be expected to impact threatened and endangered species due to the developed nature of the assumed facility location. Although suitable foraging habitat for the red-cockaded woodpecker exists in the area, the woodpecker colonies are located far enough from the site so that this species would not be directly affected by this action.

4.3.1.7 Cultural and Paleontological Resources

This section discusses potential impacts to cultural and paleontological resources that may result from the construction and operation of the pit disassembly/conversion facility at each of the representative sites analyzed. The total land disturbance for this facility is 14 ha (35 acres) during construction of which 12 ha (30 acres) would be used during operation. A 1.6-km (1-mi) reduced-access buffer zone would be created around the facility. The buffer zone would be contained within existing boundaries at all sites except ORR. For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources at the representative sites may be affected directly through ground disturbance during construction, building modification, visual intrusion of the project to the historic setting or environmental context of historic sites, visual and audio intrusions to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism.

Hanford Site

The facility would be constructed west of the 200 East Area. Although no archaeological resources have been identified during surveys conducted in the adjacent 200 Areas, some may exist in the project area. Any such sites may be identified through additional surveys. Any identified sites would be avoided. Operation would not result in additional impact.

Although all of Hanford is considered sacred land by some Native American groups, no areas of great cultural significance have been identified close to the 200 Areas. Resources may be identified through project-specific consultation. Impacts from construction and operation may include reduced access to traditional use areas or visual or auditory intrusion into sacred or ceremonial space.

Pliocene and Pleistocene fossil remains have been discovered at Hanford. Although none have been recorded in the project area, they may exist. These resources may be affected by ground disturbing construction. Operation would not have an additional impact on paleontological resources.

Nevada Test Site

The pit disassembly/conversion facility would be constructed in Area 6, near the DAF on Frenchman Flat. In 1984, a Class III cultural resources survey was conducted across the 660-ha (1,610-acre) DAF site and no NRHP-eligible sites were identified. Although no resources were identified within the DAF project area, Frenchman Flat contains 49 sites which have been determined eligible for inclusion on the NRHP. Recorded prehistoric sites within Frenchman Flat include base and temporary camps, quarries and lithic reduction areas. Identified historic resources include sites associated with nuclear testing and research. Additional unsurveyed lands necessary for the proposed facility may contain similar prehistoric or historic resources. Impacts to any identified resources would occur during construction, but not operation, of the proposed facility.

The CGTO has conducted surveys over portions of Frenchman Flat and has identified at least 20 plant species of importance to Native Americans. Additional project-specific consultations would be necessary to identify impacts to Native American resources resulting from the construction and operation of the facility. Potential impacts include reduced access to traditional use areas and visual or auditory intrusions to sacred space.

Although none have been identified to date, Quaternary deposits containing scientifically valuable paleontological remains may occur in the area to be disturbed during construction. Such remains have been found near NTS. Paleontological resources may be affected by construction, but not operation, of the facility.

Idaho National Engineering Laboratory

The pit disassembly/conversion facility would be constructed within the existing ICPP security area. The facility would be sited in a location previously approved for the construction of the Special Isotope Separation Project. A surface survey of the proposed project area identified no sites. Although it is possible, the ICPP is unlikely to contain intact subsurface cultural deposits due to prior ground disturbance and environmental setting. INEL has a contingency plan in place should any archaeological remains be discovered during construction. Two historic sites occur adjacent to the ICPP: one historic can scatter across the Big Lost River, to the northeast, and one abandoned homestead to the east. The can scatter is not considered eligible for NRHP listing and the homestead has been fenced off for protection. Construction and operation are not expected to affect either site.

Native American resources may be affected by the proposed action. Facility construction and operation may have visual or auditory impact on traditional use areas or sacred sites. Resources may be identified through consultation with the interested tribes.

Some paleontological remains may be encountered during construction. The ICPP lies on alluvial gravels associated with the Big Lost River floodplain, which have produced fossilized remains. Operation would not have an effect on paleontological resources.

Pantex Plant

The pit disassembly/conversion facility would be constructed within Zone 12. Areas to be disturbed by development have not been systematically surveyed for cultural or paleontological resources. Prior to construction, additional survey work may be necessary. Because Zone 12 is disturbed and removed from water sources, it is unlikely to contain intact subsurface prehistoric or historic remains. Operation would have no additional impact to archaeological resources as it does not involve additional ground disturbance.

DOE has recently initiated consultation with Native American groups that have expressed interest in Pantex lands. To date, no Native American resources have been identified within Zone 12. Resources may be identified through additional consultation. Although no mortuary remains have been discovered at Pantex to date, it is possible that some exist within land to be disturbed by development. Burials are often considered to be important Native American resources. Also, construction and operation could affect traditionally used plant and animal species.

The surficial geology of the Pantex area consists of silts, clays, and sands of the Blackwater Draw Formation. In other areas of the High Plains, this formation has produced Late Pleistocene vertebrate remains including wooly mammoth, bison, and camel, sometimes in context with archaeological remains. The land to be disturbed during construction may contain some fossilized remains. Operation would not have an effect on paleontological resources.

Oak Ridge Reservation

No impacts to cultural or paleontological resources are expected to result from the construction or operation of the facility at ORR. It would be sited within Y–12. The area is disturbed and therefore unlikely to contain any intact archaeological deposits. No Native American resources have been identified at Y–12 to date, nor is it known to contain scientifically valuable paleontological remains.

Savannah River Site

The location for the pit disassembly/conversion facility is open space within F-Area. Portions of F-Area have been surveyed and contain sites potentially eligible for the NRHP. Additional surveys would be conducted in unsurveyed areas to be disturbed by construction. Site types known to occur at SRS include remains of

prehistoric base camps, quarries, and workshops. Historic resources include remains of farmsteads, cemeteries, churches, and schools. Resources such as these may be affected by new facility construction, but not operation.

Some Native American resources may be affected by the proposed action. Resources such as prehistoric sites, cemeteries, and traditionally used plants could be affected during construction. Facility operation could result in reduced access to traditional use areas or sacred space. Visual or auditory intrusions to the areas may also result from facility construction or operation. Resources would be identified through consultation with the potentially affected tribes.

No scientifically valuable fossil remains have been recorded at SRS to date. Facility construction and operation are not expected to affect paleontological resources.

[Text deleted.]

4.3.1.8 Socioeconomics

This section analyzes the socioeconomic effects of the pit disassembly/conversion facility for each of the candidate sites. Only the sites with the greatest socioeconomic effects are discussed. The effects at all sites are found in the Supplemental Socioeconomic Data Report (Socio 1996).

Regional Economy Characteristics. Constructing the pit disassembly/conversion facility at any of the sites analyzed would generate employment and income increases within the affected REA. Constructing the facility would require 185 workers in the peak year of construction at any site. The largest increase in regional employment (much less than 1 percent) among the sites analyzed would be at INEL. A total of 376 new jobs (185 direct and 191 indirect) would be generated and regional unemployment would fall from 5.4 to 5.1 percent. The largest increase in regional per capita income would also occur at INEL, but the increase would be much less than 1 percent over No Action (Socio 1996a).

Operating the facility would generate greater socioeconomic changes than would construction, due to the larger, more permanent workforce. A workforce of 830 would be required for full operation at any site. Implementing the alternative at INEL would generate the largest increases in regional employment (about 2 percent) and per capita income (about 1 percent). A total of 3,056 new jobs (830 direct and 2,226 indirect) would be generated by the operational activities and regional unemployment would fall to 3.8 percent (Socio 1996a).

Population and Housing. At all of the sites analyzed, construction employment requirements would be met by the available resident labor force, but some in-migrating workers would be needed to fill more specialized positions during operations. Project-related population increases would be greatest if the facility is located at Pantex. However, this increase would be less than 1 percent over No Action population projections. Housing units, in excess of existing vacancies, may be required at all of the sites analyzed, except NTS and ORR, to accommodate the population increase. The greatest increase would be needed in the INEL ROI but this would be less than 1 percent over No Action estimates. Historic housing construction rates indicate that there would be sufficient housing units available to accommodate the population growth at all of the sites analyzed (Socio 1996a).

Community Services. During construction, there would be minimal impacts to community services in the ROIs of any of the sites analyzed. However, operation of the facility would slightly increase the demand for community services. The effects of population increase due to in-migrating workers during operations would be minor at all sites analyzed. The following discussion focuses on the Pantex and INEL ROIs, which are expected to experience the greatest increases in demand for community services among the sites analyzed.

To maintain the No Action student-to-teacher ratio of 16.3:1 in the Pantex ROI, 18 new teachers would be needed during operation of the proposed facility. The increase in teacher requirements, however, would be distributed over several school districts in the ROI; therefore, no single district would be significantly affected (Socio 1996a).

To maintain the No Action service level of 1.6 sworn police officers per 1,000 persons, only 2 new police officers would be needed in the INEL ROI. Five additional firefighters would be required to sustain the No Action service level of 2.3 firefighters per 1,000 persons in the Pantex ROI (Socio 1996a).

Projected hospital occupancy rates would increase slightly over No Action levels at each site analyzed. However, projected capacities would be capable of accommodating these small increases in patient load. To maintain the No Action service level of 1.2 physicians per 1,000 persons, only 2 additional physicians would be required in the INEL ROI during operation (Socio 1996a).

Local Transportation. Construction of the pit disassembly/conversion facility would not affect the level of service on the local road segments analyzed for any of the sites. However, traffic generated from facility

operations at INEL would affect the level of service on one road segment. U.S. 20/26 from U.S. 26 East to Idaho State Route 22/33 would experience a drop in level of service from B to C (Socio 1996a).

4.3.1.9 Public and Occupational Health and Safety

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the pit disassembly/conversion facility, whose activities are common to the Pu disposition alternatives. The section first describes the impacts from normal facility operation at each potential site, followed by a description of impacts from facility accidents.

Summaries of the radiological impacts to the public and to workers associated with normal operation are presented in Tables 4.3.1.9–1 and 4.3.1.9–2, respectively. Impacts from hazardous chemicals to these same groups are given in Table 4.3.1.9–3. Summaries of impacts associated with postulated accidents are given in Tables 4.3.1.9–4 through 4.3.1.9–9. Detailed results are presented in Appendix M.

Normal Operation. There would be no radiological releases associated with the construction of the pit disassembly/conversion facility at any of the sites analyzed. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained as low as reasonably achievable. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects to the public and workers at each site are described below.

Radiological Impacts. Radiological impacts to the average and maximally exposed members of the public resulting from the normal operation of the pit disassembly/conversion facility at each of the sites are presented in Table 4.3.1.9–1. The impacts from all site operations, including the new pit disassembly/conversion facility, are also given. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The dose to the maximally exposed member of the public from annual pit facility operation would range from $1.5x10^{-4}$ mrem at NTS to 0.014 mrem at ORR. From 10 years of operation, the corresponding risks of fatal cancer to this individual would range from $7.6x10^{-10}$ to $7.0x10^{-8}$. The impacts to the average individual would be less. As a result of annual facility operation, the population dose would range from $2.9x10^{-4}$ person-rem at NTS to 0.12 person-rem at ORR. The corresponding numbers of fatal cancer in these populations from 10 years of operation would range from $1.5x10^{-6}$ to $6.0x10^{-4}$.

The dose to the maximally exposed member of the public from annual total site operations are all within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would range from $1.1x10^{-3}$ mrem at Pantex to 3.2 mrem at ORR. From 10 years of operation, the corresponding risk of fatal cancers to this individual would range from $5.5x10^{-9}$ to $1.6x10^{-5}$. The impacts to the average individual would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of annual total site operation, the population doses would be within the limit in proposed in 10 CFR 834, and would range from $4.0x10^{-3}$ person-rem at NTS to 44 person-rem at SRS. The corresponding number of fatal cancers in these populations from 10 years of operation would range from $2.0x10^{-5}$ to 0.22.

Doses to onsite workers from normal operations are given in Table 4.3.1.9–2. Included are involved workers directly associated with the pit disassembly/conversion facility, workers who are not involved with the pit disassembly/conversion facility, and the entire workforce at each site. All doses fall within regulatory limits.

The annual dose to pit disassembly/conversion facility workers is site-independent and would be 200 mrem to the average facility worker and 83 person-rem to the entire facility workforce. The annual dose to the average noninvolved worker would range from 2.6 mrem at ORR to 32 mrem at SRS. The annual total dose to all noninvolved workers would range from 3.0 person-rem at NTS to 250 person-rem at Hanford. The annual dose

Table 4.3.1.9–1. Potential Radiological Impacts to the Public During Normal Operation of the Pit Disassembly/Conversion Facility

Receptor	Hanford		NTS		INEL		Pantex		ORR		SRS	
	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]
Annual Dose to the Maximally Exposed Individual Member of the Public[b]												
Atmospheric release pathway (mrem)	2.9×10^{-4}	4.5×10^{-3}	1.5×10^{-4}	4.2×10^{-3}	1.8×10^{-4}	0.018	1.1×10^{-3}	1.1×10^{-3}	0.014	1.5	1.6×10^{-3}	0.42
Drinking water pathway (mrem)	0	0	0	0	0	0	0	0	0	0.10	0	0.081
Total liquid release pathway (mrem)	0	9.5×10^{-4}	0	0	0	0	0	0	0	1.7	0	0.37
Atmospheric and liquid release pathways combined (mrem)	2.9×10^{-4}	5.4×10^{-3}	1.5×10^{-4}	4.2×10^{-3}	1.8×10^{-4}	0.018	1.1×10^{-3}	1.1×10^{-3}	0.014	3.2	1.6×10^{-3}	0.79
Percent of natural background[c]	9.6×10^{-5}	1.8×10^{-3}	4.8×10^{-5}	1.4×10^{-3}	5.4×10^{-5}	5.3×10^{-3}	3.4×10^{-4}	3.4×10^{-4}	4.8×10^{-3}	1.1	5.4×10^{-4}	0.27
10-year fatal cancer risk	1.4×10^{-9}	2.7×10^{-8}	7.6×10^{-10}	2.1×10^{-8}	9.0×10^{-10}	9.0×10^{-8}	5.5×10^{-9}	5.5×10^{-9}	7.0×10^{-8}	1.6×10^{-5}	8.0×10^{-9}	4.0×10^{-6}
[Text deleted.]												
Annual Population Dose Within 80 Kilometers[d]												
Atmospheric release pathway (person-rem)	0.016	0.48	2.9×10^{-4}	4.0×10^{-3}	3.2×10^{-3}	2.4	6.4×10^{-3}	6.7×10^{-3}	0.12	29	0.11	41
Total liquid release pathway (person-rem)	0	1.1	0	0	0	0	0	0	0	4.7	0	3.6
Atmospheric and liquid release pathways combined (person-rem)	0.016	1.6	2.9×10^{-4}	4.0×10^{-3}	3.2×10^{-3}	2.4	6.4×10^{-3}	6.7×10^{-3}	0.12	34	0.11	44
Percent of natural background[c]	8.6×10^{-6}	8.4×10^{-4}	3.2×10^{-6}	4.4×10^{-5}	3.5×10^{-6}	2.7×10^{-3}	5.5×10^{-6}	5.8×10^{-6}	3.1×10^{-5}	9.0×10^{-3}	4.1×10^{-5}	0.017
10-year fatal cancers	8.0×10^{-5}	7.9×10^{-3}	1.5×10^{-6}	2.0×10^{-5}	1.5×10^{-5}	0.012	3.3×10^{-5}	3.4×10^{-5}	6.0×10^{-4}	0.17	5.6×10^{-4}	0.22
[Text deleted.]												

Table 4.3.1.9–1. Potential Radiological Impacts to the Public During Normal Operation of the Pit Disassembly/Conversion Facility—Continued

Receptor	Hanford		NTS		INEL		Pantex		ORR		SRS	
	Facility	**Total Site[a]**	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**
Annual Dose to the Average Individual Within 80 Kilometers[e]												
Atmospheric and liquid release pathways combined (mrem)	$2.6x10^{-5}$	$2.6x10^{-3}$	$9.9x10^{-6}$	$1.3x10^{-4}$	$1.1x10^{-5}$	$8.9x10^{-3}$	$1.8x10^{-5}$	$1.9x10^{-5}$	$9.4x10^{-5}$	0.026	$1.2x10^{-4}$	0.049
10-year fatal cancer risk	$1.3x10^{-10}$	$1.3x10^{-8}$	$4.9x10^{-11}$	$6.6x10^{-10}$	$5.5x10^{-11}$	$4.5x10^{-8}$	$9.2x10^{-11}$	$9.6x10^{-11}$	$4.7x10^{-10}$	$1.3x10^{-7}$	$6.1x10^{-10}$	$2.5x10^{-7}$
[Text deleted.]												

[a] Includes impacts from No Action facilities (refer to Sections 4.2.1.9 through 4.2.6.9). The location of the MEI may be different under No Action than for operation of the new pit disassembly/conversion facility. Therefore, the impacts may not be directly additive.

[b] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem per year from the air pathways as required by NESHAPS (40 CFR 61, Subpart H) under the CAA, 4 mrem per year from the drinking water pathway as required by the SDWA, and 100 mrem per year from all pathways combined. Refer to DOE Order 5400.5.

[c] The annual natural background radiation levels: (1) Hanford: the average individual receives 300 mrem; the population within 80 km receives 186,400 person-rem, (2) NTS: the average individual receives 313 mrem; the population within 80 km receives 9,190 person-rem, (3) INEL: the average individual receives 338 mrem; the population within 80 km receives 90,800 person-rem (4) Pantex: the average individual receives 334 mrem; the population within 80 km receives 116,900 person-rem, (5) ORR: the average individual receives 295 mrem; the population within 80 km (50mi) receives 379,000 person-rem, (6) SRS: the average individual receives 298 mrem; the population within 80 km receives 266,000 person-rem.

[d] For DOE activities, proposed 10 CFR 834 (see 58 FR 16268) would generally limit the potential annual population dose to 100 person-rem from all pathways combined, and would require an ALARA program.

[Text deleted.]

[e] Obtained by dividing the population dose by the number of people projected to be living within 80 km of the site (621,000 at Hanford; 29,400 at NTS; 269,000 at INEL; 350,000 at Pantex; 1,285,000 at ORR; and 893,000 at SRS).

Source: Section M.2.

Table 4.3.1.9–2. Potential Radiological Impacts to Workers During Normal Operation of the Pit Disassembly/Conversion Facility

Receptor	Hanford	NTS	INEL	Pantex	ORR	SRS
Involved Workforce[a]						
Average worker dose (mrem/yr)[b]	200	200	200	200	200	200
10-year risk of fatal cancer	$8.0x10^{-4}$	$8.0x10^{-4}$	$8.0x10^{-4}$	$8.0x10^{-4}$	$8.0x10^{-4}$	$8.0x10^{-4}$
[Text deleted.]						
Total dose (person-rem/yr)	83	83	83	83	83	83
10-year fatal cancers	0.34	0.34	0.34	0.34	0.34	0.34
[Text deleted.]						
Noninvolved Workforce[c]						
Average worker dose (mrem/yr)[b]	27	5.0	30	10	2.6	32
10-year risk of fatal cancer	$1.1x10^{-4}$	$2.0x10^{-5}$	$1.2x10^{-4}$	$4.0x10^{-5}$	$1.0x10^{-5}$	$1.3x10^{-4}$
[Text deleted.]						
Total dose (person-rem/yr)	250	3.0	220	14	44	226
10-year fatal cancers	1.0	0.012	0.88	0.056	0.18	1.9
[Text deleted.]						
Total Site Workforce[d]						
Dose (person-rem/yr)	333	86	303	97	127	309
10-year fatal cancers	1.7	0.43	1.5	0.49	0.64	1.5
[Text deleted.]						

[a] The involved worker is a worker associated with operations of the proposed action.

[b] The radiological limit for an individual worker is 5,000 mrem/year (10 CFR 835). However, DOE has also established an administrative control level of 2,000 mrem per year (DOE 1992t); the sites must make reasonable attempts to maintain worker doses below this level.

[c] The noninvolved worker is a worker onsite but not associated with operations of the proposed action. The noninvolved workforce is equivalent to the No Action workforce.

[d] The impact to the total site workforce is the summation of the involved worker impact and the noninvolved worker impact.

[Text deleted.]

Source: Section M.2.

to the total site workforces would range from 86 person-rem at NTS to 333 person-rem at Hanford. The risks and numbers of fatal cancers among the different workers from 10 years of operation are included in Table 4.3.1.9–2. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. The hazardous chemical impacts from normal operation of the pit disassembly/conversion facility at several sites are presented in Table 4.3.1.9–3. Included are the impacts due only to operation of the pit disassembly/conversion facility and the site's total hazardous chemical impact. The total site impacts are provided to demonstrate the estimated level of health effects expected and the risk of cancer due to the total chemical exposures on each site. All supporting impact analyses are provided in Section M.3.

The HI to the MEI of the public due to the pit disassembly/conversion facility operation ranges from 4.0×10^{-6} at NTS to 1.6×10^{-4} at ORR. The cancer risk from hazardous chemicals to the MEI from the pit disassembly/conversion facility operation is zero (because no carcinogens are released from the hazardous chemicals used) at all sites. The HI to the onsite worker from the facility operation ranges from 2.6×10^{-4} at NTS and Pantex to 5.3×10^{-4} at ORR, and the cancer risk from the facility operation to the onsite worker is zero (because no carcinogens are released from the hazardous chemicals used) at all sites.

Facility Accidents. A set of potential accidents for the pit disassembly/conversion facility has been postulated for which there may be releases of Pu that may impact onsite workers and the offsite population. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the population located within 80 km (50 mi) of the accident release point are summarized in Tables 4.3.1.9–4 through 4.3.1.9–9 for the sites analyzed (Hanford, NTS, INEL, Pantex, ORR, and SRS). In the event that the site boundary is less than 1,000 m (3,280 ft) from the accident release point, the worker is placed at the site boundary. For the set of accidents analyzed at each site, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 2.2 at ORR for the oxyacetylene explosion in a process cell accident scenario with a probability of 1.0×10^{-7} per year. The corresponding 10-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be 2.2×10^{-6}, 1.4×10^{-8}, and 1.1×10^{-8}, respectively. The maximum population 10-year facility lifetime risk would be 1.7×10^{-4} (that is, one fatality in about 60,000 years) at ORR for the fire on the loading dock accident scenario with a probability of 5.0×10^{-4} per year. The corresponding maximum offsite individual and worker 10 year facility lifetime risks would be 9.3×10^{-7} and 7.5×10^{-7}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Tables 4.3.1.9–4 through 4.3.1.9–9.

The location of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions, and criticality could cause fatalities to workers close to the accident. Prior to construction and operation of a new facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Aircraft Crash. The probability of an aircraft crash into a new disposition facility at Pantex will depend upon its specific location relative to the airport and airplane traffic patterns. In the future, there is a possibility that air traffic patterns may change and cause a change in the probability of a crash into a specific facility. [Text deleted.] Admission of aircraft crash accidents for this PEIS is contained in Appendix R.

An indication of the magnitude to the impacts of an aircraft crash into a disposition facility is given by the earthquake scenario. The earthquake and aircraft crash scenarios are similar in that they both result in major

Table 4.3.1.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation of the Pit Disassembly/Conversion Facility

	Hanford		NTS		INEL		Pantex		ORR		SRS	
Receptor	**Facility[a]**	**Total Site[b]**	**Facility[a]**	**Total Site[b]**	**Facility[a]**	**Total Site[b]**	**Facility[a]**	**Total Site[b]**	**Facility[a]**	**Total Site[b]**	**Facility[a]**	**Total Site[b]**
Maximally Exposed Individual (Public)												
Hazard index[c]	2.7×10^{-5}	8.8×10^{-5}	4.0×10^{-6}	4.0×10^{-6}	5.8×10^{-5}	0.015	1.5×10^{-4}	5.8×10^{-3}	1.6×10^{-4}	0.039	7.3×10^{-6}	5.2×10^{-3}
Cancer risk[d]	0	0	0	0	0	3.6×10^{-6}	0	1.1×10^{-8}	0	0	0	1.3×10^{-7}
Worker Onsite												
Hazard index[e]	5.0×10^{-4}	4.4×10^{-3}	2.6×10^{-4}	2.6×10^{-4}	5.1×10^{-4}	0.22	2.6×10^{-4}	6.4×10^{-3}	5.3×10^{-4}	0.15	4.5×10^{-4}	1.2
Cancer risk[f]	0	0	0	0	0	7.7×10^{-4}	0	4.4×10^{-7}	0	0	0	1.9×10^{-4}

[a] Facility=Contribution from the proposed new facility operation only.

[b] Total=Includes the contributions from the No Action and the proposed new facility operation.

[c] Hazard Index for MEI=Sum of individual Hazard Quotients (noncancer health effects) for MEI.

[d] Cancer Risk for MEI: (Emissions Concentrations) x (0.286 [converts concentrations to doses]) x (Slope Factor [SF]).

[e] Hazard Index for Workers=Sum of individual Hazard Quotients (noncancer health effects) for workers.

[f] Cancer Risk for Workers: (Emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [Fraction of year exposed]) x (0.571 [Fraction of lifetime working]) x (Slope Factor).

Note: Where there are no known carcinogens among the hazardous chemicals emitted, there are no slope factors; therefore, the calculated cancer risk value is 0.

Source: Section M.3, Tables M.3.4–28 through M.3.4–33.

Table 4.3.1.9–4. Pit Disassembly/Conversion Facility Accident Impacts at Hanford Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatalities (per 10 yr)[a]**	**Number of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Fire on the loading dock	6.4×10^{-7}	1.3×10^{-4}	2.5×10^{-8}	5.1×10^{-6}	4.6×10^{-5}	9.3×10^{-3}	5.0×10^{-4}
Fire in a process cell	7.6×10^{-13}	7.6×10^{-10}	3.0×10^{-14}	3.0×10^{-11}	5.5×10^{-11}	5.5×10^{-8}	1.0×10^{-4}
Deflagration inside a glovebox	1.6×10^{-10}	1.6×10^{-7}	6.4×10^{-12}	6.4×10^{-9}	1.2×10^{-8}	1.2×10^{-5}	1.0×10^{-4}
Impact induced spill	1.2×10^{-16}	2.7×10^{-13}	4.9×10^{-18}	1.1×10^{-14}	8.8×10^{-15}	2.0×10^{-11}	4.5×10^{-5}
Nuclear criticality	6.9×10^{-13}	6.9×10^{-7}	2.9×10^{-14}	2.9×10^{-8}	7.8×10^{-12}	7.8×10^{-6}	1.0×10^{-7}
Beyond evaluation basis fire in a process cell	5.4×10^{-12}	5.4×10^{-6}	2.2×10^{-13}	2.2×10^{-7}	3.9×10^{-10}	3.9×10^{-4}	1.0×10^{-7}
Oxyacetylene explosion in a process cell	9.4×10^{-9}	9.4×10^{-3}	3.2×10^{-10}	3.2×10^{-4}	5.8×10^{-7}	0.58	1.0×10^{-7}
Beyond evaluation basis earthquake	4.1×10^{-9}	4.1×10^{-3}	1.6×10^{-10}	1.6×10^{-4}	2.9×10^{-7}	0.29	1.0×10^{-7}
Expected risk[d]	6.5×10^{-7}	-	2.6×10^{-8}	-	4.7×10^{-5}	-	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.3.1.1-4 and M.5.3.1.1–5 and the MACCS computer code.

Table 4.3.1.9–5. Pit Disassembly/Conversion Facility Accident Impacts at Nevada Test Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatalities (per 10 yr)[a]**	**Number of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Fire on the loading dock	$4.4x10^{-7}$	$8.7x10^{-5}$	$1.0x10^{-8}$	$2.0x10^{-6}$	$1.0x10^{-6}$	$2.1x10^{-4}$	$5.0x10^{-4}$
Fire in a process cell	$5.2x10^{-13}$	$5.2x10^{-10}$	$1.2x10^{-14}$	$1.2x10^{-11}$	$1.3x10^{-12}$	$1.3x10^{-9}$	$1.0x10^{-4}$
Deflagration inside a glovebox	$1.1x10^{-10}$	$1.1x10^{-7}$	$2.5x10^{-12}$	$2.5x10^{-9}$	$2.6x10^{-10}$	$2.6x10^{-7}$	$1.0x10^{-4}$
Impact induced spill	$8.3x10^{-17}$	$1.9x10^{-13}$	$1.9x10^{-18}$	$4.3x10^{-15}$	$2.0x10^{-16}$	$4.5x10^{-13}$	$4.5x10^{-5}$
Nuclear criticality	$5.0x10^{-13}$	$5.0x10^{-7}$	$1.1x10^{-14}$	$1.1x10^{-8}$	$1.6x10^{-13}$	$1.6x10^{-7}$	$1.0x10^{-7}$
Beyond evaluation basis fire in a process cell	$3.7x10^{-12}$		$8.6x10^{-14}$	$8.6x10^{-8}$	$8.9x10^{-12}$	$8.9x10^{-6}$	$1.0x10^{-7}$
Oxyacetylene explosion in a process cell	$6.3x10^{-9}$	$6.3x10^{-3}$	$1.3x10^{-10}$	$1.3x10^{-4}$	$1.3x10^{-8}$	0.013	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$2.7x10^{-9}$	$2.7x10^{-3}$	$6.3x10^{-11}$	$6.3x10^{-5}$	$6.5x10^{-9}$	$6.5x10^{-3}$	$1.0x10^{-7}$
Expected risk[d]	$4.5x10^{-7}$	–	$1.0x10^{-8}$	–	$1.1x10^{-6}$	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.3.1.1-4 and M.5.3.1.1–5 and the MACCS computer code.

Table 4.3.1.9–6. Pit Disassembly/Conversion Facility Accident Impacts at Idaho National Engineering Laboratory

Accident Description	Worker at 1,000 m: Risk of Cancer Fatality (per 10 yr)[a]	Worker at 1,000 m: Probability of Cancer Fatality[b]	Maximum Offsite Individual: Risk of Cancer Fatality (per 10 yr)[a]	Maximum Offsite Individual: Probability of Cancer Fatality[b]	Population to 80 km: Risk of Cancer Fatalities (per 10 yr)[a]	Population to 80 km: Number of Cancer Fatalities[c]	Accident Frequency (per yr)
Fire on the loading dock	$6.0x10^{-7}$	$1.2x10^{-4}$	$6.4x10^{-9}$	$1.3x10^{-6}$	$1.4x10^{-5}$	$2.8x10^{-3}$	$5.0x10^{-4}$
Fire in a process cell	$7.1x10^{-13}$	$7.1x10^{-10}$	$7.7x10^{-15}$	$7.7x10^{-12}$	$1.7x10^{-11}$	$1.7x10^{-8}$	$1.0x10^{-4}$
Deflagration inside a glovebox	$1.5x10^{-10}$	$1.5x10^{-7}$	$1.6x10^{-12}$	$1.6x10^{-9}$	$3.5x10^{-9}$	$3.5x10^{-6}$	$1.0x10^{-4}$
Impact induced spill	$1.1x10^{-16}$	$2.5x10^{-13}$	$1.2x10^{-18}$	$2.7x10^{-15}$	$2.7x10^{-15}$	$5.9x10^{-12}$	$4.5x10^{-5}$
Nuclear criticality	$6.7x10^{-13}$	$6.7x10^{-7}$	$6.7x10^{-15}$	$6.7x10^{-9}$	$2.1x10^{-12}$	$2.1x10^{-6}$	$1.0x10^{-7}$
Beyond evaluation basis fire in a process cell	$5.1x10^{-12}$	$5.1x10^{-6}$	$5.5x10^{-14}$	$5.5x10^{-8}$	$1.2x10^{-10}$	$1.2x10^{-4}$	$1.0x10^{-7}$
Oxyacetylene explosion in a process cell	$9.2x10^{-9}$	$9.2x10^{-3}$	$8.0x10^{-11}$	$8.0x10^{-5}$	$1.7x10^{-7}$	0.17	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$3.7x10^{-9}$	$3.7x10^{-3}$	$4.0x10^{-11}$	$4.0x10^{-5}$	$8.6x10^{-8}$	0.086	$1.0x10^{-7}$
Expected risk[d]	$6.1x10^{-7}$	–	$6.6x10^{-9}$	–	$1.4x10^{-5}$	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.3.1.1-4 and M.5.3.1.1–5 and the MACCS computer code.

Table 4.3.1.9–7. Pit Disassembly/Conversion Facility Accident Impacts at Pantex Plant

Accident Description	Worker at 1,000 m: Risk of Cancer Fatality (per 10 yr)[a]	Worker at 1,000 m: Probability of Cancer Fatality[b]	Maximum Offsite Individual: Risk of Cancer Fatality (per 10 yr)[a]	Maximum Offsite Individual: Probability of Cancer Fatality[b]	Population to 80 km: Risk of Cancer Fatalities (per 10 yr)[a]	Population to 80 km: Number of Cancer Fatalities[c]	Accident Frequency (per yr)
Fire on the loading dock	$2.6x10^{-7}$	$5.1x10^{-5}$	$1.0x10^{-7}$	$2.0x10^{-5}$	$1.6x10^{-5}$	$3.2x10^{-3}$	$5.0x10^{-4}$
Fire in a process cell	$3.1x10^{-13}$	$3.1x10^{-10}$	$1.2x10^{-13}$	$1.2x10^{-10}$	$1.9x10^{-11}$	$1.9x10^{-8}$	$1.0x10^{-4}$
Deflagration inside a glovebox	$6.4x10^{-11}$	$6.4x10^{-8}$	$2.6x10^{-11}$	$2.6x10^{-8}$	$3.9x10^{-9}$	$3.9x10^{-6}$	$1.0x10^{-4}$
Impact induced spill	$4.9x10^{-17}$	$1.1x10^{-13}$	$2.0x10^{-17}$	$4.3x10^{-14}$	$3.0x10^{-15}$	$6.7x10^{-12}$	$4.5x10^{-5}$
Nuclear criticality	$3.1x10^{-13}$	$3.1x10^{-7}$	$1.4x10^{-13}$	$1.4x10^{-7}$	$4.8x10^{-12}$	$4.8x10^{-6}$	$1.0x10^{-7}$
Beyond evaluation basis fire in a process cell	$2.2x10^{-12}$	$2.2x10^{-6}$	$8.7x10^{-13}$	$8.7x10^{-7}$	$1.3x10^{-10}$	$1.3x10^{-4}$	$1.0x10^{-7}$
Oxyacetylene explosion in a process cell	$3.3x10^{-9}$	$3.3x10^{-3}$	$1.3x10^{-9}$	$1.3x10^{-3}$	$2.0x10^{-7}$	0.20	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$1.6x10^{-9}$	$1.6x10^{-3}$	$6.4x10^{-10}$	$6.4x10^{-4}$	$9.8x10^{-8}$	0.098	$1.0x10^{-7}$
Expected risk[d]	$2.6x10^{-7}$	-	$1.0x10^{-7}$	-	$1.6x10^{-5}$	-	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.3.1.1-4 and M.5.3.1.1–5 and the MACCS computer code.

Table 4.3.1.9–8. Pit Disassembly/Conversion Facility Accident Impacts at Oak Ridge Reservation

Accident Description	Worker at 772 m: Risk of Cancer Fatality (per 10 yr)[a]	Worker at 772 m: Probability of Cancer Fatality[b]	Maximum Offsite Individual: Risk of Cancer Fatality (per 10 yr)[a]	Maximum Offsite Individual: Probability of Cancer Fatality[b]	Population to 80 km: Risk of Cancer Fatalities (per 10 yr)[a]	Population to 80 km: Number of Cancer Fatalities[c]	Accident Frequency (per yr)
Fire on the loading dock	7.5×10^{-7}	1.5×10^{-4}	9.3×10^{-7}	1.9×10^{-4}	1.7×10^{-4}	0.035	5.0×10^{-4}
Fire in a process cell	8.9×10^{-13}	8.9×10^{-10}	1.1×10^{-12}	1.1×10^{-9}	2.1×10^{-10}	2.1×10^{-7}	1.0×10^{-4}
Deflagration inside a glovebox	1.9×10^{-10}	1.9×10^{-7}	2.3×10^{-10}	2.3×10^{-7}	4.3×10^{-8}	4.3×10^{-5}	1.0×10^{-4}
Impact induced spill	1.4×10^{-16}	3.2×10^{-13}	1.8×10^{-17}	4.0×10^{-13}	3.3×10^{-14}	7.4×10^{-11}	4.5×10^{-5}
Nuclear criticality	7.8×10^{-13}	7.8×10^{-7}	9.8×10^{-13}	9.8×10^{-7}	6.6×10^{-11}	6.6×10^{-5}	1.0×10^{-7}
Beyond evaluation basis fire in a process cell	6.3×10^{-12}	6.3×10^{-6}	7.9×10^{-12}	7.9×10^{-6}	1.5×10^{-9}	1.5×10^{-3}	1.0×10^{-7}
Oxyacetylene explosion in a process cell	1.1×10^{-8}	0.011	1.4×10^{-8}	0.014	2.2×10^{-6}	2.2	1.0×10^{-7}
Beyond evaluation basis earthquake	4.6×10^{-9}	4.6×10^{-3}	5.8×10^{-9}	5.8×10^{-3}	1.1×10^{-6}	1.1	1.0×10^{-7}
Expected risk[d]	7.6×10^{-7}	-	9.5×10^{-7}	-	1.8×10^{-4}	-	-

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 772 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary [772 m for the facility at ORR], whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.3.1.1-4 and M.5.3.1.1-5 and the MACCS computer code.

Table 4.3.1.9–9. Pit Disassembly/Conversion Facility Accident Impacts at Savannah River Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatalities (per 10 yr)[a]**	**Number of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Fire on the loading dock	$4.2x10^{-7}$	$8.4x10^{-5}$	$1.0x10^{-8}$	$2.0x10^{-6}$	$5.0x10^{-5}$	$9.9x10^{-3}$	$5.0x10^{-4}$
Fire in a process cell	$5.0x10^{-13}$	$5.0x10^{-10}$	$1.2x10^{-14}$	$1.2x10^{-11}$	$5.9x10^{-11}$	$5.9x10^{-8}$	$1.0x10^{-4}$
Deflagration inside a glovebox	$1.0x10^{-10}$	$1.0x10^{-7}$	$2.6x10^{-12}$	$2.6x10^{-9}$	$1.2x10^{-8}$	$1.2x10^{-5}$	$1.0x10^{-4}$
Impact induced spill	$8.0x10^{-17}$	$1.8x10^{-13}$	$2.0x10^{-18}$	$4.4x10^{-15}$	$9.5x10^{-15}$	$2.1x10^{-11}$	$4.5x10^{-5}$
Nuclear criticality	$4.5x10^{-13}$	$4.5x10^{-7}$	$1.0x10^{-14}$	$1.0x10^{-8}$	$1.0x10^{-11}$	$1.0x10^{-5}$	$1.0x10^{-7}$
Beyond evaluation basis fire in a process cell	$3.6x10^{-12}$	$3.6x10^{-6}$	$8.7x10^{-14}$	$8.7x10^{-8}$	$4.2x10^{-10}$	$4.2x10^{-4}$	$1.0x10^{-7}$
Oxyacetylene explosion in a process cell	$5.8x10^{-9}$	$5.8x10^{-3}$	$1.3x10^{-10}$	$1.3x10^{-4}$	$6.2x10^{-7}$	0.62	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$2.8x10^{-9}$	$2.8x10^{-3}$	$6.4x10^{-11}$	$6.4x10^{-5}$	$3.1x10^{-7}$	0.31	$1.0x10^{-7}$
Expected risk[d]	$4.3x10^{-7}$	-	$1.0x10^{-8}$	-	$5.1x10^{-5}$	-	-

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.3.1.1-4 and M.5.3.1.1–5 and the MACCS computer code.

structural damage and the release of Pu directly to the environment. They differ in that an earthquake induced fire is based on limited combustible materials while the aircraft crash has the potential for a major fuel related fire. Also, the earthquake has the potential for damage and release of hazardous materials throughout the facility while the aircraft crash may only damage and release hazardous materials in the vicinity of the point of impact. In both scenarios, the involved workers located within the facility could receive serious or fatal injuries.

[Text deleted.]

4.3.1.10 Waste Management

This section summarizes the waste management impacts for the construction and operation of a pit disassembly/ conversion facility. There is no spent nuclear fuel or HLW associated with the operation of the pit disassembly/ conversion facility. Table 4.3.1.10–1 provides the estimated operational waste volumes projected to be generated at the sites analyzed as a result of the pit disassembly/conversion facility. Facilities that would support the pit disassembly/conversion facility would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the regulatory requirements of RCRA, and other applicable statutes. Depending in part on decisions in waste-type-specific RODs for the Waste Management PEIS, wastes could be treated, and depending on the type of waste, disposed of onsite or at regionalized or centralized DOE sites. For the purposes of analyses only, this PEIS assumes that TRU and mixed TRU waste would be treated onsite to the current planning-basis WIPP WAC, and shipped to WIPP for disposal. This PEIS also assumes that LLW, mixed LLW, hazardous and nonhazardous wastes would be treated and disposed of in accordance with current site practice. The incremental waste volumes generated from the pit disassembly/ conversion facility and the resultant waste effluent used for the waste impact analysis can be found in Section E.3.2.1. A detailed description of the waste management activities that would be required to support the pit disassembly/conversion facility can also be found in Section E.3.2.1.

Construction and operation of a pit disassembly/conversion facility would impact existing waste management activities at each of the sites analyzed, increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, and solid nonhazardous and hazardous wastes. The nonhazardous waste would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous or radioactive constituents is expected to be generated during construction. However, if any are generated, it would be managed in accordance with site practice, and all applicable Federal and State regulations.

Approximately 67 m^3 (88 yd^3) of TRU waste consisting of retired gloveboxes, contaminated wipes and rags, plastics, packaging materials, declassified components, and glovebox sweepings would require treatment and repackaging to meet the current planning-basis WIPP WAC or alternative treatment level. Hanford, INEL, and SRS have existing and planned TRU waste facilities that could be utilized. ORNL has the only existing or planned capability at ORR to handle TRU waste. ORNL existing and planned TRU waste facilities could handle this increase. Due to their limited capability to process, package, and store TRU waste, a radwaste facility would need to be constructed as part of the pit disassembly/conversion facility if sited at Pantex or NTS. A small quantity (4 m^3 [6 yd^3]) of mixed TRU waste would require treatment and packaging to meet the current planning-basis WIPP WAC or alternative treatment level. Mixed TRU waste would be principally leaded rubber gloves. To transport the TRU and mixed TRU waste to WIPP (depending on decisions made in the ROD associated with the supplemental EIS for the proposed continued phased development of WIPP for disposal of TRU waste), eight truck shipments per year or, if applicable, four regular train shipments per year or one dedicated train shipment per year, would be required.

All of the sites analyzed have existing or planned facilities that could manage the small quantities of LLW. Approximately 102 m^3 (133 yd^3) of LLW from paper and surgeon's gloves, which are discarded inside the Radioactive Materials Area but external to gloveboxes, and solidified liquid LLW would require disposal. Using the land usage factors from Section E.1.4, the area required for LLW disposal would be 0.03 ha/yr (0.08 acre/yr) at Hanford and ORR, 0.02 ha/yr (0.04 acre/yr) at NTS and INEL, and 0.01 ha/yr (0.03 acre/yr) at SRS. With no onsite LLW disposal capability, Pantex would require six additional LLW shipments per year to NTS. The ultimate disposal of LLW will be in accordance with the ROD(s) from the Waste Management PEIS.

A small quantity (0.4 m^3 [100 gal]) of liquid and (1.7 m^3 [2.2 yd^3]) of solid mixed LLW consisting of solvents, lead, and vacuum pump oil that have been contaminated with radioactive constituents would require treatment to meet the land disposal restrictions of RCRA. Mixed LLW would be managed in accordance with the Tri-Party

Table 4.3.1.10–1. Estimated Annual Generated Waste Volumes for the Pit Disassembly/Conversion Facility[a]

Category	New Facility (m³)	Hanford No Action (m³)	NTS No Action (m³)	INEL No Action (m³)	Pantex No Action (m³)	ORR No Action (m³)	SRS No Action (m³)
Transuranic							
Liquid	0	None	None	None	None	None	None
Solid	67	271	None	3.5	None	119	338
Mixed Transuranic							
Liquid	0	None	None	None	None	None	None
Solid	4	98	None	Included in TRU	None	None	Included in TRU
Low-Level							
Liquid	4[b]	None	Dependent on restoration activities	None	8	2,970	74,000
Solid	102	3,390	15,000	7,200	32	7,320	16,400
Mixed Low-Level							
Liquid	0.4	3,760	None	4	4	87,600	1,330
Solid	1.7	1,505	50	170	46	432	7,700
Hazardous							
Liquid	2	Included in solid	Included in solid	Included in solid	2	6,460	1,260
Solid	0.7	560	212	1,200	31	26	15,100
Nonhazardous (Sanitary)							
Liquid	85,200	414,000	Not reported separately, included in solid	Not reported separately, included in solid	141,000	550,000	703,000
Solid	100	5,107	2,120	52,000	339	53,100	61,200
Nonhazardous (Other)							
Liquid	Included in sanitary	Included in sanitary	Included in sanitary	None	Included in sanitary	650,000	Included in sanitary
Solid	3[c]	Included in sanitary	76,500	Included in sanitary	Included in sanitary	321	Included in sanitary

[a] The No Action volumes are from Tables 4.2.1.10–1, 4.2.2.10–1, 4.2.3.10–1, 4.2.4.10–1, 4.2.5.10–1, and 4.2.6.10–1. Incremental waste generation volumes for pit disassembly/conversion are from Table E.3.2.1–1. Waste effluent volumes (that is, after treatment and volume reduction) which are used in the narrative description of the impacts are also provided in Table E.3.2.1–1.

[b] Liquid LLW would be treated and solidified prior to disposal.

[c] Recyclable wastes.

Agreement for Hanford or the respective site treatment plan that was developed to comply with the *Federal Facility Compliance Act* for the remainder of the sites analyzed.

Liquid hazardous waste would consist of cleaning solvents, vacuum pump oils, film processing fluids, hydraulic fluids from mechanical equipment, antifreeze solutions, and paint. Liquid hazardous waste would be treated onsite or collected in DOT-approved containers and shipped offsite to RCRA-permitted treatment facilities. After treatment, the waste would be disposed of offsite in commercial RCRA-permitted disposal facilities. Solid hazardous waste would consist of lead packing and wipes contaminated with oils, lubricants, and cleaning solvents. After compaction, solid hazardous waste would be packaged in DOT-approved containers, treated onsite or offsite, and shipped to RCRA-permitted treatment and disposal facilities. All the sites analyzed would have adequate capacity to stage the 2 m^3 (500 gal) of liquid and 0.7 m^3 (0.9 yd^3) of solid hazardous waste until sufficient quantity accumulated to warrant shipment to a RCRA-permitted treatment and disposal facility.

Approximately 85,200 m^3 (22,500,000 gal) of liquid nonhazardous sanitary and industrial wastewater, steam plant blowdown, and estimated stormwater runoff would require treatment, in accordance with site practice and discharge permits. Construction of sanitary, utility, and process wastewater treatment systems may be required. The 100 m^3 (131 yd^3) of solid nonhazardous waste such as paper, glass, discarded office material, and cafeteria waste that is not recycled or salvageable would be shipped to an onsite or offsite landfill in accordance with site-specific practice.

4.3.2 PLUTONIUM CONVERSION FACILITY

The environmental impacts described in the following sections are based on the analysis of the Pu conversion facility as described in Section 2.4.2. The representative sites used for this facility are: Hanford, NTS, INEL, Pantex, ORR, and SRS. These sections describe the construction and operational impacts of the Pu conversion facility on the following potentially affected areas: land resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomic, public and occupational health and safety, and waste management.

In accordance with the Preferred Alternative for surplus Pu disposition, the Pu conversion facility could be located at either Hanford or SRS. Further tiered NEPA review will be conducted to examine alternative locations including new and existing facilities at these two sites should the Preferred Alternative be selected at the ROD. Although new facilities are analyzed in Section 4.3.2.1 through 4.3.2.10, DOE would preserve the option for using existing facilities to the extent practical pursuant to subsequent tiered NEPA review.

4.3.2.1 Land Resources

At all sites, the Pu conversion facility would disturb 36 ha (90 acres) of land during construction of which approximately 28 ha (70 acres) would be used during operations. The facility would be sited in a 1.6-km (1-mi) buffer zone contained within the boundary except at ORR, where the buffer zone is less than 1.6 km (1 mi). With the 1.6-km (1-mi) buffer zone, total land requirement would be 1,416 ha (3,500 acres). This section describes the impacts of constructing and operating the Pu conversion facility to land resources for each analysis site.

As discussed in Section 4.3.2.8, new housing construction at all sites should be sufficient to absorb the increase in population due to the in-migration of operational workers. No in-migration would occur during construction. No offsite land use would be affected; therefore, no indirect impacts would occur.

Hanford Site

Land Use. The potential site for the Pu conversion facility would utilize vacant land in the 200 Area adjacent to 200 East. Construction and operation of the Pu conversion facility would be in conformance with existing and future land use as described in the current *Hanford Site Development Plan* and with ongoing discussions in the comprehensive land use planning process. According to the *Hanford Site Development Plan*, 200 Areas land use is identified as waste operations, which includes radioactive material management, processing, and storage (HF DOE 1993c:13,14). [Text deleted.]

Construction and operation would not affect other Hanford or offsite land uses. No prime farmlands exist onsite. Construction would be consistent with State and local (Benton, Franklin, and Grant Counties and the city of Richland) land-use plans, policies, and controls since Hanford provides information to these jurisdictions for use in their efforts to comply with the GMA (HF DOE 1993c:17).

Visual Resources. [Text deleted.] Construction and operation would be consistent with the industrialized landscape character of the 200 Areas. Construction and operation would be consistent with the current VRM Class 5 designation.

Nevada Test Site

Land Use. The potential location for the Pu conversion facility would be on undeveloped land in Area 6. Construction and operation of the facility in Area 6 would not be in conformance with the current *Nevada Test Site Development Plan*, which designates the southeast area of NTS as a nonnuclear test area. [Text deleted.] However, Area 6 is under a potential site for long-term storage and disposition of weapons-usable fissile materials as part of

the NTS defense program material disposition activities considered under the Expanded Use Alternative (part of the Preferred Alternative) of the NTS EIS (NT DOE 1996c:3-8–3-9; NT DOE 1996e:A-18). [Text deleted.]

Construction and operation would not affect other NTS or offsite land uses. No prime farmlands exist onsite. The alternative would not be in conflict with land-use plans, policies, and controls of adjacent jurisdictions since none of these counties and municipalities currently undertake land-use planning.

Visual Resources. [Text deleted.] Construction and operation of the facility would be compatible with the industrial landscape character of the adjacent DAF and the current VRM Class 5 designation of Area 6. Views of the proposed action would be blocked from sensitive viewpoints accessible to the public by mountainous terrain.

Idaho National Engineering Laboratory

Land Use. The proposed Pu conversion facility would be located on undeveloped land within the ICPP security area which is part of the central core area/Prime Development Land Zone of INEL (IN DOE 1992g:12). Construction and operation of the facility would be consistent with the current *Idaho National Engineering Laboratory Site Development Plan* which designates the future land use of the ICPP as receiving and storing spent nuclear fuels and radioactive wastes (IN DOE 1994d:9-8). [Text deleted.]

Construction would not affect other INEL or offsite land uses. No prime farmlands exist onsite. Construction and operation would not be in conflict with land-use plans, policies, and controls of adjacent counties and the city of Idaho Falls since they do not address the potential site.

Visual Resources. [Text deleted.] Construction and operation of the facility would be consistent with the existing industrialized landscape character of the ICPP. Construction and operation would be consistent with the current VRM Class 5 designation of the area.

Pantex Plant

Land Use. Undeveloped land in Zone 12 is the potential location for the Pu conversion facility. The potential action would be consistent with the current *Pantex Site Development Plan* master plan, which designates Zone 12 as weapons assembly/disassembly (PX DOE 1995g:16). [Text deleted.]

Construction and operation would not affect other Pantex or offsite land uses. There would be no impacts to prime farmland. The alternative would not be in conflict with the city of Amarillo's land-use plans, policies, and controls since they do not address Pantex.

Visual Resources. [Text deleted.] The proposed visual environment would be consistent with the existing industrialized landscape character. Construction and operation would be consistent with the current VRM Class 5 designation of Zone 12.

Oak Ridge Reservation

Land Use. The Pu conversion facility is proposed to be sited on undeveloped land at Y–12. Weapons component manufacturing and development is among the future land uses designated for Y–12 by the future land use plan of the current *Oak Ridge Reservation Site Development and Facilities Utilization Plan* (OR DOE 1989a:5-6–5-7). The alternative is compatible with the plan.

Construction and operation of the Pu conversion facility would not affect other ORR or offsite land uses. No prime farmlands exist onsite. Construction and operation would not be in conflict with the city of Oak Ridge

land-use plans, policies, and controls since the current *Oak Ridge Area Land Use Plan* designates the potential site for Industrial land use.

Visual Resources. Potential impacts to visual resources would not occur. The visual environment would be consistent with the existing industrial landscape character. Construction and operation would be consistent with the current VRM Class 5 designation of Y–12.

Savannah River Site

Land Use. Vacant land in the F-Area would be used for the Pu conversion facility. Construction and operation of the proposed facility would be in conformance with existing and future land use as designated by the current *Savannah River Site Development Plan*. According to the plan, current F-Area land use is designated industrial operations, while the future land-use category is primary industrial mission (SR DOE 1994d:11,12). Vacant land would be utilized.

Construction and operation would not affect other SRS or offsite land uses. There is no prime farmland on SRS. Construction and operation would not be in conflict with land-use plans, policies, and controls of adjacent counties and cities since they do not address SRS.

Visual Resources. [Text deleted.] The visual environment would be consistent with the industrial landscape character. Construction and operation would be consistent with current VRM Class 5 designation of the F-Area.

[Text deleted.]

4.3.2.2 Site Infrastructure

This section discusses the impacts on site infrastructure needed to support the Pu conversion facility at each of the six representative sites. Constructing and operating the facility would impact infrastructure at each site differently, depending on operating resources.

The Pu conversion facility would be composed of shipping and receiving, material management, processing operations, waste management, and necessary facility infrastructure and utility support functions. Construction would require approximately 6 years to complete. Table 4.3.2.2–1 presents a comparison of annual construction resource needs for each of the representative sites. Comparative impact of average annual resource needs for operation are presented in Table 4.3.2.2–2.

Table 4.3.2.2–1. Additional Site Infrastructure Needed for the Construction of the Plutonium Conversion Facility (Annual)

	Electrical		Fuel		
	Energy (MWh/yr)	**Peak Load (MWe)**	**Oil (l/yr)**	**Natural Gas (m^3/yr)**	**Coal (t/yr)**
Facility Requirement	1,100	<1	157,850	0	0
Hanford					
Site availability	1,678,700	281	14,775,000	21,039,531	91,708
Projected usage (without facility)	345,500	58	9,334,800	21,039,531	0
Projected usage (with facility)	346,600	59	9,492,650	21,039,531	0
Amount required in excess to site availability	0	0	0	0	0
NTS					
Site availability	176,844	45	5,716,000	0	0
Projected usage (without facility)	124,940	25	5,716,000	0	0
Projected usage (with facility)	126,040	26	5,873,850	0	0
Amount required in excess to site availability	0	0	157,850[a]	0	0
INEL					
Site availability	394,200	124	16,000,000	0	11,340
Projected usage (without facility)	232,500	42	5,820,000	0	11,340
Projected usage (with facility)	233,600	43	5,977,850	0	11,340
Amount required in excess to site availability	0	0	0	0	0

Table 4.3.2.2–1. Additional Site Infrastructure Needed for the Construction of the Plutonium Conversion Facility (Annual)—Continued

	Electrical		Fuel		
	Energy (MWh/yr)	**Peak Load (MWe)**	**Oil (l/yr)**	**Natural Gas (m^3/yr)**	**Coal (t/yr)**
Facility Requirement	1,100	<1	157,850	0	0
Pantex					
Site availability	201,480	23	1,775,720	289,000,000	0
Projected usage (without facility)	46,266	10	795,166	7,200,000	0
Projected usage (with facility)	47,366	11	953,016	7,200,000	0
Amount required in excess to site availability	0	0	0	0	0
ORR					
Site availability	13,880,000	2,100	416,000	250,760,000	16,300
Projected usage (without facility)	726,000	110	379,000	95,000,000	16,300
Projected usage (with facility)	727,100	111	536,850	95,000,000	16,300
Amount required in excess to site availability	0	0	120,850[a]	0	0
SRS					
Site availability	1,672,000	330	28,390,500	0	244,000
Projected usage (without facility)	794,000	116	28,390,500	0	221,352
Projected usage (with facility)	795,100	117	28,548,350	0	221,350
Amount required in excess to site availability	0	0	148,350	0	0

[a] Fuel oil requirements in excess to site availability could be procured through normal contractual means.

Source: HF 1995a:1; INEL 1995a:1; LANL 1996c; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; PX DOE 1995g; SRS 1995a:2.

Table 4.3.2.2–2. Additional Site Infrastructure Needed for the Operation of the Plutonium Conversion Facility (Annual)

	Transportation		Electrical		Fuel		
	Roads (km)	**Rail (km)**	**Energy (MWh/yr)**	**Peak Load (MWe)**	**Oil (l/yr)**	**Natural Gas (m^3/yr)**	**Coal (t/yr)**
Facility Requirement	<5	0	21,000	5	39,750	4,361,000	0
Hanford							
Site availability	420	204	1,678,700	281	14,775,000	21,039,531	91,708
Projected usage (without facility)	420	204	345,500	58	9,334,800	21,039,531	0
Projected usage (with facility)	425	204	366,500	63	9,374,550	25,400,531	0
Amount required in excess to site availability	<5	0	0	0	0	4,361,000[a]	0
NTS							
Site availability	1,100[b]	0	176,844	45	5,716,000	0	0
Projected usage (without facility)	645	0	124,940	25	5,716,000	0	0
Projected usage (with facility)	650	0	145,940	30	5,755,750	4,361,000	0
Amount required in excess to site availability	0	0	0	0	39,750[c]	4,361,000[a]	0
INEL							
Site availability	445	48	394,000	124	16,000,000	0	11,340
Projected usage (without facility)	445	48	232,500	42	5,820,000	0	11,340
Projected usage (with facility)	450	48	253,500	47	5,859,750	4,361,000	11,340
Amount required in excess to site availability	<5	0	0	0	0	4,361,000[a]	0
Pantex							
Site availability	76	27	201,480	23	1,775,720	289,000,000	0
Projected usage (without facility)	76	27	46,266	10	795,166	7,200,000	0

Table 4.3.2.2–2. Additional Site Infrastructure Needed for the Operation of the Plutonium Conversion Facility (Annual)—Continued

	Transportation		Electrical		Fuel		
	Roads (km)	**Rail (km)**	**Energy (MWh/yr)**	**Peak Load (MWe)**	**Oil (l/yr)**	**Natural Gas (m^3/yr)**	**Coal (t/yr)**
Facility Requirement	<5	0	21,000	5	39,750	4,361,000	0
Projected usage (with facility)	81	27	67,266	15	834,916	11,561,000	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
ORR							
Site availability	71	27	13,880,000	2,100	416,000	250,760,000	16,300
Projected usage (without facility)	71	27	726,000	110	379,000	95,000,000	16,300
Projected usage (with facility)	76	27	747,000	115	418,750	99,361,000	16,300
Amount required in excess to site availability	<5	0	0	0	2,750[c]	0	0
SRS							
Site availability	230	103	1,672,000	330	28,390,500	0	244,000
Projected usage (without facility)	230	103	659,000	130	28,390,500	0	210,000
Projected usage (with facility)	235	103	680,000	135	28,430,250	4,361,000	210,000
Amount required in excess to site availability	<5	0	0	0	39,750[c]	4,361,000[a]	0

[a] Facility would be adapted to use fuel oil instead of natural gas.

[b] Includes both paved and unpaved roads.

[c] Fuel oil requirements in excess to site availability could be procured through normal contractual means.

Source: HF 1995a:1; INEL 1995a:1; LANL 1996c; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; PX DOE 1995g; SRS 1995a:2.

Hanford Site

Resources needed for construction are well within site availability. These resources would represent a small fraction of those needed to operate the site. Operations impacts would be small. The planned Pu conversion facility would use natural gas as the primary utility fuel, and the total requirement for natural gas would be higher than the site currently has available. The additional amount could be procured normal contractual means. [Text deleted.]

Nevada Test Site

Resources needed for construction would be well within site availability for all resources except oil. These resources would represent a small fraction of those needed to operate the site. Operational impacts would be small except for utility fuel. The planned Pu conversion facility would use natural gas as the primary utility fuel. Since NTS uses fuel oil as its primary utility fuel, using natural gas in lieu of fuel oil would require additional infrastructure. The final facility design would be converted to a fuel oil basis. Fuel oil requirements would exceed current site availability, but can be procured through normal contractual means.

Idaho National Engineering Laboratory

Resources needed for construction would be within site availability. These resources would represent a small fraction of those needed to operate the site. Operations impacts would be small except for utility fuel. The planned Pu conversion facility would use natural gas as the primary utility fuel. Since INEL uses fuel oil as its primary utility fuel, using natural gas in lieu of fuel oil would require additional infrastructure. The final facility design would be converted to a fuel oil basis. With this conversion from natural gas to fuel oil, site infrastructure requirements are within site capacities. [Text deleted.]

Pantex Plant

Resources needed for construction would be within site availability. [Text deleted.] Operations requirements would be within site availability. Adequate electrical energy would be available from the regional power grid.

Oak Ridge Reservation

Except for fuel oil, resources needed for construction would be well within site availability. Additional fuel oil for construction could be procured through normal contractual means. These resources would represent a small fraction of those needed to operate the site. Operational impacts would be small. [Text deleted.] However, the total requirement for oil would be slightly higher than the site currently has available. The additional amount could be procured through normal contractual means.

Savannah River Site

Resources needed for construction would be within site availability for all resources except oil. Additional fuel oil for construction could be procured through normal contractual means. These resources would represent a small fraction of those needed to operate the site. Operational impacts would be within availability capacity except for oil and natural gas. Since SRS uses fuel oil as its primary utility fuel, using natural gas in lieu of fuel oil would require additional infrastructure. The final facility design would be converted to a fuel oil basis. With this conversion from natural gas to fuel oil, site infrastructure requirements would be within site capacities, except for oil. Additional oil could be procured through normal contractual means.

4.3.2.3 Air Quality and Noise

Construction and operation of the Pu conversion facility would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts, criteria and toxic/hazardous concentrations from this facility have been compared with Federal and State standards and guidelines for each site. Impacts for radiological airborne emissions are discussed in Section 4.3.2.9.

Noise impacts during either construction or operation are expected to be low. Air quality and noise impacts are described separately. Supporting data for the air quality and noise analysis are presented in Appendix F.

AIR QUALITY

Construction and operation of the facility would result in the emission of some pollutants at each of the sites. Emissions would typically not exceed Federal, State, or local air quality regulations or guidelines.

The principal sources of emissions during construction include the following:

- Fugitive dust from land clearing, site preparation, excavation, wind erosion of exposed ground surfaces, and possible operation of a concrete batch plant
- Exhaust and road dust generated by construction equipment, vehicles delivering construction materials, and vehicles carrying construction workers

The PM_{10} and TSP concentrations are expected to increase during the peak construction period, especially during dry and windy conditions. Appropriate control measures would be followed. It is expected that the sites will continue to comply with applicable Federal and State ambient air quality standards during construction.

Emission rates for operation of the Pu conversion facility are presented in Table F.1.3–5. Air pollutant emissions sources associated with operations include the following:

- Increased operation of existing boilers for space heating
- Operation of diesel generators and periodic testing of emergency diesel generators

[Text deleted.]

- Toxic/hazardous pollutant emissions from facility processes

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. The estimated pollutant concentrations for facility operation plus the No Action concentrations are presented in Table 4.3.2.3–1.

NOISE

The location of the facilities associated with the Pu conversion facility relative to the site boundary and sensitive receptors was examined for each of the six sites to evaluate the potential contribution to noise levels at these locations and the potential for onsite and offsite noise impacts. Noise sources during construction may include heavy-construction equipment and increased traffic. Increased traffic would occur onsite and along offsite major transportation routes used to bring construction material and workers to the site.

Table 4.3.2.3–1. Estimated Operational Concentrations of Pollutants and Comparison With Most Stringent Regulations or Guidelines—Plutonium Conversion Facility and No Action Alternative

Pollutant	Averaging Time	Most Stringent Regulation or Guideline[a] (μg/m³)	Hanford No Action (μg/m³)	Hanford Total (μg/m³)	NTS No Action (μg/m³)	NTS Total (μg/m³)	INEL No Action (μg/m³)	INEL Total (μg/m³)	Pantex No Action (μg/m³)	Pantex Total (μg/m³)	ORR No Action (μg/m³)	ORR Total (μg/m³)	SRS No Action (μg/m³)	SRS Total (μg/m³)
Criteria Pollutants														
Carbon monoxide	8-hour	10,000	0.08	0.71	2,290	2,290.5	284	285.59	602	608.13	5	5.16	22	27.42
	1-hour	40,000	0.3	5.23	2,748	2,751.56	614	618.03	2,900	2,932.0	11	11.33	171	196.51
Lead	Calendar Quarter	1.5	<0.01	<0.01	b	b	0.001	0.001	0.09	0.09	0.05	0.05	<0.01	<0.01
	24-hour	0.5	<0.01	<0.01	c	c	c	c	c	c	c	c	c	c
Nitrogen dioxide	Annual	100	0.03	0.06	b	<0.01[d]	4	4.03	2.15	2.29	3	3.01	5.7	5.81
Ozone	1-hour	235	e	e	e	e	e	e	e	e	e	e	e	e
Particulate matter less than or equal to 10 microns in diameter	Annual	50	<0.01	<0.01	9.4	9.4	5	5	8.73	8.73	1	1	3	3
	24-hour	150	0.02	0.02	106	106	80	80	88.5	88.51	2	2	50.6	50.61
Sulfur dioxide	Annual	52	<0.01	<0.01	8.4	8.4	6	6	<0.01	<0.01	2	2	14.5	14.5
	24-hour	260	<0.01	<0.01	94.6	94.6	135	135	<0.01	0.01	32	32	196	196
	3-hour	1,300	0.01	0.01	725	725	579	579	<0.01	0.04	80	80	823	823.03
	1-hour	1,018	0.02	0.02	c	c	c	c	c	c	c	c	c	c
	1-hour	655[f]	0.02	0.02	c	c	c	c	c	c	c	c	c	c
	30-minute	1,045	c	c	c	c	c	c	<0.01	0.09	c	c	c	c
Mandated by State														
Gaseous fluoride (as HF)	30-day	0.8	b	<0.01[d]	c	c	c	c	<0.75	<0.75	0.2	0.2	0.09	0.09
	7-day	1.6	b	<0.01[d]	c	c	c	c	<0.75	<0.75	0.3	0.3	0.39	0.39
	24-hour	2.9	b	<0.01[d]	c	c	c	c	0.75	0.75	0.6[g]	0.6[g]	1.04	1.04
	12-hour	3.7	b	<0.01[d]	c	c	c	c	1.05	1.05	0.6[g]	0.6[g]	1.99	1.99
	8-hour	250	c	c	c	c	c	c	c	c	0.6	0.6	c	c
	3-hour	4.9	c	c	c	c	c	c	4.21	4.21	c	c	c	c
Hydrogen sulfide	1-hour	112	c	c	b	b	c	c	c	c	c	c	c	c
	30-minute	111	c	c	c	c	c	c	b	b	c	c	c	c

Table 4.3.2.3–1. Estimated Operational Concentrations of Pollutants and Comparison With Most Stringent Regulations or Guidelines—Plutonium Conversion Facility and No Action Alternative—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guideline[a] (μg/m³)	Hanford No Action (μg/m³)	Hanford Total (μg/m³)	NTS No Action (μg/m³)	NTS Total (μg/m³)	INEL No Action (μg/m³)	INEL Total (μg/m³)	Pantex No Action (μg/m³)	Pantex Total (μg/m³)	ORR No Action (μg/m³)	ORR Total (μg/m³)	SRS No Action (μg/m³)	SRS Total (μg/m³)
Total suspended particulates	Annual	60	<0.01	<0.01	c	c	5	5	c	c	c	c	12.6	12.6
	24-hour	150	0.02	0.02	c	c	80	80	c	c	2	2	c	c
	3-hour	200	c	c	c	c	c	c	b	d	c	c	c	c
	1-hour	400	c	c	c	c	c	c	b	d	c	c	c	c
Hazardous and Other Toxic Compounds														
Ammonia	Annual	17	c	c	c	c	6	6	b	<0.01[d]	c	c	c	c
	24-hour	100	<0.01	<0.01	c	c	c	c	c	c	c	c	b	<0.01[d]
	8-hour	404.8	c	c	b	<0.01[d]	c	c	c	c	b	<0.01[d]	c	c
	30-minute	170	c	c	c	c	c	c	b	0.08[d]	c	c	c	c
Chlorine	Annual	1.5	c	c	c	c	b	<0.01[d]	b	<0.01[d]	c	c	c	c
	24-hour	5	b	<0.01[d]	c	c	c	c	c	c	c	c	7.63	7.63
	8-hour	35.7	c	c	b	<0.01[d]	c	c	c	c	4.1	4.1	c	c
	30-minute	15	c	c	c	c	c	c	b	0.06[d]	c	c	c	c
Ethanol	Annual	1,880	c	c	c	c	b	<0.01[d]	b	<0.01[d]	c	c	c	c
	24-hour	6,300	b	<0.01[d]	c	c	c	c	c	c	c	c	b	<0.01[d]
	8-hour	44,762	c	c	b	<0.01[d]	c	c	c	c	b	<0.01[d]	c	c
	30-minute	18,800	c	c	c	c	c	c	b	0.16[d]	c	c	c	c
Hydrogen chloride	Annual	0.1	c	c	c	c	0.98	0.98	0.07	0.07	c	c	c	c
	24-hour	7	b	<0.01[d]	c	c	c	c	c	c	c	c	b	0.01[d]
	8-hour	750	c	c	b	<0.01[d]	c	c	c	c	57	57	c	c
	30-minute	75	c	c	c	c	c	c	6.17	6.27	c	c	c	c
Hydrazine	Annual	0.0002	b	<0.00001[d]	c	c	0.000001	0.000001	b	<0.0001[d]	c	c	c	c
	24-hour	0.5	c	c	c	c	c	c	c	c	c	c	b	<0.01[d]
	8-hour	1.3	c	c	b	<0.01[d]	c	c		c	b	<0.01[d]	c	c
	30-minute	0.13	c	c	c	c	c	c	b	0.01[d]	c	c	c	c

Table 4.3.2.3–1. Estimated Operational Concentrations of Pollutants and Comparison With Most Stringent Regulations or Guidelines—Plutonium Conversion Facility and No Action Alternative—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guideline[a] (μg/m³)	Hanford		NTS		INEL		Pantex		ORR		SRS	
			No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)
Hazardous and Other Toxic Compounds (continued)														
Nitric acid	Annual	5.2	c	c	c	c	0.64	0.64	b	<0.01[d]	c	c	c	c
	24-hour	17	b	<0.01[d]	c	c	c	c	c	c	c	c	50.96	50.96
	8-hour	123.8	c	c	b	<0.01[d]	c	c	c	c	78	78	c	c
	30-minute	52	c	c	c	c	c	c	b	0.02[d]	c	c	c	c
Phosphoric acid	Annual	1	c	c	c	c	b	<0.01[d]	b	<0.01[d]	c	c	c	c
	24-hour	3.3	b	<0.01[d]	c	c	c	c	c	c	c	c	0.462	0.462
	8-hour	23.8	c	c	b	<0.01[d]	c	c	c	c	b	<0.01[d]	c	c
	30-minute	10	c	c	c	c	c	c	b	0.01[d]	c	c	c	c
Sulfuric acid	Annual	10	c	c	c	c	b	<0.01[d]	b	<0.01[d]	c	c	c	c
	24-hour	3.3	b	<0.01[d]	c	c	c	c	c	c	c	c	b	<0.01[d]
	8-hour	23.8	c	c	b	<0.01[d]	c	c	c	c	20	20	c	c
	30-minute	50	c	c	c	c	c	c	b	0.01[d]	c	c	c	c

Table 4.3.2.3–1. Estimated Operational Concentrations of Pollutants and Comparison With Most Stringent Regulations or Guidelines—Plutonium Conversion Facility and No Action Alternative—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guideline[a] (μg/m^3)	Hanford		NTS		INEL		Pantex		ORR		SRS	
			No Action (μg/m^3)	Total (μg/m^3)	No Action (μg/m^3)	Total (μg/m^3)	No Action (μg/m^3)	Total (μg/m^3)	No Action (μg/m^3)	Total (μg/m^3)	No Action (μg/m^3)	Total (μg/m^3)	No Action (μg/m^3)	Total (μg/m^3)
Hazardous and Other Toxic Compounds (continued)														
Trichloroethylene	Annual	0.077	b	<0.01[d]	c	c	0.00097	0.004	0.21	0.24	c	c	c	c
	24-hour	6,750	c	c	c	c	c	c	c	c	c	c	b	0.21[d]
	8-hour	6,405	c	c	b	0.06[d]	c	c	c	c	b	0.02[d]	c	c
	30-minute	1,350	c	c	c	c	c	c	51.1	54.69	c	c	c	c

[a] The more stringent of the Federal and State standards is presented for each averaging time.

[b] No sources of this pollutant have been identified.

[c] No State standard for indicated averaging time.

[d] The concentration represents the alternative contribution only.

[e] Ozone, as a criteria pollutant, is not directly emitted nor monitored by the sites. See Section 4.1.3 for discussion of ozone-related issues.

[f] At Hanford, the level is not to be exceeded more than twice in any seven consecutive days.

[g] 8-hour averaging time concentration was used.

Note: Total concentrations are based on site contribution, including concentrations from ongoing activities (No Action), and do not include the contribution from non-facility sources. Concentrations for other hazardous/toxic pollutants reported for No Action in Section 4.2 are unchanged for this alternative and are not shown here. Emission of unspecified cleaning solvents was not modeled.

Source: 40 CFR 50; ID DHW 1995a; ID DHW 1995b; LANL 1996c; NV DCNR 1995a; SC DHEC 1991a; SC DHEC 1992b; TN DEC 1994a; TN DHE 1991a; TX ACB 1987a; TX NRCC 1992a; TX NRCC 1995a; WA Ecology 1994a.

Nontraffic noise sources associated with operation of the Pu conversion facility include ventilation systems, cooling systems, and material handling equipment. These noise sources would be located at sufficient distance from offsite areas that the contribution to offsite noise levels would continue to be small. Due to the size of the sites, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may result in impacts such as disturbance of wildlife.

4.3.2.4 Water Resources

The construction and operation of a Pu conversion facility would affect water resources. Water resource requirements and discharges provided in Tables C.1.1.2–2, C.2.1.2–2, and E.3.2.2–1 were used to assess impacts to surface and groundwater. The discussion of impacts are provided for each site separately. Table 4.3.2.4–1 presents No Action surface and groundwater uses and discharges at each site, and the potential changes resulting from construction and operation of the Pu conversion facility.

Hanford Site

Surface Water. Surface water from the Columbia River would be used as the water source for construction and operation of the Pu conversion facility. During construction, water requirements would be approximately 2.4 million l/yr (0.6 million gal/yr), which would represent a 0.02-percent increase over the existing annual surface water withdrawal. This additional withdrawal would be negligible. During operation, water requirements would be approximately 80.5 million l/yr (21.2 million gal/yr), which would represent a 0.6-percent increase over the existing surface water withdrawal. This additional withdrawal would also be negligible.

[Text deleted.]

During construction of the Pu conversion facility, sanitary and other nonhazardous wastewater (2.4 million l/yr [0.6 million gal/yr]), would be generated and discharged to the existing wastewater treatment systems at the 200 Area. The effluents from this facility would be discharged to evaporation/infiltration ponds. During operation, approximately 15 million l/yr (4 million gal/yr) of sanitary and other wastewater would be discharged to this wastewater treatment system. This would represent a 6.1-percent increase in the wastewater discharged at Hanford. All discharges would be monitored to comply with discharge limits. No impacts to surface water are expected.

The Pu conversion facility would be located in the 200 Area which is above the 100-year, 500-year, and probable maximum flood boundaries; flooding from dam failures; and flooding from a landslide resulting in river blockage.

Groundwater. No groundwater would be used during construction or operation of the Pu conversion facility; therefore, there would be no impacts to groundwater availability. No wastewater would be discharged directly to groundwater; therefore, groundwater quality should not be affected. Treated wastewater discharged to evaporation/infiltration ponds that does not evaporate, however, could percolate downward into the groundwater. This water would be monitored before discharge to the ponds and would not be discharged until contaminant levels are within the limits specified. Impacts to groundwater quality are therefore not expected. In addition, other factors contributing to a lessening of potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Nevada Test Site

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with any of the proposed facilities; groundwater would be used as the water source for the Pu conversion facility. Therefore, there should be no impacts to surface water availability.

[Text deleted.]

During construction of the Pu conversion facility, sanitary wastewater (2.4 million l/yr [0.6 million gal/yr]), would be generated. During operation, a maximum of approximately 15 million l/yr (4 million gal/yr) of

Table 4.3.2.4–1. Potential Changes to Water Resources Resulting From the Plutonium Conversion Facility

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Water Source	Surface	Ground	Ground	Ground	Surface	Ground
No Action water requirements (million l/yr)	13,511	2,400	7,570	249	14,760	13,247
No Action wastewater discharge (million l/yr)	246	82	540	141	2,277	700
Construction						
Water Availability and Use						
Total water requirement (million l/yr)	2.4	2.4	2.4	2.4	2.4	2.4
Percent increase in projected water use[a]	0.02	0.1	0.03	1.0	0.02	0.02
Water Quality						
Total wastewater discharge (million l/yr)	2.4	2.4	2.4	2.4	2.4	2.4
Percent change in wastewater discharge[b]	1.0	2.9	0.4	1.7	0.1	0.3
Percent change in streamflow	neg	NA	NA	NA	0.005[c]	0.05[d]
Operation						
Water Availability and Use						
Total water requirement (million l/yr)	80.5	80.5	80.5	80.5	80.5	80.5
Percent increase in projected water use[e]	0.6	3.4	1.1	32.3	0.6	0.6
Water Quality						
Total wastewater discharge (million l/yr)	15	15	15	15	15	15
Percent change in wastewater discharge[f]	6.1	18.2	2.8	10.6	0.7	2.1
Percent change in streamflow	neg	NA	NA	NA	0.03[c]	0.3[d]

Table 4.3.2.4–1. Potential Changes to Water Resources Resulting From the Plutonium Conversion Facility—Continued

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Floodplain						
Is action in 100-year floodplain?	No	No	No	No	No	No
Is critical action in 500-year floodplain?	No	Uncertain	Uncertain	No	No	Unlikely

[a] Percent increases in water requirements during construction of a Pu conversion facility are calculated by dividing water requirements for the facility (2.4 million l/yr) with that for No Action water requirements at each site: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 l/yr).

[b] Percent increases in wastewater discharged during construction of a Pu conversion facility are calculated by dividing waste water discharges for the facility (2.4 million l/yr) with that for No Action water discharges at each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

[c] Percent changes in stream flow from wastewater discharges are calculated from the average flow of Clinch River (132 m^3/s) and East Fork Poplar Creek (1.5 m^3/s). The comparison for the East Fork Poplar Creek is shown in the table.

[d] Percent changes in stream flow from wastewater discharge are calculated from the minimum flow of the Fourmile Branch (0.16 m^3/s).

[e] Percent increases in water requirements during operation of a Pu conversion facility are calculated by dividing water requirements for the facility (80.5 million l/yr) with that for No Action water requirements at each site: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

[f] Percent increases in wastewater discharged during operation of a Pu conversion facility are calculated by dividing wastewater discharges for the facility (15.0 million l/yr) with that for No Action discharges at each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

Note: NA=not applicable; neg=negligible. Construction impacts are considered to be temporary, lasting only throughout the construction period. Impacts from operations would occur continuously.

Source: HF 1995a:1; INEL 1995a:1; LANL 1996c; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; PX DOE 1995g; SRS 1995a:2.

sanitary and other wastewater would be discharged to a new wastewater treatment system. After treatment, all wastewater generated during construction and operation would be available for recycle.

Because there are no continuously flowing streams on NTS and no designated floodplains, there are no studies to assess the 500-year floodplain boundaries. Studies of the 100-year floodplain have shown it to be confined to the Jackass Flats and Frenchman Lake area. The site for the Pu conversion facility is not located in either of these areas. However, since the NTS is in a region where most flooding occurs from locally intense thunderstorms that can create brief (less than 6 hours) flash floods, the facility would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater. The Lower and Upper Carbonate, the Volcanic, and the Valley-Fill Aquifers are the sources of water for operations at NTS.

Water requirements for construction of the proposed facilities (2.4 million l/yr [0.6 million gal/yr]), represent approximately 0.006 percent of the minimum estimated annual recharge to the regional aquifer under the entire NTS. This is based on several recent studies that estimated that recharge would be 38 to 57 billion l (10 to 15 billion gal). As shown in Table 4.3.2.4–1, the quantity of water required for construction of the proposed facilities represents approximately a 0.1-percent increase over the total projected No Action groundwater usage. Withdrawal of this additional quantity should have minimal impact on groundwater availability. Operating the proposed facilities at NTS would require 80.5 million l/yr (21.2 million gal/yr) of water, which is approximately 3.4 percent of the projected groundwater usage. This additional withdrawal represents less than 0.2 percent of the estimated minimum annual recharge. No impacts are expected.

Construction and operation of the Pu conversion facility would not result in direct discharges to groundwater. Treated wastewater discharged to disposal ponds, however, could percolate downward toward the groundwater of the Valley-Fill Aquifer. This water would be monitored and would not be discharged until contaminant levels were within the limits specified. Impacts to groundwater quality are, therefore, not expected. In addition, other factors contributing to a lessening of potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Idaho National Engineering Laboratory

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the facility; groundwater would be used as the water source for the Pu conversion facility. Therefore, there should be no impacts to surface water availability.

[Text deleted.]

During construction of the Pu conversion facility, sanitary wastewater (2.4 million l/yr [0.6 million gal]), would be generated and discharged to the existing wastewater treatment system at the ICPP Area. This amount would represent a 0.4-percent increase in the effluent discharged at INEL. During operation, approximately 15 million l/yr (4 million gal/yr) of sanitary and other wastewater would be discharged to this wastewater treatment system. This amount represents a 2.8-percent increase in INEL's effluent. After treatment, all wastewater generated during construction and operation would be available to recycle or would then be allowed to evaporate to the atmosphere and/or infiltrate to the subsurface. All discharges would be monitored to comply with discharge limits.

The site for the Pu conversion facility is not located in an area historically prone to flooding, but is within the flood zone that could occur as a result of the failure of the MacKay Dam during a maximum probable flood. This

flood event would be more critical than either the 100- or 500-year flood. Because INEL is in a region where flash floods could occur, the facility would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater from the Snake River Plain Aquifer. Construction water requirements for the Pu conversion facilities are small relative to INEL's total usage. Construction and operation water requirements for the facility (2.4 million l/yr [0.6 million gal/yr]), and 80.5 million l/yr (21.2 million gal/yr), respectively, represent 0.03- and 1.1-percent increases over the projected annual groundwater usage. These withdrawals would increase the total projected amount to be pumped at INEL to 17.6 percent of the total allotment during construction and 17.8 percent of the allotment during operation. As discussed in Section 3.4.4, a groundwater allotment not to exceed 43,000 million l/yr (11,360 million gal/yr), has been negotiated by DOE with the Idaho Department of Water Resources (DOE 1991c:4-73). These additional withdrawals should not impact groundwater availability.

Construction and operation of the proposed Pu conversion facility would not result in direct discharges to groundwater and would not be expected to contribute to existing near surface contamination. Treated wastewater that would be discharged to disposal ponds but does not evaporate, however, could percolate downward toward the groundwater of the Snake River Plain Aquifer. This water would be monitored and would not be discharged until contaminant levels were within the limits specified. Impacts to groundwater quality are, therefore, not expected. In addition, other factors contributing to a lessening of potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Pantex Plant

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the proposed facility; groundwater would be used as the water source for the Pu conversion facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the Pu conversion facility, sanitary wastewater (2.4 million l/yr [0.6 million gal/yr]), would be generated and discharged to the existing wastewater treatment systems north of Zone 12. During operation, approximately 15 million l/yr (4 million gal/yr) of sanitary wastewater and other wastewater would be discharged to either of these wastewater treatment systems. After treatment, all wastewater generated during construction and operation would be discharged to the playa lakes or would be available for recycle. In 1994, Pantex averaged approximately 1.4 million l/day (0.37 million gal/day) of wastewater discharged to the playas. This quantity is expected to decrease in the future. The expected quantity of additional wastewater potentially discharged to the playas during operation (0.04 million l/day [0.01 million gal/day]) should not cumulatively cause any exceedances of the monthly average limit of 2.46 million l/day (0.65 million gal/day).

The new Pu conversion facility would be located in Zone 12. Since no 100-year, 500-year, or standard project flood boundaries have been delineated in Zone 12, there would be no impacts to flood plains. However, flooding at the playas could occur due to the runoff associated with precipitation and ponding in local playas (LLNL 1988a:XVI).

Groundwater. All water required for construction and operation would be supplied from groundwater using the existing supply system or possibly reclaimed wastewater from the Hollywood Road Wastewater Treatment Plant. Construction water requirements for the Pu conversion facilities are small relative to the recoverable water in aquifer storage which for the year 2010 was estimated to be 287 trillion l (76 trillion gal) (PX WDB 1993a:1). As shown in Table 4.3.2.4–1, construction of the proposed Pu conversion facility would require 2.4 million l/yr (0.6 million gal/yr) of water, which represents approximately a 1.0-percent increase over the projected annual groundwater usage. [Text deleted.] Water required for operations (80.5 million l/yr [21.2 million gal/yr]) would increase projected water requirements by 32.3 percent. Previous studies have

shown that when the Amarillo City Well Field pumped 18.5 billion l/yr (4.9 billion gal/yr) from the Ogallala Aquifer, an average of 1.8-m/yr (5.9-ft/yr) decline in the water table occurred over a 10-yr period in the local well field area. This water level decline caused a shift in the groundwater flow direction beneath Pantex. Operating the proposed Pu conversion facility at Pantex would require 80.5 million l/yr (21.2 million gal/yr), resulting in a small drawdown representing 4.2 percent of the capacity of the groundwater system. Although this additional groundwater withdrawal would add to the existing decline in water levels of the Ogallala Aquifer, the estimated degree would not affect regional groundwater levels. The total site groundwater withdrawal including this facility would be 329 million l/yr (86.9 million gal/yr) which, because of expected cutbacks in other programs, would be 61 percent less than the 836 million l/yr (221 million gal/yr) currently being withdrawn from wells at Pantex.

Construction and operation of the proposed Pu conversion facility would not result in direct discharges to groundwater. Treated wastewater discharged to playas, however, could percolate downward into the groundwater of the near surface aquifer. This water would be monitored and would not be discharged until contaminant levels were within the limits specified by the TNRCC. [Text deleted.]

Although the expected drawdowns caused by withdrawing the water required for this alternative is small, the overall decline in groundwater levels in the Amarillo are is of concern. Possible groundwater conservation measures at Pantex that could be considered including decreasing research farm irrigation demands through dry farming, installing dripless faucets, and process water reuse. In addition, to alleviate some of the effects from pumping groundwater from the Ogallala Aquifer, the city of Amarillo is considering supplying treated wastewater to Pantex from the Hollywood Road Wastewater Treatment Plant for industrial use. However, details of this measure have not been determined.

Oak Ridge Reservation

Surface Water. Water required for construction and operation of the Pu conversion facility would be provided via existing distribution systems. The source of this water is the Clinch River and its tributaries. Water requirements during construction (2.4 million l/yr [0.6 million gal/yr]) and operation (80.5 million l/yr [21.2 million gal/yr]) would represent a 0.02-percent and 0.6-percent increase respectively in the projected annual surface water withdrawal. These additional water withdrawals from the Clinch River should cause negligible impacts to surface water availability.

During construction of the Pu conversion facility, sanitary wastewater (approximately 2.4 million l/yr [0.6 million gal/yr]) would be generated and discharged to the existing wastewater treatment system in the Y–12 area. This would cause a 0.1-percent increase in the effluent from this facility. During operation, a total of 15 million l/yr (3.9 million gal/yr) of wastewater would be generated by the new facilities. This would cause a 0.7-percent increase in the effluent discharged from the Y–12 area. All discharges would be monitored to comply with discharge requirements. Minimal impacts would be expected.

Since the potential site for the Pu conversion facility would be located outside both the 500- and 100-year floodplains, there would be no impacts to floodplains.

Groundwater. No groundwater would be used for any project-related water requirements and no wastewater would be discharged directly to groundwater; therefore, neither groundwater quality nor availability would be affected.

Savannah River Site

Surface Water. No surface water would be used for project requirements during construction and operation of the Pu conversion facility. [Text deleted.]

During construction of the Pu conversion facility, sanitary wastewater (2.4 million l/yr [0.6 million gal/yr]) would be generated and discharged to the sitewide wastewater treatment system, which would not require any modifications. This amount would represent a 0.3-percent increase in the estimated annual flow to this facility and could be handled within the existing capacity. During operation, a total of 15 million l/yr (3.9 million gal/yr) of wastewater would be generated by the new facility, representing a 2.1-percent increase. [Text deleted.]

The potential location of the Pu conversion facility would be located outside the 100-year floodplain. Information on the location of the 500-year floodplain at SRS is only available for a limited number of project areas. However, the Pu Conversion facility at SRS would not likely affect, or be affected by the 500-year floodplain of either the Fourmile Branch or Upper Three Runs Creek because the facility would be located at an elevation of about 91 m (300 ft) above MSL and is approximately 33 m (107 ft) and 64 m (210 ft) above these streams and at distances from these streams of 0.8 km (0.5 mi) to 1.5 km (0.94 mi), respectively. The maximum flow that has occurred on the Upper Three Runs Creek was in 1990, with a flow rate of about 58 m^3/s (2,040 ft^3/s). At that time the creek reached an elevation of almost 30 m (98 ft) above MSL (SR USGS 1996a:1). The elevations of the buildings in F-Area are more than 62 m (202 ft) above the highest flow elevation of the Upper Three Runs Creek. The maximum flow that has occurred on the Fourmile Branch was in 1991 with a rate of approximately 5 m^3/s (186 ft^3/s), and an elevation of about 61 m (199 ft) above MSL (SR USGS 1996a:1). Elevations of the buildings in F-Area are more than approximately 31 m (101 ft) higher than the maximum flow level that has occurred.

Groundwater. During construction, the quantity of water required would be approximately 2.4 million l/yr (0.6 million gal/yr), which would represent a 0.02-percent increase over the existing projected annual ground water withdrawal. During operation, water requirements would be approximately 80.5 million l/yr (21.2 million gal/yr), which would represent a 0.6-percent increase in ground water withdrawals. Minimal impacts to groundwater availability are expected.

No wastewater would be discharged directly to groundwater; therefore, groundwater quality would not be affected.

[Text deleted.]

4.3.2.5 Geology and Soils

This section describes the environmental impacts to the geologic and soil resource as related to the construction and operation of the Pu conversion facility. A Pu conversion facility, at any of the sites analyzed, would involve some ground-disturbing construction activities (36 ha [90 acres]) that would affect the soil erosion potential. The key factors affecting soil erosion potential are the amount of land disturbed and climate. The relative amount of annual precipitation (rainfall) is greater at ORR and SRS than Pantex, Hanford, INEL, and NTS. Combining these key factors together, the relative soil erosion potential for a site can be categorized as slight, moderate, or severe.

No apparent direct or indirect effects on the geologic resource are anticipated. Neither facility construction and operational activities nor site infrastructure improvements would restrict access to potential geologic resources.

The soil erosion potential from direct (facility construction) and indirect (site infrastructure improvements) impacts associated with construction and operational activities is low for Pantex, Hanford, INEL, and NTS. The soil erosion potential for ORR and SRS during construction and operational activities is moderate due primarily to the greater relative annual precipitation. Soil disturbance would occur primarily from ground-disturbing construction activities (foundation preparation) and associated building construction laydown areas that can expose the soil profile and lead to a possible increase in soil erosion as a result of wind and water action. Soil loss would depend on the frequency and severity of rain, wind (increases in wind velocity and duration increase potential soil erosion), and the size, location, and duration of ground-breaking activities with respect to local drainage and wind patterns.

Operational effects to the soil resource would be minimal assuming typical landscaping and ground cover improvements were employed. Net soil disturbance during operation would be considerably less than that during construction, because areas previously without ground cover would have some type of improvement (buildings, roads, and landscaping). Although erosion from stormwater runoff and wind action could occasionally occur during operation, it is anticipated to be minimal.

[Text deleted.]

4.3.2.6 Biological Resources

Construction of the Pu conversion facility would disturb 36 ha (90 acres) of land at each of the DOE sites analyzed. This includes areas on which plant facilities would be constructed, as well as areas to be used for construction laydown. Consultation with USFWS and State agencies would be conducted at the site-specific level as appropriate to avoid potential impacts to threatened and endangered species, and other protected species and habitat.

Hanford Site

It is assumed that the Pu conversion facility would be located west of the 200 East Area. Impacts to terrestrial resources, wetlands, aquatic resources, and threatened species are discussed below.

Terrestrial Resources. Construction and operation of the Pu conversion facility would result in the disturbance of terrestrial habitat equaling about 0.02 percent of Hanford. This includes areas on which plant facilities would be constructed as well as areas that would be revegetated following construction. Vegetation within the assumed site would be destroyed during land clearing operations. The facility location falls within the sagebrush/ cheatgrass or Sandberg's bluegrass community. Sagebrush communities are well represented on Hanford, but they are relatively uncommon regionally because of widespread conversion of shrub-steppe habitats to agriculture. Disturbed areas are generally recolonized by cheatgrass, a nonnative species, at the expense of native plants.

Construction of the Pu conversion facility would affect animal populations. Less mobile animals within the project area, such as reptiles and small mammals, would not be expected to survive. Construction activities and noise would cause larger mammals and birds in the construction and adjacent areas to move to similar habitat nearby. If the area to which they moved was below its carrying capacity, these animals would be expected to survive. However, if the area was already supporting the maximum number of individuals, the additional animals would compete for limited resources which could lead to habitat degradation and eventual loss of the excess population. Nests and young animals living within the assumed site may not survive. The site would be surveyed as necessary for the nests of migratory birds prior to construction. Areas disturbed by construction, but not occupied by facility structures, would be of minimal value to wildlife because they would be maintained as landscaped areas.

Activities associated with facility operations, such as noise and human presence, could affect wildlife living immediately adjacent to the Pu conversion facility. These disturbances may cause some species to move from the area. Disturbance to wildlife living adjacent to the facility would be minimized by preventing workers from entering undisturbed areas.

Wetlands. Construction and operation of the Pu conversion facility would not affect wetlands since no wetlands exist near the assumed facility location. Since water would be withdrawn from the Columbia River through an existing intake structure and wastewater would be discharged to evaporation/infiltration ponds, wetlands would not be affected by placement of intake and discharge structures.

Aquatic Resources. Construction of a Pu conversion facility at Hanford would not impact aquatic resources since there are no surface water bodies near the assumed facility location. During both construction and operation, water would be withdrawn from the Columbia River through an existing intake structure so impacts to aquatic resources from impingement and entertainment would be minimal. Since the volume of water included represents a small percentage of the flow of the river, flow-related impacts to aquatic resources would be minimal. Wastewater would be discharged to evaporation/infiltration ponds; therefore, aquatic resources would not be affected.

Threatened and Endangered Species. It is unlikely that federally listed threatened and endangered species would be affected by construction and operation of the Pu conversion facility; however, sagebrush habitat would be disturbed. The sagebrush community is important nesting/breeding and foraging habitat for several State-listed and candidate species such as the ferruginous hawk, loggerhead shrike, western burrowing owl, pygmy rabbit, western sage grouse, sage sparrow, and sage thrasher. Preactivity surveys would be conducted as appropriate prior to construction to determine the occurrence of plant species or animal species in the area to be disturbed.

Nevada Test Site

It is assumed that the Pu conversion facility would be located in the Frenchman Flat area of NTS. Impacts to terrestrial resources, wetlands, aquatic resources, and threatened species are described below.

Terrestrial Resources. Construction and operation of the Pu conversion facility at NTS would result in the disturbance of terrestrial resources equaling about 0.01 percent of NTS. This includes areas on which plant facilities would be constructed as well as areas that would be revegetated following construction. Vegetative cover within the assumed facility location, which is primarily creosote bush (Figure 3.3.6–1), would be destroyed during land clearing operations. Creosote bush communities are well represented on NTS.

Construction of the Pu conversion facility would affect animal populations. Less mobile animals, such as reptiles and small mammals, within the project area would not be expected to survive. Construction activities and noise would cause larger mammals and birds in the construction and adjacent areas to move to similar habitat nearby. If the area to which they moved was below its carrying capacity, these animals would be expected to survive. However, if the area was already supporting the maximum number of individuals, the additional animals would compete for limited resources which could lead to habitat degradation and eventual loss of the excess population. Nests and young animals living within the assumed site may not survive. The site would be surveyed as necessary for the nests of migratory birds prior to construction. Areas disturbed by construction, but not occupied by facility structures, would be of minimal value to wildlife because of the difficulty in establishing vegetative cover in a desert environment.

Activities associated with operation, such as noise and human presence, could affect wildlife living immediately adjacent to the facility. These disturbances may cause some species to move from the area. Disturbance to wildlife living adjacent to the facility would be minimized by preventing workers from entering undisturbed areas.

Wetlands. Construction and operation of the Pu conversion facility would not affect wetlands because there are no wetlands near the assumed facility location.

Aquatic Resources. Construction and operation of the Pu conversion facility would not affect aquatic resources because there are no permanent surface water bodies near the facility location.

Threatened and Endangered Species. The threatened desert tortoise is a federally listed species that could be affected by construction of the Pu conversion facility at NTS. Construction activities such as land clearing operations, trenches, and excavation could pose a threat to any tortoises residing within the disturbed area. An increase in vehicular traffic is an additional hazard to the tortoise. Measures designed to avoid impacts to the desert tortoise from previous projects at NTS have been implemented as a result of a Biological Opinion issued by the USFWS (NT DOI 1992b:8-15). Recommended mitigation measures included providing worker training, putting restrictions on vehicle speeds and off-road movement, conducting clearance surveys prior to surface disturbance, approving stop work authority if tortoises are found within work areas, removing tortoises from roadways and work areas, placing permanent and temporary tortoise proof fencing around trenches, landfills, and treatment ponds, inspecting trenches, and having biologists survey when heavy equipment is in use. The

USFWS would be consulted, and USFWS recommendations would be implemented if NTS were selected as the location for the Pu conversion facility.

[Text deleted.]

Any listed plant species (Table 3.3.6–1) located within the construction area would be lost during land-clearing activities. Preactivity surveys would be conducted as appropriate prior to construction to determine the occurrence of these species in the area to be disturbed.

During facility operation, vehicular traffic would pose a hazard to the desert tortoise similar to the hazard caused by current traffic. Extensive measures, including personnel training, are presently being taken to ensure that drivers on the NTS avoid the tortoise. [Text deleted.] Groundwater levels in Devils Hole cavern are not expected to change due to operation of the Pu conversion facility (Section 4.3.2.4); therefore, impacts to the Devils Hole pupfish are not expected. Similarly, other rare endemic aquatic species found in the Ash Meadows area would not be affected.

Idaho National Engineering Laboratory

It is assumed that the Pu conversion facility would be constructed within an undeveloped portion of the ICPP area. The ICPP area falls within the big sagebrush/thickspike wheatgrass/needle-and-thread grass community. Impacts to wildlife would be limited to smaller mammals and some birds and reptiles which could be displaced or suffer mortality. Larger mammals are excluded from the assumed facility location by the perimeter fence and thus would not be impacted. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the area would have already adapted to similar disturbances. Due to the lack of wetlands or aquatic resources near the assumed facility location, these resources would not be affected by construction or operation of the Pu conversion facility. Since the new facility would be located within the ICPP security area, impacts to threatened and endangered species would not be expected since they are not present at the ICPP.

Pantex Plant

It is assumed that the Pu conversion facility would be located within Zone 12 which is a developed area that lacks natural vegetation. Disturbance to wildlife would be limited due to the disturbed nature of the assumed facility location; however, small mammals and some birds and reptiles could be displaced by construction. Since the area does not contain any wetlands or aquatic resources, these resources would not be affected by construction of the Pu conversion facility. During operation, wastewater would be discharged to a site playa through an NPDES-regulated outfall. The additional wastewater could lead to a minor increase in open water near the outfall, as well as a slight change in plant species composition. No federally listed threatened or endangered species would be affected by construction or operation of the Pu conversion facility. Although the assumed facility location has been disturbed, it is possible that the State-listed Texas horned lizard could be present. Preactivity surveys would be conducted as appropriate prior to construction.

Oak Ridge Reservation

It is assumed that the Pu conversion facility would be constructed on a disturbed area within Y–12. Impacts to terrestrial resources would be minimal. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to Y–12 would have already adapted to similar disturbance. There would be no direct impacts to wetlands or aquatic resources from construction of the facility. Secondary impacts from stormwater runoff would be controlled by implementation of a soil erosion and sediment control plan. Operational impacts to wetlands and aquatic resources would be minimal since water would be taken from existing sources and discharged via NPDES permitted outfalls and would involve minor volumes. Construction and operation of the Pu conversion facility would not be expected

to impact threatened and endangered species due to the developed nature of the assumed facility location. Impacts to the Tennessee dace (State deemed in need of management) would not be expected since erosion would be controlled and discharges would be through permitted outfalls.

Savannah River Site

It is assumed that the Pu conversion facility would be constructed within the F-Area, which is one of the highly developed industrial areas of the SRS. Impacts to terrestrial resources would be minimal. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the F-Area would have already adapted to similar disturbances. There would be no direct impacts to wetlands or aquatic resources from construction of the facility. Secondary impacts from stormwater runoff would be controlled by implementation of a soil erosion and sediment control plan. Operational impacts to wetlands and aquatic resources would be minimal since minor volumes of water would be taken from existing sources and discharged via NPDES-permitted outflows. Impacts from construction and operation of the Pu conversion facility would not be expected to impact threatened and endangered species due to the developed nature of the assumed facility location. Although suitable foraging habitat for the red-cockaded woodpecker exists in the area, the woodpecker colonies are located far enough from the site that this species would not be directly affected by this action.

4.3.2.7 Cultural and Paleontological Resources

This section discusses potential impacts to cultural and paleontological resources that may result from the construction and operation of the Pu conversion facility at each of the representative sites analyzed. The total land disturbance for this facility is 36 ha (90 acres) during construction, of which 28 ha (70 acres) would be used during operation. A 1.6-km (1-mi) reduced-access buffer zone would be created around the facility, except ORR which would have a reduced buffer zone at the site. The buffer zone would be contained within existing boundaries at all sites. For the discussion of impacts, the term cultural resources includes prehistoric, historic, and Native American resources. Cultural and paleontological resources at the representative sites may be affected directly through ground disturbance during construction, building modification, visual intrusion of the project to the historic setting or environmental context of historic sites, visual and audio intrusions to Native American resources, reduced access to traditional use areas, and unauthorized artifact collecting and vandalism.

Hanford Site

The facility would be constructed west of the 200 East Area. Although no archaeological resources were identified during surveys conducted in the adjacent 200 Areas, some may exist in the project area. Any such sites may be identified through additional surveys. Any identified sites would be avoided. Operation would not result in additional impact.

Although all of Hanford is considered sacred land by some Native American groups, no areas of great cultural significance have been identified close to the 200 Areas. Resources may be identified through project-specific consultation. Impacts from construction and operation may include reduced access to traditional use areas or visual or auditory intrusion into sacred or ceremonial space.

Pliocene and Pleistocene fossil remains have been discovered at Hanford. Although none have been recorded in the project area, they may exist. These resources may be affected by ground disturbing construction. Operation would not have an additional impact on paleontological resources.

Nevada Test Site

The Pu conversion facility would be constructed in Area 6, near the DAF on Frenchman Flat. In 1984, a Class III cultural resources survey was conducted across the 660-ha (1,610-acre) DAF site and no NRHP-eligible sites were identified. Although no resources were identified within the DAF project area, Frenchman Flat contains 49 sites which have been determined eligible for inclusion on the NRHP. Recorded prehistoric sites within Frenchman Flat include base and temporary camps, quarries, and lithic reduction areas. Identified historic resources include sites associated with nuclear testing and research. Additional unsurveyed lands necessary for the proposed facility may contain similar prehistoric or historic resources. Impacts to resources would occur during construction, but not the operation, of the facility.

The CGTO conducted surveys over portions of Frenchman Flat and has identified at least 20 plant species of importance to Native Americans there. Additional project-specific consultations would be necessary to identify impacts to Native American resources resulting from the construction and operation of the facility. Potential impacts may include reduced access to traditional use areas and visual or auditory intrusions to sacred space.

Although none have been identified to date, Quaternary deposits containing scientifically valuable paleontological remains may occur in the area to be disturbed during construction. Such remains have been found near NTS. Paleontological resources may be affected by construction, but not operation, of the facility.

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The Pu conversion facility would be constructed within the existing ICPP security area. The facility would be sited in a location previously approved for the construction of the Special Isotope Separation Project. An associated surface survey identified no sites within the proposed project area. Although it is possible, the ICPP is unlikely to contain intact subsurface cultural deposits due to prior ground disturbance and environmental setting. INEL has a contingency plan in place should any archaeological remains be discovered during construction. Two historic sites occur adjacent to the ICPP—one historic can scatter across the Big Lost River, to the northeast, and one abandoned homestead to the east. The can scatter is not considered eligible for NRHP listing and the homestead has been fenced off for protection. Construction and operation are not expected to affect either site.

Native American resources may be affected by the proposed action. Facility construction and operation may have a visual or auditory impact on traditional use areas or sacred sites. Resources may be identified through consultation with the interested tribes.

Some paleontological resources may be encountered during construction. The ICPP lies on alluvial gravels associated with the Big Lost River floodplain which have produced fossilized remains. Operation would not have an effect on paleontological resources.

Pantex Plant

The Pu conversion facility would be constructed in Zone 12. A surface survey of the plant was completed in 1981. No prehistoric or historic resources were identified in Zone 12 except for 12 remaining World War II Era structures, some of which may be potentially NRHP eligible. Although it is possible that subsurface remains exist within Pantex boundaries, Zone 12 is disturbed and probably does not contain any intact archaeological sites. Consequently, impacts to prehistoric and historic resources are not anticipated. [Text deleted.] Should any resources be discovered during testing or construction, mitigation measures would be taken in consultation with the Texas SHPO. Operation of the facility would not result in additional impacts to prehistoric or historic resources.

DOE has initiated a public outreach program to involve Native American groups in decision-making related to land use and cultural resources. Native American resources such as cemeteries may be affected by new construction. Facility operation may have an auditory or visual impact on sacred or ceremonial sites. To date, none of the Native American tribes known to have traditional interest in Pantex lands have identified any resources in Zone 12. Some may be identified through additional consultation.

Important paleontological remains such as bison and camel bones have been found in other areas of the High Plains. It is possible that some of the land to be affected by construction may contain fossilized remains. Operation would not affect paleontological resources because it does not involve additional ground disturbance.

Oak Ridge Reservation

The facility would be constructed within Y–12. Because most of Y–12 is already developed or disturbed, construction and operation would not affect prehistoric or historic sites. No Native American resources have been identified at Y–12, so impacts to these resources are not expected to result from the construction or operation of the proposed facility. Paleontological resources at ORR include common invertebrate fossils with relatively low research potential, so any impacts to them would be considered negligible.

Savannah River Site

The location for the Pu conversion facility is on open space within F-Area. Portions of F-Area have been surveyed and contain sites potentially eligible for the NRHP. Additional surveys would be conducted in any unsurveyed areas to be disturbed by construction. Site types known to occur at SRS include remains of prehistoric base camps, quarries, and workshops. Historic resources include remains of farmsteads, cemeteries, churches, and schools. Resources such as these may be affected by facility construction, but not operation.

Some Native American resources may be affected by the proposed action. Resources such as prehistoric sites, cemeteries, and traditional plants could be affected by construction. Facility operation could result in reduced access to traditional use areas or sacred space. Visual or auditory intrusions to such areas may also result. Any resources would be identified through consultation with the potentially affected tribes.

No scientifically valuable fossil remains have been recorded at SRS to date. Facility construction and operation are not expected to affect paleontological resources.

[Text deleted.]

4.3.2.8 Socioeconomics

This section analyzes the socioeconomic effects of the Pu conversion facility for each of the candidate sites. Only the sites with the greatest socioeconomic effects are discussed. The effects at all candidate sites are found in the Supplemental Socioeconomic Data Report (Socio 1996a).

Regional Economy Characteristics. Constructing a Pu conversion facility at any of the sites analyzed would generate employment and income increases within the affected REA. Constructing the facility would require 358 workers during the peak year of construction at any site. The largest increase in regional employment (less than 1 percent) among the sites analyzed would be at INEL. A total of 727 new jobs (358 direct and 369 indirect) would be generated and regional unemployment would fall from 5.4 percent to 4.9 percent. The largest increase in regional per capita income would also occur at INEL during the construction of the facility, but the increase would be much less than 1 percent over No Action (Socio 1996a).

Operating the facility would generate greater socioeconomic changes than would construction, due to the larger, more permanent workforce. A workforce of 883 would be required for full operation at any site. Implementing the alternative at INEL would generate the largest changes in regional employment (about 2 percent) and per capita income (about 1 percent). A total of 3,251 new jobs (883 direct and 2,368 indirect) would be created by the operational activities, and INEL regional unemployment would fall to 3.7 percent (Socio 1996a).

Population and Housing. At all of the sites analyzed, construction employment requirements would be met by the available resident labor force, but some in-migrating workers would be needed to fill more specialized positions during operations. Locating the facility at Pantex would induce the largest population increase among the sites analyzed. However, project-related immigration would increase the ROI population by only about 1 percent over No Action population projections. Housing units, in excess of existing vacancies, may be required at all of the sites analyzed, except NTS and ORR, to accommodate the population growth. The greatest increase would occur in the INEL ROI, but this would be less than 1 percent over No Action projections. Historic housing construction rates indicate that there would be sufficient housing units available to accommodate the population growth at all of the sites analyzed (Socio 1996a).

Community Services. During construction, there would be minimal impacts to community services in the ROIs of any of the sites analyzed. However, operation of the facility would slightly increase the demand for community services. The effects of population growth due to in-migrating workers during operations would be minor at all sites analyzed. The following discussion focuses on the Pantex and INEL ROIs, which would experience the greatest increases in demand for community services.

To maintain the No Action student-to-teacher ratio of 16.3:1 in the Pantex ROI, 19 new teachers would be needed during operation of the proposed facility. The increase in teacher requirements, however, would be distributed over several school districts in the ROI; therefore, no single school district would be significantly affected (Socio 1996a).

To maintain the No Action service level of 1.6 sworn police officers per 1,000 persons in the INEL ROI, 2 new officers would be needed. Four additional firefighters would be required to sustain the No Action service level of 2.3 firefighters per 1,000 persons in the Pantex ROI (Socio 1996a).

Projected hospital occupancy rates would increase slightly over No Action levels. However, projected capacities would be capable of accommodating these small increases in patient load. To maintain the No Action service level of 2.0 physicians per 1,000 persons, 3 additional physicians would be needed in the Pantex ROI during full operation (Socio 1996a).

Local Transportation. Traffic generated from construction of the Pu conversion facility would not affect the level of service on the local road segments analyzed at any of the sites. However, traffic generated during

operations at INEL would cause a drop in the level of service on one road segment. U.S. 20/26 from U.S. 26 East to ID 22/33 would drop from level of service B to C (Socio 1996a).

4.3.2.9 Public and Occupational Health and Safety

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the Pu conversion facility, whose activities are common to Pu disposition alternatives. The section first describes the impacts from normal facility operation at each potential site followed by a description of impacts from facility accidents.

Summaries of the radiological impacts to the public and to workers associated with normal operation are presented in Tables 4.3.2.9–1 and 4.3.2.9–2, respectively. Impacts from hazardous chemicals to these same groups are given in Table 4.3.2.9–3. Summaries of impacts associated with postulated accidents are given in Tables 4.3.2.9–4 through 4.3.2.9–9. Detailed results are presented in Section M.

Normal Operation. There would be no radiological releases associated with the construction of a new Pu conversion facility at any of the sites. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment and also direct in-plant exposures. The resulting doses and potential health effects to the public and workers at each site are described below.

Radiological Impacts. Radiological impacts to the average and maximally exposed members of the public resulting from the normal operation of the new Pu conversion facility at each of the sites are presented in Table 4.3.2.9–1. The impacts from all site operations, including the new Pu conversion facility, are also given. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

The doses to the maximally exposed member of the public from annual Pu conversion facility operation would range from 9.5×10^{-5} mrem at NTS site to 9.2×10^{-3} mrem at ORR. From 10 years of operation, the corresponding risks of fatal cancer to this individual would range from 4.8×10^{-10} to 4.6×10^{-8}. The impacts to the average individual would be less. As a result of annual facility operation, the population doses would range from 1.9×10^{-4} person-rem at NTS site to 0.074 person-rem at ORR. The corresponding numbers of fatal cancers in these populations from 10 years of operation would range from 9.5×10^{-7} to 3.7×10^{-4}.

The doses to the maximally exposed member of the public from annual total site operations are all within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would range from 7.0×10^{-4} mrem at Pantex to 3.2 mrem at ORR. From 10 years of operation, the corresponding risks of fatal cancers to this individual would range from 3.5×10^{-9} to 1.6×10^{-5}. The impacts to the average individual would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of annual total site operation, the population doses would be within the limit given in proposed 10 CFR 834, and would range from 3.9×10^{-3} person-rem at NTS to 44 person-rem at SRS. The corresponding numbers of fatal cancers in these populations from 10 years of operation would range from 2.0×10^{-5} to 0.22.

Doses to onsite workers from normal operations are given in Table 4.3.2.9–2. Included are involved workers directly associated with the new Pu conversion facility, workers who are not involved with the Pu conversion facility, and the entire workforce at each site. All doses fall within regulatory limits.

The annual dose to Pu conversion facility workers is site-independent and would be 233 mrem to the average facility worker and 133 person-rem to the entire facility workforce. The annual dose to the average noninvolved worker would range from 2.6 mrem at ORR to 32 mrem at SRS. The annual total dose to all noninvolved workers would range from 3.0 person-rem at the NTS site to 250 person-rem at the Hanford site. The annual

Table 4.3.2.9–1. Potential Radiological Impacts to the Public During Normal Operation of the Plutonium Conversion Facility

Receptor	Hanford		NTS		INEL		Pantex		ORR		SRS	
	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]	Facility	Total Site[a]
Annual Dose to the Maximally Exposed Individual Member of the Public[b]												
Atmospheric release pathway (mrem)	1.8×10^{-4}	4.4×10^{-3}	9.5×10^{-5}	4.2×10^{-3}	1.2×10^{-4}	0.018	6.9×10^{-4}	7.0×10^{-4}	9.2×10^{-3}	1.5	1.0×10^{-3}	0.42
Drinking water pathway (mrem)	0	0	0	0	0	0	0	0	0	0.1	0	0.081
Total liquid release pathway (mrem)	0	9.5×10^{-4}	0	0	0	0	0	0	0	1.7	0	0.37
Atmospheric and liquid release pathways combined (mrem)	1.8×10^{-4}	5.4×10^{-3}	9.5×10^{-5}	4.2×10^{-3}	1.2×10^{-4}	0.018	6.9×10^{-4}	7.0×10^{-4}	9.2×10^{-3}	3.2	1.0×10^{-3}	0.79
Percent of natural background[c]	6.0×10^{-5}	1.8×10^{-3}	3.0×10^{-5}	1.3×10^{-3}	3.6×10^{-5}	5.3×10^{-3}	2.1×10^{-4}	2.1×10^{-4}	3.1×10^{-3}	1.1	3.4×10^{-4}	0.27
10-year fatal cancer risk	9.0×10^{-10}	2.7×10^{-8}	4.8×10^{-10}	2.1×10^{-8}	6.0×10^{-10}	8.9×10^{-8}	3.5×10^{-9}	3.5×10^{-9}	4.6×10^{-8}	1.6×10^{-5}	5.0×10^{-9}	4.0×10^{-6}
[Text deleted.]												
Annual Population Dose Within 80 Kilometers[d]												
From atmospheric release pathway (person-rem)	8.4×10^{-3}	0.47	1.9×10^{-4}	3.9×10^{-3}	1.2×10^{-3}	2.4	3.8×10^{-3}	4.1×10^{-3}	0.074	29	0.066	41
From total liquid release pathway (person-rem)	0	1.1	0	0	0	0	0	0	0	4.7	0	3.6
From atmospheric and liquid release pathways combined (person-rem)	8.4×10^{-3}	1.6	1.9×10^{-4}	3.9×10^{-3}	1.2×10^{-3}	2.4	3.8×10^{-3}	4.1×10^{-3}	0.074	34	0.066	44
Percent of natural background[c]	4.5×10^{-6}	8.4×10^{-4}	2.1×10^{-6}	4.2×10^{-5}	1.3×10^{-6}	2.7×10^{-3}	3.3×10^{-6}	3.5×10^{-6}	2.0×10^{-5}	9.0×10^{-3}	2.5×10^{-5}	0.017
10-year fatal cancers	4.2×10^{-5}	7.8×10^{-3}	9.5×10^{-7}	2.0×10^{-5}	6.0×10^{-6}	0.012	1.9×10^{-5}	2.0×10^{-5}	3.7×10^{-4}	0.17	3.3×10^{-4}	0.22
[Text deleted.]												

Table 4.3.2.9–1. Potential Radiological Impacts to the Public During Normal Operation of the Plutonium Conversion Facility—Continued

	Hanford		NTS		INEL		Pantex		ORR		SRS	
Receptor	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**	**Facility**	**Total Site[a]**
Annual Dose to the Average Individual Within 80 Kilometers[e]												
Atmospheric and liquid release pathways combined (mrem)	$1.4x10^{-5}$	$2.6x10^{-3}$	$6.5x10^{-6}$	$1.3x10^{-4}$	$4.5x10^{-6}$	$8.9x10^{-3}$	$1.1x10^{-5}$	$1.2x10^{-5}$	$5.8x10^{-5}$	0.026	$7.4x10^{-5}$	0.049
10-year fatal cancer risk	$6.8x10^{-11}$	$1.3x10^{-8}$	$3.2x10^{-11}$	$6.6x10^{-10}$	$2.2x10^{-11}$	$4.5x10^{-8}$	$5.5x10^{-11}$	$6.0x10^{-11}$	$2.9x10^{-10}$	$1.3x10^{-7}$	$3.7x10^{-10}$	$2.5x10^{-7}$
[Text deleted.]												

[a] Includes impacts from No Action facilities (refer to Sections 4.2.1.9 through 4.2.6.9). The location of the MEI may be different under No Action than for operation of the new Pu conversion facility. Therefore, the impacts may not be directly additive.

[b] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem per year from the air pathways as required by NESHAPS (40 CFR 61, Subpart H) under the CAA; 4 mrem per year from the drinking water pathway as required by the SDWA, and 100 mrem per year from all pathways combined. Refer to DOE Order 5400.5.

[c] The annual natural background radiation levels: (1) Hanford: the average individual receives 300 mrem; the population within 80 km receives 186,400 person-rem, (2) NTS: the average individual receives 313 mrem; the population within 80 km receives 9,190 person-rem, (3) INEL: the average individual receives 338 mrem; the population within 80 km receives 90,800 person-rem, (4) Pantex: the average individual receives 334 mrem; the population within 80 km receives 116,900 person-rem, (5) ORR: the average individual receives 295 mrem; the population within 80 km receives 379,000 person-rem, (6) SRS: the average individual receives 298 mrem; the population within 80 km receives 266,000 person-rem.

[d] For DOE activities proposed 10 CFR 834 (see 58 FR 16268) would generally limit the potential annual population dose exceeds 100 person-rem from all pathways combined, and would require an ALARA program.

[Text deleted.]

[e] Obtained by dividing the population dose by the number of people projected to be living within the 80 km of the site (621,000 at Hanford; 29,400 at NTS; 269,000 at INEL; 350,000 at Pantex; 1,285,000 at ORR; and 893,000 at SRS).

Source: Section M.2.

Table 4.3.2.9–2. Potential Radiological Impacts to Workers During Normal Operation of the Plutonium Conversion Facility

Receptor	Hanford	NTS	INEL	Pantex	ORR	SRS
Involved Workforce[a]						
Average worker dose (mrem/yr)[b]	233	233	233	233	233	233
10-year risk of fatal cancer	9.3×10^{-4}	9.3×10^{-4}	9.3×10^{-4}	9.3×10^{-4}	9.3×10^{-4}	9.3×10^{-4}
[Text deleted.]						
Total dose (person-rem/yr)	133	133	133	133	133	133
10-year fatal cancers	0.53	0.53	0.53	0.53	0.53	0.53
[Text deleted.]						
Noninvolved Workforce[c]						
Average worker dose (mrem/yr)[b]	27	5.0	30	10	2.6	32
10-year risk of fatal cancer	1.1×10^{-4}	2.0×10^{-5}	1.2×10^{-4}	4.0×10^{-5}	1.0×10^{-5}	1.3×10^{-4}
[Text deleted.]						
Total dose (person-rem/yr)	250	3.0	220	14	44	226
10-year fatal cancers	1.0	0.012	0.88	0.056	0.18	1.9
[Text deleted.]						
Total Site Workforce[d]						
Dose (person-rem/yr)	383	136	353	147	177	359
10-year fatal cancers	1.5	0.54	1.4	0.59	0.71	1.4
[Text deleted.]						

[a] The involved worker is a worker associated with operations of the proposed action.

[b] The radiological limit for an individual worker is 5,000 mrem/year (10 CFR 835). However, DOE has also established an administrative control level of 2,000 mrem per year (DOE 1992t); the sites must make reasonable attempts to maintain worker doses below this level.

[c] The noninvolved worker is a worker onsite but not associated with operations of the proposed action. The noninvolved workforce is equivalent to the No Action workforce.

[d] The impact to the total site workforce is the summation of the involved worker impact and the noninvolved worker impact.

[Text deleted.]

Source: Section M.2.

dose to the total site workforce would range from 136 person-rem at the NTS site to 383 person-rem at Hanford. The risks and numbers of fatal cancers among the different workers from 10 years of operation are included in Table 4.3.2.9–2. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual fatal cancers calculated would be lower for the operation of this facility.

Hazardous Chemical Impacts. The hazardous chemical impacts from normal operation of the Pu conversion facility at several sites are presented in Table 4.3.2.9–3. Included are the impacts due to operation of the Pu stabilization and conversion facility, and the site's total hazardous chemical impact. The total site impacts are provided to demonstrate the estimated level of health effects expected, and the risk of cancer due to the total chemical exposures on each site. All supporting impact analyses are provided in Section M.3.

The HI to the MEI ranges from $4.3x10^{-6}$ at the NTS site to $6.2x10^{-4}$ at INEL due to the Pu conversion facility operation. The cancer risk from hazardous chemicals to the MEI ranges from $4.7x10^{-9}$ at NTS to $1.9x10^{-7}$ at ORR. The HI to the onsite worker ranges from $8.0x10^{-4}$ at Pantex to $3.3x10^{-3}$ at ORR, and the cancer risk to the onsite worker ranges from $7.2x10^{-6}$ at Pantex to $1.5x10^{-5}$ at the ORR site.

Facility Accidents. A set of potential accidents have been postulated for which there may be releases of Pu that may impact onsite workers and the offsite population. The accident consequences and risks to a worker located 1,000 m (3,280 ft) from the accident release point, the maximum offsite individual located at the site boundary, and the population located within 80 km (50 mi) of the accident release point are summarized in Tables 4.3.2.9–4 through 4.3.2.9–9 for the sites analyzed (Hanford, NTS, INEL Pantex, ORR, and SRS). In the event that the site boundary is less than 1,000 m (3,280 ft) from the accident release point, the worker is placed at the site boundary. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 1.6 at ORR for the oxyacetylene explosion in a process cell accident scenario with a probability of $1.0x10^{-7}$ per year. The corresponding 10-year facility lifetime risk from the same accident scenario for the population, maximum offsite individual, and worker at 1,000 m (3,280 ft), would be $1.6x10^{-6}$, $9.8x10^{-9}$, and $7.9x10^{-9}$, respectively. The maximum population 10-year facility lifetime risk would be $1.3x10^{-4}$ (that is, one fatality in about 7,500 years) at ORR for the fire on the loading dock accident scenario with a probability of $5.0x10^{-4}$ per year. The corresponding maximum offsite individual and worker 10-year facility lifetime risks would be $7.0x10^{-7}$ and $5.6x10^{-7}$, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Tables 4.3.2.9–4 through 4.3.2.9–9.

The location of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions, and criticality could cause fatalities to workers close to the accident. Prior to construction and operation of a new facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas to minimize the risk of injury or fatality in the event of an accident.

Aircraft Crash. The probability of an aircraft crash into a new disposition facility at Pantex will depend upon its specific location relative to the airport and airplane traffic patterns. In the future, there is the possibility that air traffic patterns may change and cause a change in the probability of a crash into a specific facility. [Text deleted.] A discussion of aircraft crash accidents for this PEIS is contained in Appendix R.

An indication of the magnitude of the impacts of an aircraft crash into a disposition facility is given by the earthquake scenario. The earthquake and aircraft crash scenarios are similar in that they both result in major structural damage and the release of plutonium directly to the environment. They differ in that an earthquake-induced fire is based on limited combustible materials while the aircraft crash has the potential for a major fuel related fire. Also, the earthquake has the potential for damage and release of hazardous materials throughout the

Table 4.3.2.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation of the Plutonium Conversion Facility

Receptor	Hanford Facility[a]	Hanford Total Site[b]	INEL Facility[a]	INEL Total Site[b]	NTS Facility[a]	NTS Total Site[b]	ORR Facility[a]	ORR Total Site[b]	Pantex Facility[a]	Pantex Total Site[b]	SRS Facility[a]	SRS Total Site[b]
Maximally Exposed Individual (Public)												
Hazard Index[c]	2.9×10^{-5}	9.1×10^{-5}	6.2×10^{-4}	0.015	4.3×10^{-6}	1.7×10^{-6}	3.3×10^{-4}	0.040	1.6×10^{-4}	5.8×10^{-3}	7.9×10^{-6}	5.2×10^{-3}
Cancer Risk[d]	3.2×10^{-8}	3.2×10^{-8}	6.8×10^{-8}	3.7×10^{-6}	4.7×10^{-9}	1.9×10^{-9}	1.9×10^{-7}	1.9×10^{-7}	1.8×10^{-7}	1.9×10^{-7}	8.7×10^{-9}	1.4×10^{-7}
Worker Onsite												
Hazard Index[e]	1.6×10^{-3}	5.6×10^{-3}	1.6×10^{-3}	0.23	8.3×10^{-4}	1.7×10^{-4}	3.3×10^{-3}	0.16	8.0×10^{-4}	6.9×10^{-3}	1.4×10^{-3}	1.2
Cancer Risk[f]	1.4×10^{-5}	1.4×10^{-5}	1.4×10^{-5}	7.8×10^{-4}	7.4×10^{-6}	7.4×10^{-6}	1.5×10^{-5}	1.5×10^{-5}	7.2×10^{-6}	7.7×10^{-6}	1.3×10^{-5}	2.1×10^{-4}

[a] Facility=contribution from the proposed new facility operation only.
[b] Total=includes the contributions from the No Action and the proposed new facility operation.
[c] Hazard Index for MEI=sum of individual Hazard Quotients (noncancer health effects) for MEI.
[d] Cancer Risk for MEI=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (Slope Factor).
[e] Hazard Index for workers=sum of individual Hazard Quotients (noncancer health effects) for workers.
[f] Cancer Risk for workers=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (Slope Factor).
Source: Section M.3, Tables M.3.4–34 through M.3.4–39.

Table 4.3.2.9–4. Plutonium Conversion Facility Accident Impacts at Hanford Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 10 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 10 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 10 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
Fire on the loading dock	$4.8x10^{-7}$	$9.7x10^{-5}$	$1.9x10^{-8}$	$3.8x10^{-6}$	$3.5x10^{-5}$	$7.0x10^{-3}$	$5.0x10^{-4}$
Fire in the process cell	$5.8x10^{-13}$	$5.8x10^{-10}$	$2.3x10^{-14}$	$2.3x10^{-11}$	$4.2x10^{-9}$	$4.2x10^{-6}$	$1.0x10^{-4}$
Deflagration inside a glovebox	$1.2x10^{-10}$	$1.2x10^{-7}$	$4.8x10^{-12}$	$4.8x10^{-9}$	$8.7x10^{-9}$	$8.7x10^{-6}$	$1.0x10^{-4}$
Forklift breach of containment	$9.2x10^{-17}$	$2.0x10^{-13}$	$3.7x10^{-18}$	$8.2x10^{-15}$	$6.7x10^{-15}$	$1.5x10^{-11}$	$4.5x10^{-5}$
Nuclear criticality	$2.1x10^{-13}$	$2.1x10^{-7}$	$8.4x10^{-15}$	$8.4x10^{-9}$	$1.7x10^{-12}$	$1.7x10^{-6}$	$1.0x10^{-7}$
Beyond evaluation basis fire in a process cell	$4.1x10^{-12}$	$4.1x10^{-6}$	$1.6x10^{-13}$	$1.6x10^{-7}$	$3.0x10^{-10}$	$3.0x10^{-4}$	$1.0x10^{-7}$
Oxyacetylene explosion in a process cell	$6.8.x10^{-9}$	$6.8x10^{-3}$	$2.4x10^{-10}$	$2.4x10^{-4}$	$4.4x10^{-7}$	0.44	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$3.1x10^{-9}$	$3.1x10^{-3}$	1.2x10-10	$1.2x10^{-4}$	$2.2x10^{-7}$	0.22	$1.0x10^{-7}$
Expected risk[d]	$4.9x10^{-7}$	–	$2.0x10^{-8}$	–	$3.6x10^{-5}$	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source term in Tables M.5.3.9.1–4 and M.5.3.9.1–5 and the MACCS computer code.

Table 4.3.2.9–5. Plutonium Conversion Facility Accident Impacts at Nevada Test Site

Accident Description	Worker at 1,000 m: Risk of Cancer Fatality (per 10 yr)[a]	Worker at 1,000 m: Probability of Cancer Fatality[b]	Maximum Offsite Individual: Risk of Cancer Fatality (per 10 yr)[a]	Maximum Offsite Individual: Probability of Cancer Fatality[b]	Population to 80 km: Risk of Cancer Fatalities (per 10 yr)[a]	Population to 80 km: Number of Cancer Fatalities[c]	Accident Frequency (per yr)
Fire on the loading dock	$3.3x10^{-7}$	$6.6x10^{-5}$	$7.6x10^{-9}$	$1.5x10^{-6}$	$7.9x10^{-7}$	$1.6x10^{-4}$	$5.0x10^{-4}$
Fire in the process cell	$4.0x10^{-13}$	$4.0x10^{-10}$	$9.1x10^{-15}$	$9.1x10^{-12}$	$9.5x10^{-13}$	$9.5x10^{-10}$	$1.0x10^{-4}$
Deflagration inside a glovebox	$8.2x10^{-11}$	$8.2x10^{-8}$	$1.9x10^{-12}$	$1.9x10^{-9}$	$2.0x10^{-10}$	$2.0x10^{-7}$	$1.0x10^{-4}$
Forklift breach of containment	$6.3x10^{-17}$	$1.4x10^{-13}$	$1.4x10^{-18}$	$3.2x10^{-15}$	$1.5x10^{-16}$	$3.4x10^{-13}$	$4.5x10^{-5}$
Nuclear criticality	$1.5x10^{-13}$	$1.5x10^{-7}$	$3.2x10^{-15}$	$3.2x10^{-9}$	$3.3x10^{-14}$	$3.3x10^{-8}$	$1.0x10^{-7}$
Beyond evaluation basis fire in a process cell	$2.8x10^{-12}$	$2.8x10^{-6}$	$6.4x10^{-14}$	$6.4x10^{-8}$	$6.7x10^{-12}$	$6.7x10^{-6}$	$1.0x10^{-7}$
Oxyacetylene explosion in a process cell	$4.5x10^{-9}$	$4.5x10^{-3}$	$9.4x10^{-11}$	$9.4x10^{-5}$	$9.9x10^{-9}$	$9.9x10^{-3}$	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$2.1x10^{-9}$	$2.1x10^{-3}$	$4.7x10^{-11}$	$4.7x10^{-5}$	$4.9x10^{-9}$	$4.9x10^{-3}$	$1.0x10^{-7}$
Expected risk[d]	$3.4x10^{-7}$	–	$7.7x10^{-9}$	–	$8.1x10^{-7}$	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source term in Tables M.5.3.9.1–4 and M.5.3.9.1–5 and the MACCS computer code.

Table 4.3.2.9–6. Plutonium Conversion Facility Accident Impacts at Idaho National Engineering Laboratory

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatalities (per 10 yr)[a]**	**Number of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Fire on the loading dock	$4.5x10^{-7}$	$9.0x10^{-5}$	$4.9x10^{-9}$	$9.7x10^{-7}$	$1.0x10^{-5}$	$2.1x10^{-3}$	$5.0x10^{-4}$
Fire in the process cell	$5.4x10^{-13}$	$5.4x10^{-10}$	$5.8x10^{-15}$	$5.8x10^{-12}$	$1.3x10^{-11}$	$1.3x10^{-8}$	$1.0x10^{-4}$
Deflagration inside a glovebox	$1.1x10^{-10}$	$1.1x10^{-7}$	$1.2x10^{-12}$	$1.2x10^{-9}$	$2.6x10^{-9}$	$2.6x10^{-6}$	$1.0x10^{-4}$
Forklift breach of containment	$8.6x10^{-17}$	$1.9x10^{-13}$	$9.3x10^{-19}$	$2.1x10^{-15}$	$2.0x10^{-15}$	$4.5x10^{-12}$	$4.5x10^{-5}$
Nuclear criticality	$2.0x10^{-13}$	$2.0x10^{-7}$	$1.9x10^{-15}$	$1.9x10^{-9}$	$4.3x10^{-13}$	$4.3x10^{-7}$	$1.0x10^{-7}$
Beyond evaluation basis fire in a process cell	$3.8x10^{-12}$	$3.8x10^{-6}$	$4.1x10^{-14}$	$4.1x10^{-8}$	$8.9x10^{-11}$	$8.9x10^{-5}$	$1.0x10^{-7}$
Oxyacetylene explosion in a process cell	$6.9x10^{-9}$	$6.9x10^{-3}$	$6.1x10^{-11}$	$6.1x10^{-5}$	$1.3x10^{-7}$	0.13	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$2.8x10^{-9}$	$2.8x10^{-3}$	$3.0x10^{-11}$	$3.0x10^{-5}$	$6.5x10^{-8}$	0.065	$1.0x10^{-7}$
Expected risk[d]	$4.6x10^{-7}$	–	$5.0x10^{-9}$	–	$1.1x10^{-5}$	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source term in Tables M.5.3.9.1–4 and M.5.3.9.1–5 and the MACCS computer code.

Table 4.3.2.9–7. Plutonium Conversion Facility Accident Impacts at Pantex Plant

Accident Description	Worker at 1,000 m: Risk of Cancer Fatality (per 10 yr)[a]	Worker at 1,000 m: Probability of Cancer Fatality[b]	Maximum Offsite Individual: Risk of Cancer Fatality (per 10 yr)[a]	Maximum Offsite Individual: Probability of Cancer Fatality[b]	Population to 80 km: Risk of Cancer Fatalities (per 10 yr)[a]	Population to 80 km: Number of Cancer Fatalities[c]	Accident Frequency (per yr)
Fire on the loading dock	1.9×10^{-7}	3.9×10^{-5}	7.7×10^{-8}	1.5×10^{-5}	1.2×10^{-5}	2.4×10^{-3}	5.0×10^{-4}
Fire in the process cell	2.3×10^{-13}	2.3×10^{-10}	9.3×10^{-14}	9.3×10^{-11}	1.4×10^{-11}	1.4×10^{-8}	1.0×10^{-4}
Deflagration inside a glovebox	4.8×10^{-11}	4.8×10^{-8}	1.9×10^{-11}	1.9×10^{-8}	3.0×10^{-9}	3.0×10^{-6}	1.0×10^{-4}
Forklift breach of containment	3.7×10^{-17}	8.2×10^{-14}	1.5×10^{-17}	3.3×10^{-14}	2.3×10^{-15}	5.1×10^{-12}	4.5×10^{-5}
Nuclear criticality	9.7×10^{-14}	9.7×10^{-8}	4.6×10^{-14}	4.6×10^{-8}	1.1×10^{-12}	1.1×10^{-6}	1.0×10^{-7}
Beyond evaluation basis fire in a process cell	1.6×10^{-12}	1.6×10^{-6}	6.6×10^{-13}	6.6×10^{-7}	1.0×10^{-10}	1.0×10^{-4}	1.0×10^{-7}
Oxyacetylene explosion in a process cell	2.5×10^{-9}	2.5×10^{-3}	9.7×10^{-10}	9.7×10^{-4}	1.5×10^{-7}	0.15	1.0×10^{-7}
Beyond evaluation basis earthquake	1.2×10^{-9}	1.2×10^{-3}	4.8×10^{-10}	4.8×10^{-4}	7.4×10^{-8}	0.074	1.0×10^{-7}
Expected risk[d]	2.0×10^{-7}	–	7.9×10^{-8}	–	1.2×10^{-5}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source term in Tables M.5.3.9.1–4 and M.5.3.9.1–5 and the MACCS computer code.

Table 4.3.2.9–8. Plutonium Conversion Facility Accident Impacts at Oak Ridge Reservation

Accident Description	Worker at 722 m		Maximum Offsite Individual		Population to 80 km		Accident Frequency (per yr)
	Risk of Cancer Fatality (per 10 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 10 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 10 yr)[a]	Number of Cancer Fatalities[c]	
Fire on the loading dock	5.6x10^{-7}	1.1x10^{-4}	7.0x10^{-7}	1.4x10^{-4}	1.3x10^{-4}	0.026	5.0x10^{-4}
Fire in the process cell	6.8x10^{-13}	6.8x10^{-10}	8.4x10^{-13}	8.4x10^{-10}	1.6x10^{-10}	1.6x10^{-7}	1.0x10^{-4}
Deflagration inside a glovebox	1.4x10^{-10}	1.4x10^{-7}	1.8x10^{-10}	1.8x10^{-7}	3.3x10^{-8}	3.3x10^{-5}	1.0x10^{-4}
Forklift breach of containment	1.1x10^{-16}	2.4x10^{-13}	1.3x10^{-16}	3.0x10^{-13}	2.5x10^{-14}	5.6x10^{-11}	4.5x10^{-5}
Nuclear criticality	2.4x10^{-13}	2.4x10^{-7}	3.0x10^{-13}	3.0x10^{-7}	1.8x10^{-11}	1.8x10^{-5}	1.0x10^{-7}
Beyond evaluation basis fire in a process cell	4.8x10^{-12}	4.8x10^{-6}	6.0x10^{-12}	6.0x10^{-6}	1.1x10^{-9}	1.1x10^{-3}	1.0x10^{-7}
Oxyacetylene explosion in a process cell	7.9x10^{-9}	7.9x10^{-3}	9.8x10^{-9}	9.8x10^{-3}	1.6x10^{-6}	1.6	1.0x10^{-7}
Beyond evaluation basis earthquake	3.5x10^{-9}	3.5x10^{-3}	4.4x10^{-9}	4.4x10^{-3}	8.2x10^{-7}	0.82	1.0x10^{-7}
Expected risk[d]	5.8x10^{-7}	–	7.2x10^{-7}	–	1.3x10^{-4}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 772 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary [772 m for the facility at ORR], whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source term in Tables M.5.3.9.1–4 and M.5.3.9.1–5 and the MACCS computer code.

Table 4.3.2.9–9. Plutonium Conversion Facility Accident Impacts at Savannah River Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality (per 10 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatalities (per 10 yr)[a]**	**Number of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
Fire on the loading dock	3.2x10^{-7}	6.3x10^{-5}	7.7x10^{-9}	1.5x10^{-6}	3.2x10^{-5}	7.5x10^{-3}	5.0x10^{-4}
Fire in the process cell	3.8x10^{-13}	3.8x10^{-10}	9.3x10^{-15}	9.3x10^{-12}	4.5x10^{-11}	4.5x10^{-8}	1.0x10^{-4}
Deflagration inside a glovebox	7.9x10^{-11}	7.9x10^{-8}	1.9x10^{-12}	1.9x10^{-9}	9.4x10^{-9}	9.4x10^{-6}	1.0x10^{-4}
Forklift breach of containment	6.0x10^{-17}	1.3x10^{-13}	1.5x10^{-18}	3.3x10^{-15}	7.2x10^{-15}	1.6x10^{-11}	4.5x10^{-5}
Nuclear criticality	1.4x10^{-13}	1.4x10^{-7}	2.8x10^{-15}	2.8x10^{-9}	2.3x10^{-12}	2.3x10^{-6}	1.0x10^{-7}
Beyond evaluation basis fire in a process cell	2.7x10^{-12}	2.7x10^{-6}	6.6x10^{-14}	6.6x10^{-8}	3.2x10^{-10}	3.2x10^{-4}	1.0x10^{-7}
Oxyacetylene explosion in a process cell	4.4x10^{-9}	4.4x10^{-3}	9.7x10^{-11}	9.7x10^{-5}	4.7x10^{-7}	0.47	1.0x10^{-7}
Beyond evaluation basis earthquake	2.1x10^{-9}	2.1x10^{-3}	4.8x10^{-11}	4.8'x10^{-5}	2.3x10^{-7}	0.23	1.0x10^{-7}
Expected risk[d]	3.2x10^{-7}	–	7.9x10^{-9}	–	3.8x10^{-5}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual) or the number of cancer fatalities (for the population to 80 km) by the accident frequency and the number of years of operation.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks over the lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source term in Tables M.5.3.9.1–4 and M.5.3.9.1–5 and the MACCS computer code.

facility while the aircraft crash may only damage and release hazardous materials in the vicinity of the point of impact. In both scenarios, the involved workers located within the facility could receive serious or fatal impacts.

[Text deleted.]

4.3.2.10 Waste Management

This section summarizes the waste management impacts for the construction and operation of a Pu conversion facility. There is no spent nuclear fuel or HLW associated with the operation of the Pu conversion facility. Table 4.3.2.10–1 provides the projected operational waste volumes generated at the sites analyzed as a result of the Pu conversion facility. Facilities that would support the Pu conversion facility would treat and package all generated waste into forms that would enable long-term storage and/or disposal in accordance with the regulatory requirements of RCRA and other applicable statutes. Depending in part on decisions in waste-type-specific RODs for the Waste Management PEIS, wastes could be treated, and depending on the type of waste, disposed of, onsite or at regionalized or centralized DOE sites. For the purposes of analyses only, this PEIS assumes that TRU and mixed TRU waste would be treated onsite to the current planning-basis WIPP WAC, and shipped to WIPP for disposal. This PEIS also assumes that LLW, mixed LLW, hazardous, and nonhazardous waste would be treated and disposed of in accordance with current site practice. The incremental waste volumes generated from the Pu conversion facility and the resultant waste effluent used for the waste impact analysis can be found in Section E.3.2.2. A detailed description of the waste management activities that would be required to support the Pu conversion facility can also be found in Section E.3.2.2.

Construction and operation of a Pu conversion facility would impact existing waste management activities at each of the sites analyzed, increasing the generation of TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, solid nonhazardous, and hazardous wastes. The nonhazardous wastes would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous or radioactive constituents is expected to be generated during construction. However, if any is generated, it would be managed in accordance with site practice, and all applicable Federal and State regulations.

Table 4.3.2.10–1. Estimated Annual Generated Waste Volumes for the Plutonium Conversion Facility[a]

Category	New Facility (m^3)	Hanford No Action (m^3)	NTS No Action (m^3)	INEL No Action (m^3)	Pantex No Action (m^3)	ORR No Action (m^3)	SRS No Action (m^3)
Transuranic							
Liquid	3.2[b]	None	None	None	None	None	None
Solid	278	271	None	3.5	None	119	338
Mixed Transuranic							
Liquid	0	None	None	None	None	None	None
Solid	191	98	None	Included in TRU	None	None	Included in TRU
Low-level							
Liquid	56[b]	None	Dependent on restoration activities	None	8	2,970	74,000
Solid	1,743	3,390	15,000	7,200	32	7,320	16,400
Mixed low-level							
Liquid	0.04	3,760	None	4	4	87,600	1,330
Solid	191	1,505	50	170	46	432	7,700
Hazardous							
Liquid	2	Included in solid	Included in solid	Included in solid	2	6,460	1,260
Solid	11	560	212	1,200	31	26	15,100

Table 4.3.2.10–1. Estimated Annual Generated Waste Volumes for the Plutonium Conversion Facility[a]—Continued

Category	New Facility (m^3)	Hanford No Action (m^3)	NTS No Action (m^3)	INEL No Action (m^3)	Pantex No Action (m^3)	ORR No Action (m^3)	SRS No Action (m^3)
Nonhazardous (sanitary)							
Liquid	15,000	414,000	Not reported separately, included in solid	Not reported separately, included in solid	141,000	550,000	703,000
Solid	2,060	5,107	2,120	52,000	339	53,100	61,200
Nonhazardous (other)							
Liquid	56	Included in sanitary	Included in sanitary	None	Included in sanitary	650,000	Included in sanitary
Solid	0	Included in sanitary	76,500	Included in sanitary	Included in sanitary	321	Included in sanitary

[a] The No Action volumes are from Tables 4.2.1.10–1, 4.2.2.10–1, 4.2.3.10–1, 4.2.4.10–1, 4.2.5.10–1, and 4.2.6.10–1. Incremental waste generation volumes for Pu conversion are from Table E.3.2.2–1. Waste effluent volumes (that is, after treatment and volume reduction) which are used in the narrative description of the impacts are also provided in Table E.3.2.2–1.

[b] Liquid TRU and LLW would be treated and solidified prior to disposal.

Following treatment and volume reduction, approximately 278 m^3 (364 yd^3) of TRU waste consisting of solidified liquid TRU waste (such as decontamination solutions, used HEPA filters, contaminated wipes and rags, and glovebox sweepings), would require treatment and repackaging in a radwaste facility to meet the current planning-basis WIPP WAC or alternative treatment level. Hanford, INEL, and SRS have existing and planned TRU waste facilities that could be utilized. Due to their limited capability to process, package, and store TRU waste, a radwaste facility would need to be constructed as part of the Pu conversion facility if sited at Pantex, ORR, or NTS. An estimated 191 m^3 (250 yd^3) of mixed TRU waste would also require treatment and packaging to meet the current planning-basis WIPP WAC or alternative treatment level. Mixed TRU waste would principally be leaded rubber gloves. To transport the TRU and mixed TRU waste to WIPP (depending on decisions made in the ROD associated with the supplemental EIS for the proposed continued phased development of WIPP for disposal of TRU waste), 54 truck shipments per year or, if applicable, 27 regular train shipments per year or 9 dedicated train shipments per year, would be required.

The Pu conversion facility conceptual design includes a radioactive liquid waste treatment facility which would treat the 56 m^3 (14,800 gal) of liquid LLW from infrequent container decontamination, laboratory solutions, and scrubber solutions from stacks and exhaust systems. After treatment and volume reduction, approximately 1,743 m^3 (2,280 yd^3) of solid LLW from solidified liquid LLW, packaging materials, HEPA filters, glovebox parts, protective clothing, decontamination materials (swipes, mops), and damaged equipment would require disposal in a DOE LLW disposal facility. Using the land usage factors from Section E.1.4, the area required for LLW disposal would be 0.5 ha/yr (1.3 acres/yr) at Hanford and ORR; 0.3 ha/yr (0.7 acres/yr) at NTS and INEL; and 0.2 ha/yr (0.5 acres/yr) at SRS. With no onsite LLW disposal capability, Pantex would require 105 additional LLW shipments per year to NTS. The ultimate disposal of LLW will be in accordance with the ROD(s) from the Waste Management PEIS.

Approximately 0.04 m^3 (11 gal) of liquid and 191 m^3 (250 yd^3) of solid mixed LLW, consisting of solvent rags, Pb, and hydraulic fluids which have been contaminated with radioactive constituents, would require treatment to meet the land disposal restrictions of RCRA. Mixed LLW would be managed in accordance with the Tri-Party Agreement for Hanford or the respective site treatment plans that were developed to comply with the *Federal Facility Compliance Act* for the remainder of the sites analyzed.

Liquid hazardous wastes would consist of cleaning solvents, cutting oils, vacuum pump oils, film processing fluids, hydraulic fluids from mechanical equipment, antifreeze solutions, and paint. Liquid hazardous wastes would be treated onsite or collected in DOT-approved containers and shipped offsite to RCRA-permitted treatment and disposal facilities. Solid hazardous wastes would consist of lead packing and wipes contaminated with oils, lubricants, and cleaning solvents. After compaction, solid hazardous wastes would be packaged in DOT-approved containers, treated onsite or offsite and shipped to RCRA-permitted treatment facilities. After treatment the waste would be disposed of offsite in commercial RCRA-permitted disposal facilities. All the sites analyzed would have adequate capacity to stage the 2 m^3 (528 gal) of liquid and 11 m^3 (15 yd^3) of solid hazardous wastes until sufficient quantity accumulated to warrant shipment to a RCRA-permitted treatment and disposal facility.

Approximately 15,000 m^3 (3,960,000 gal) of liquid nonhazardous sanitary and industrial wastewater, steam plant blowdown, and stormwater runoff would require treatment in accordance with site practice and discharge permits. Construction of sanitary, utility, and process wastewater treatment systems may be required. Approximately 2,060 m^3 (2,700 yd^3) of solid nonhazardous wastes such as paper, glass, discarded office material, and cafeteria waste that is not recycled or salvageable would be shipped to an onsite or offsite landfill in accordance with site-specific practice.

4.3.3 DEEP BOREHOLE ALTERNATIVE CATEGORY

These sections describe two deep borehole alternatives for the disposition of Pu: Direct Disposition Alternative and Immobilized Disposition Alternative. Impacts from borehole construction and operations are described on a generic range of site conditions within the United States. Impacts from the immobilization facility on the following representative sites are described: Hanford, NTS, INEL, Pantex, ORR, and SRS. The sections describe the construction and operational impacts of the Deep Borehole Alternative facilities on the following potentially affected areas: land resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomic, public and occupational health and safety, and waste management. The impacts for either of the alternatives in these sections would be in addition to those associated with the pit disassembly/conversion facility (Section 4.3.1) and the Pu conversion facility (Section 4.3.2). The deep borehole complex is defined for a generic site over a range of characteristics as defined in Section 3.10. [Text deleted.] Should either of the deep borehole alternatives be selected, a siting study would be conducted in support of tiered NEPA documentation.

4.3.3.1 Direct Disposition Alternative

The environmental impacts described in the following sections are based on the analysis of the deep borehole complex for the Direct Disposition Alternative as described in Section 2.4.3.1. Environmental impacts for this facility are described in the context of a generic range of conditions that could exist at potential locations.

4.3.3.1.1 *Land Resources*

The deep borehole complex would disturb 63 ha (156 acres) of land during construction of which 57 ha (141 acres) would be used during operation. The facility would be sited within a 1.6-km (1-mi) buffer zone for a total land requirement of 2,041 ha (5,044 acres). However, the potential site could range up to 20,000 ha (49,420 acres) of land area. If the borehole site were located on privately owned land, it would likely require the low to middle range of land area. If the site were located on publicly owned land (Federal, State, or local), the borehole could be part of a much larger site and could require the upper range of land area. [Text deleted.] Because no site has been identified for analysis, impacts to land use and visual resources cannot be determined at this time. If this alternative is selected, a siting study would be conducted in support of NEPA tiered documentation.

4.3.3.1.2 *Site Infrastructure*

Since no actual sites for a deep borehole complex have been considered, the site infrastructure impact analysis for constructing, operating, and post-closure monitoring of the new complex compares the requirements shown in the tables in the appendices against the generic deep borehole disposition site described in Section 3.9.2.

Implementation of the alternative for direct emplacement of Pu into a deep borehole requires construction of a stand-alone complex containing five groupings of surface facilities and several very deep boreholes, about 2 to 4 km (1.3 to 2.5 mi) below the surface. Upon completion of the Pu disposition mission, only a concrete cap remains on the surface.

The region's utility and transportation infrastructure must be extended to support the facilities and operations of this proposed borehole complex. Connection of the borehole complex to the nearest existing electrical utility via high-voltage transmission lines may require constructing additional transmission lines and obtaining rights-of-way.

Impacts from construction of the deep borehole complex using standard construction practices for the surface facilities and transportation links are shown in Table 4.3.3.1.2–1. At a minimum, a 1.6-km (1-mi) two-lane paved road and railroad spur track would have to be constructed for the deep borehole complex to transport workers and material and to deliver equipment. The length depends on the specific site selected and distance from existing transportation. Rights-of-way may also be required.

The surface facilities would be metal framed, sealed buildings with a 10- to 20-year usable life, which would be typical for a packaging and handling operation. It is estimated to require approximately 3 years to construct the necessary borehole complex facilities. The greatest surface effects from subsurface borehole construction would be caused by the surface retention areas containing all material removed during drilling operations. The total amount of utilities and material resources consumed during the construction period, assuming only 1.6 km (1 mi) of roads, is shown in Table 4.3.3.1.2–1.

Table 4.3.3.1.2–1. Additional Site Infrastructure Needed for the Construction of the Deep Borehole Complex—Direct Disposition Alternative (Annual)

Resource	Construction Requirement	Range of Resource Availability at the Generic Borehole Site
Electrical	600 MWh	6,500 to 12,000 MWh
Oil	2,133,000 l	0 to 100 million
Natural gas	0	0 to 5 million m^3
Coal	0	0 to 200,000 t

Source: LLNL 1996a.

Since the lower end of the range of resources available generally exceeds the annualized construction requirement, there would be minimal impact on these resources during construction.

Borehole facility operations require electrical power, compressed air, process water, and process wastewater treatment. The impacts to site infrastructure from these emplacement operations are shown in Table 4.3.3.1.2–2. The range of available resources at the generic borehole site was previously described in Section 3.9.2. The 6,500 MWh electrical requirement to operate the entire borehole array area for a year would have no measurable impact on any of the sub-regional power pools in the contiguous 48 states. Fuel and transportation requirements present no measurable impacts. Since oil and natural gas availability is governed by usage, any additional oil and natural gas could be procured.

Table 4.3.3.1.2–2. Additional Site Infrastructure Needed for the Operation of the Deep Borehole Complex—Direct Disposition Alternative (Annual)

	Transportation		Electrical		Fuel		
	Roads (km)	**Railroads (km)**	**Energy (MWh/yr)**	**Peak Load (MWe)**	**Oil (l/yr)**	**Natural Gas (m^3/yr)**	**Coal (t/yr)**
Facility Requirement	1.6	1.6	6,500	2	774,400	5,100,000	0
Range of available resources	0 to 60	0 to 20	6,500 to 12,000	2 to 1,000	0 to 100 million	0 to 5 million	0 to 200,000
Amount required in excess of low-end site availability	1.6	1.6	0	0	774,100	5,100,000	0

Source: LLNL 1996a.

During the post-closure period, the borehole array area of 25 ha (60 acres) would be declared a limited access area indefinitely, and a 1.6-km (1-mi) buffer zone of 1,358 ha (3,355 acres) may also be declared off limits. The disturbed area remaining after decommissioning would be the 15 m x 15 m (50 ft x 50 ft) concrete security and water anti-infiltration caps installed above the borehole array, assumed to be four holes. Even though the borehole area would be designated as limited access, there are minimal continuing requirements or effects above ground. These minimal requirements include surveillance and groundwater monitoring. Surveillance could be accomplished from a remote location without impact at the site. Groundwater monitoring could be done from locations at various distances from the site. There would be a continuing infrastructure impact directly at the site in that any future land use requiring excavation or mining operations would be restricted in perpetuity due to the long half-life of Pu. Such restrictions could be institutionalized by constructing drilling barriers and installing a variety of permanent markers.

4.3.3.1.3 *Air Quality and Noise*

Construction and operation of the deep borehole complex would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts, criteria and toxic/hazardous concentrations from operation of this facility have been compared with Federal standards. Impacts for radiological airborne emissions are discussed in Section 4.3.3.1.9.

Noise impacts during either construction or operation are expected to be low. Air quality and noise impacts are described separately. Supporting data for the air quality and noise analysis are presented in Appendix F.

AIR QUALITY

Construction and operation of the facility would result in the emission of some pollutants at the generic site. Emissions would typically not exceed Federal, State, or local air quality regulations or guidelines.

The principal sources of emissions during construction include the following:

- Fugitive dust from land clearing, site preparation, excavation, wind erosion of exposed ground surfaces, and possible operation of a concrete batch plant
- Exhaust and road dust generated by construction equipment, vehicles delivering construction materials, and vehicles carrying construction workers

The PM_{10} and TSP concentrations are expected to increase during the peak construction period, especially during dry and windy conditions. Appropriate control measures would be followed. It is expected that the site will continue to comply with applicable Federal and State ambient air quality standards during construction.

Emission rates for operation of the deep borehole complex are presented in Table F.1.3–7. Air pollutant emissions sources associated with operations include the following:

- Operation of boilers for space heating
- Operation of diesel generators and periodic testing of emergency diesel generators

[Text deleted.]

During operation, concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. The estimated pollutant concentrations for facility operation plus the No Action concentration are presented in Table 4.3.3.1.3–1.

NOISE

The location of the facilities associated with the deep borehole complex relative to the site boundary and sensitive receptors was examined to evaluate the potential contribution to noise levels at these locations and the potential for onsite and offsite noise impacts. Noise sources during construction may include heavy-construction equipment and increased traffic. Increased traffic would occur onsite and along offsite major transportation routes used to bring construction material and workers to the site.

Table 4.3.3.1.3–1. Estimated Operational Concentrations of Pollutants and Comparison With Most Stringent Regulations or Guidelines—Deep Borehole Complex and No Action Alternative—Direct Disposition Alternative

Pollutant	Averaging Time	Most Stringent Regulation or Guideline[a] (μg/m³)	Generic Site[b] (μg/m³)
Criteria Pollutants			
Carbon monoxide	8-hour	10,000	72.38
	1-hour	40,000	103.40
Lead	Calendar Quarter	1.5	c
Nitrogen dioxide	Annual	100	28.37
Ozone	1-hour	235	d
Particulate matter less than or equal to 10 microns in diameter	Annual	50	10.84
	24-hour	150	43.38
Sulfur dioxide	Annual	80	2.59
	24-hour	365	10.36
	3-hour	1,300	23.32
Hazardous and Other Toxic Compounds[e]			
[Text deleted.]			

[a] The Federal standards are presented.
[b] The concentration represents the alternative contribution only. No Action concentrations at a generic site cannot be determined since there is a range of possible pollutants and conditions that could be found at a potential site.
[c] No sources of this pollutant have been identified.
[d] Ozone, as a criteria pollutant, is not directly emitted or monitored by the site. See Section 4.1.3 for a discussion of ozone-related issues.
[e] Emissions of unspecified hydrocarbons were not modeled.
Note: Concentrations are based on site contribution and do not include the contribution from non-facility sources.
Source: 40 CFR 50; LLNL 1996a.

Non-traffic noise sources associated with operation of these facilities include: ventilation systems, cooling systems, material handling equipment, drilling rigs, pumps, and generators. These noise sources are assumed to be located at sufficient distance from offsite areas so that the contribution to offsite noise levels would continue to be small. It is assumed that, due to the size of the site, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may result in impacts such as disturbance of wildlife.

4.3.3.1.4 *Water Resources*

Water resources would be affected by the operation of a direct emplacement deep borehole complex. Water resource requirements and discharges provided in Tables C.1.1.3–1 and C.2.1.3–1 and Table E.3.3.1–1 were used to assess impacts to surface and groundwater. Table 4.3.3.1.4–1 provides the total water requirements and estimated construction and operation wastewater effluent volumes projected to be generated as a result of the deep borehole complex. If this alternative is selected, a siting study would be considered and met in future site specific tiered NEPA documents, as appropriate. During construction and operation, either surface water, groundwater, or a municipal source could be used to support the facility. Support facilities for the deep borehole complex would treat and dispose of wastewater in accordance with regulatory requirements.

Surface Water. Surface water could be used to supply the fresh water required for the deep borehole facility. Water quantities required for both construction and operation of the generic deep borehole facility are shown in Table 4.3.3.1.4–1. The facility would be located such that these quantities of surface water would be readily available.

Table 4.3.3.1.4–1. Potential Changes to Water Resources Resulting From the Deep Borehole Complex—Direct Disposition Alternative

Affected Resource Indicator	Generic Site
Water Source	Surface or Ground
Construction	
Water Availability and Use	
Total water requirement (million l/yr)	15.1
Water Quality	
Total wastewater discharge (million l/yr)	12.0
Operation	
Water Availability and Use	
Total water requirement (million l/yr)	165.4
Water Quality	
Total wastewater discharge (million l/yr)	17.4
Floodplain	
Is action in 100-year floodplain?	No
Is critical action in 500-year floodplain?	No

Source: LLNL 1996a.

Surface water quality could be affected by the discharge of treated industrial and sanitary wastewater to surface impoundments (that is, evaporation/infiltration ponds), dry lake beds, or natural drainage channels. NPDES permits would be obtained prior to any such discharge. These permits would specify the allowable limits for any potential pollutants and would establish strict effluent monitoring requirements.

Drilling operations also include activities that have the potential to affect surface water quality. The primary effluents from drilling are the overflow of briny water from the mud pits and the briny water that would be pumped out of the well from conductive features in the rock. Water and drilling muds are circulated through the borehole during drilling. Drilling mud, which includes chemicals such as polymers, soaps, and pH control additives, and rock cuttings removed from the borehole are staged in surface impoundments called mud pits. The rock cuttings settle by gravity and the mud is recirculated to the borehole. These pits could be lined to prevent infiltration to the subsurface. Depending on State and local regulations, the rock cuttings may be left in place in the mud pit and covered following completion of the drilling process. Because the drilling mud and chemical additives would be selected for compatibility with the specific downhole conditions, the exact

composition of the drilling mud and specific chemical additives would not be known until the site-specific geology was determined.

No wastewater would be generated by the emplacement and borehole sealing process. Water produced from the borehole, however, would be sampled for radioactivity and brine chemical composition. The sample would first be tested for radioactivity (from the fissile material) and, if not contaminated, the water would be returned to the mud pits. If the water is contaminated, it would be routed to the process wastewater treatment facility. Other wastewater originating from the borehole array area would be expected to consist of mopwaters and cleaning solutions, sealants and additives, drilling mud and grout additives, and machine coolant wastes.

The process wastewater treatment facility would be equipped to treat conventional, hazardous, radioactive, and mixed liquid wastes generated at several facilities onsite (for example, the surface processing and fissile material-grout preparation facilities). Treatment processes for each type of waste stream would be segregated. Effluent from this facility would be reclaimed after treatment and used as makeup water to the cooling tower; there would be no surface discharge.

Utility operations would also generate wastewater. This wastewater would consist of cooling tower blowdown and boiler blowdown and would be treated in the utility wastewater treatment facility. Treatment would consist of reverse osmosis followed by evaporation and spray drying. Reclaimed water produced by this facility would be used as makeup water for the cooling tower; there would be no surface discharge.

Another potential source of impacts to surface water quality is stormwater runoff from graded areas, raw material and drilling waste storage areas, and paved areas. This water would be retained in catch tanks or ponds, tested for the appropriate parameters, and then discharged to an infiltration pond if it passed the testing requirements. If the water exceeded any established thresholds, it would be diverted to an evaporation basin where any distillate would be treated and used as reclaimed water. NPDES permits, which would specify the exact testing requirements, would be required for each type of discharge (for example, point source and stormwater).

Groundwater. If water required for construction and operation were obtained from groundwater resources, it likely would be supplied from groundwater from the near-surface aquifer. Groundwater quantities required for both construction and operation of the generic deep borehole facility are shown in Table 4.3.3.1.4–1.

Several factors contribute to the theory that the deep borehole can isolate the fissile material for the required timeframe (many tens of thousands of years): the very slow movement of "groundwater" (brine) at great depths; the very slow release of radionuclides from the disposal form (molecular diffusion); the retardation or adsorption of released radionuclides by physiochemical interactions with the host rock; and the capability to perform the drilling, emplacing, and borehole-sealing operations without compromising the natural barriers of the earth's crust (host rock) or creating new pathways to the biosphere (that is, accessible environment) (LLNL 1996a:1-2,1-5).

In order for this alternative to be feasible, several site-specific environmental features are preferred: competent, seismically stable host rock with low fracture density and no fault zones; brines with high salinity (indicative of long-term isolation from the biosphere), low carbonate concentrations, and slightly basic and reducing geochemistry; low thermal gradient; and a high salinity gradient. Thermal and salinity gradients are key factors in the potential for brine circulation (advective transport) within the borehole. This is the principle mechanism for potential radionuclide migration in the deep borehole environment. Radionuclides will also migrate extremely slowly in the deep subsurface via molecular diffusion. Site specific siting criteria would be met in future tiered NEPA documents, as appropriate.

Casing the borehole (in the upper portion before competent bedrock is encountered) and sealing or cementing around the casing would be a primary barrier to fluid flow. The cement would seal the void space between the

casing and the borehole wall, thus eliminating this potential pathway for convective fluid circulation and possible mobilization of fissile material to the biosphere. In addition, the casing and cement grout would prevent groundwater from near-surface aquifers in the upper portion of the borehole from entering the borehole. This effectively isolates the potable, near-surface groundwater from the drilling muds in the borehole during drilling and also from the waste in the emplacement zone. Similarly, at greater depths, the grout would prevent brines from entering the borehole during drilling. The grout would also seal fractures in the host rock that intersect the borehole, which would otherwise represent potential flow pathways. In addition, to further isolate the fissile material, specially formulated sealing plugs would be installed across the entire borehole cross-section at strategic locations within the borehole.

Other engineered safety features at the ground surface would be provided to ensure that the disposal system would operate in compliance with regulatory requirements. For instance, wastewater discharge holding ponds could be lined and used as evaporation ponds instead of infiltration ponds. Additionally, near-surface groundwater would be periodically sampled and analyzed for radioactivity (and nonradioactive contaminants) emanating from the surface facilities and from the emplaced waste. The groundwater monitoring wells would be located both onsite and at strategically placed distant, downgradient points. All of the design criteria would be evaluated in future site-specific tiered NEPA documentation, as appropriate, should the Direct Disposition Alternative be selected.

4.3.3.1.5 *Geology and Soils*

Construction of a deep borehole complex would require the disturbance of approximately 63 ha (156 acres). The deep borehole complex represents an irreversible commitment because wastes in below-ground area could not be completely removed, nor could the site be feasibly used for any other purposes following closure of the facility. This land would be perpetually unusable because of the substrata and would not be suitable for potentially intrusive facilities such as mining, utilities, or building foundations. Because no site has been identified for analysis, impacts to geologic and soil resources cannot be determined at this time.

The identification and acceptance of a site location would require extensive site characterization to ensure that the primary objective of the deep borehole complex, isolation from the biosphere, would be met. A siting study would be conducted in support of the tiered NEPA documentation.

4.3.3.1.6 Biological Resources

Construction of a deep borehole complex would disturb 63 ha (156 acre) of land at an unspecified location. Additional land would be needed for rights-of-way. If this alternative is selected, a siting study would be conducted in support of tiered NEPA documentation. During the siting process, concern for individual species (and critical habitats) that are sensitive to disturbance and whose existence may be threatened by development would be a primary consideration. Further, once a site is selected, consultation with USFWS and the appropriate state agency would take place to ensure that threatened and endangered species would be protected. Potential impacts to individual species, necessary consultation, and protection measures will be addressed in site-specific NEPA documentation.

Terrestrial Resources. The excavation of material from a deep borehole could lead to potential impacts to terrestrial resources. Dust from drilling operations and the stockpiling of spoils could be deposited on plant surfaces and interfere with normal photosynthesis. Runoff from spoils disposal areas could affect vegetation in nearby areas.

Construction of the facility would affect animal populations. Less mobile animals within the project area, such as reptiles and small mammals, would not be expected to survive. Construction activities and noise would cause larger mammals and birds in the construction and adjacent areas to move to similar habitat nearby. If the area to which they moved was below its carrying capacity, these animals would be expected to survive. However, if the area was already supporting the maximum number of individuals, the additional animals would compete for limited resources which could lead to habitat degradation and eventual loss of the excess population. Nests and young animals living within the assumed site may not survive. The site would be surveyed as necessary for the nests of migratory birds prior to construction. Areas disturbed by construction, but not occupied by facility structures, would be of minimal value to wildlife because they would be maintained as landscaped areas.

Activities associated with facility operations, such as noise and human presence, could affect wildlife living immediately adjacent to the deep borehole complex. These disturbances may cause some species to move from the area. Disturbance to wildlife living adjacent to the facility would be minimized by preventing workers from entering undisturbed areas.

Wetlands. Clearing and grading operations could result in the direct loss of wetlands, although proper placement of the facility within the overall site would eliminate or reduce the potential for such loss. Where direct loss is unavoidable, mitigation measures would be developed. [Text deleted.] In general, direct impacts to wetlands from construction and operations would not be expected at dry sites.

Indirect impacts to wetlands from a deep borehole complex could occur as a result of stormwater runoff carrying sediments to wetlands located adjacent to the site. Changes in hydrology, water quality, and soils could occur as a result of alterations in water levels, runoff, and the buildup of sediments. These changes could, in turn, change the vegetative composition of the wetland.

Aquatic Resources. During construction of a deep borehole complex, potential impacts to aquatic resources could result from stormwater runoff, including runoff from spoils disposal areas. Runoff could alter flow rates, increase turbidity, and lead to sedimentation of stream beds. These impacts could, in turn, cause temporary and permanent changes in species compositions and density, and alter breeding habitats. Operational impacts to aquatic resources would generally be expected to be minimal since wastewater volumes would be minimal and would be discharged through an NPDES permitted outfall. However, runoff from spoils disposal areas could impact aquatic resources during operation. In general, direct impacts to aquatic resources from construction and operations would not be expected at dry sites.

Threatened and Endangered Species. Construction and operation of the deep borehole complex would have the potential to impact threatened and endangered species. Sources of impacts would be similar to those

discussed above for terrestrial resources, wetlands, and aquatic resources. The primary difference is that the resources of concern involve individual species (and critical habitats) that are sensitive to disturbance and whose existence may be threatened by development. Consultations with USFWS and State agencies would be conducted at the site-specific level, as appropriate.

4.3.3.1.7 *Cultural and Paleontological Resources*

The construction of the deep borehole site complex would disturb approximately 63 ha (156 acres) of land. The operational land requirement is 2,041 ha (5,044 acres), which includes a 1.6-km (1-mi) buffer zone. The actual facility requires 57 ha (141 acres) during operation. In addition, approximately 1.6 km (1 mi) each of road or railway would also be constructed. No specific site has been proposed for this alternative. Impacts to cultural and paleontological resources would be addressed in tiered NEPA documents as appropriate. A siting study would be conducted in support of tiered NEPA documentation.

Prehistoric and historic resources that may be NRHP eligible would be identified through additional surveys. Specific concerns about the presence, type, and location of Native American resources would be addressed through consultation with the potentially affected tribes in accordance with NHPA, the *Native American Graves Protection and Repatriation Act*, and the *American Indian Religious Freedom Act*. Therefore, it is not possible to determine potential effects on cultural and paleontological resources.

4.3.3.1.8 *Socioeconomics*

Candidate sites for the deep borehole complex have not been identified; therefore, the socioeconomic characteristics of the associated REAs and ROIs cannot be fully described. Instead, the following section describes a range of impacts that could potentially result from locating the facility in different types of geographical areas. Although the borehole complex would likely be located in an area away from population centers, the workforce needed to support the construction and operation of the facility would either have to reside in communities within commuting distance, or a small community would develop near the site. Once a specific site is selected, a more detailed analysis will be performed in tiered NEPA documents.

Regional Economy Characteristics. Constructing a deep borehole facility would require 870 workers at peak construction and 342 workers each year for 10 years of operation. The number of indirect jobs created by construction and operation of the borehole facility would depend upon the economic structure of the REA where the facility is located.

In a rural REA consisting of small communities, construction of the borehole facility could create as many as 400 indirect jobs. The number of indirect jobs created from operation could range from 0 to 350 depending on the types and concentration of businesses that are located in the region. If the borehole facility were constructed in an REA that included a large metropolitan area, up to 1,300 indirect jobs could be generated during construction, and up to 650 indirect jobs could be created during operation.

No matter where the borehole facility is located, the affected region's per capita income would increase and its unemployment rate would decrease. The magnitude of economic benefit to the REA would depend on the state of the regional economy and the availability of resident labor at the time of construction, as well as the capacity of the region's infrastructure (for example, transportation network) to accommodate increased business activity.

At the end of the 10-year operating period, the workforce would be phased out, and, in the absence of alternative job opportunities, regional unemployment would increase and per capita income would decrease. Phaseout in a diversified economy would lead to minimal losses; however, the more rural the REA the more unlikely it is there would be new employment opportunities to offset the loss of jobs.

The socioeconomic effects of a borehole facility on an REA would be maximized if the facility were located in a region with little or no previous economic activity. The effect would be similar to that of a mining town undergoing a boom-bust cycle. In other words, a community would develop, there would be an influx of workers and their families, and after the project was completed, there would be mass out-migration from the community.

Population and Housing. Most REAs would probably have sufficient available labor to construct the borehole facility, and few or no new workers would in-migrate to the ROI. Many construction workers would likely commute long distances rather than relocate near the site. However, some temporary housing may be needed near the site to accommodate a portion of the workforce who are not willing to endure a long commute during the construction period.

If the available labor force in REA would be sufficient to operate the facility, little or no in-migration would occur. However, labor availability would decrease the more rural the REA, thus increasing in-migration to the region. In any case, housing to accommodate in-migrating workers and their families would depend upon the ROI's owner/renter vacancy rates and housing market trends.

Following completion of the 10-year operation period, there would likely be out-migration of population because of the reduced job opportunities. Such out-migration would increase housing vacancies and could affect housing market values.

Community Services. There could be an increase in demand for community services during the construction phase of the project, depending on the need for in-migrating construction workers. The demand for these services would most likely increase further during operation. The ability to meet these new demands would depend on the level and capacities of services in the ROI where the borehole facility would be located. A more rural ROI would likely be the most affected.

Once the 10-year operation of the borehole facility is completed, there could be some out-migration. Any out-migration would reduce the demand on community services.

Local Transportation. Traffic levels in the vicinity of the borehole facility would increase by 1,670 vehicle trips per day during the construction phase and 657 during the operation phase. It is possible that the borehole facility would be located in a remote area, requiring improvement or construction of some roads to enable workers to access the site (Socio 1996a).

4.3.3.1.9 *Public and Occupational Health and Safety*

This section describes the radiological and hazardous chemical releases and the associated impacts resulting from either normal operation or accidents involved with the direct emplacement of the Pu in a deep borehole. The section first describes the impacts from normal operation at the generic site, followed by a description of impacts from postulated facility accidents.

For the public, the analysis includes an annual dose and cumulative risk to the maximally exposed individual, population, and average individual within 80 km (50 mi). For workers, the analysis includes an annual and cumulative risk to an average involved and noninvolved worker and total involved and noninvolved workers. The radiological health effects were derived from data for representative DOE sites described in Sections 3.2 through 3.8. Data for the representative DOE sites were used to allow quantification of impacts, but do not necessarily capture the entire range of potential deep borehole complex sites. This approach to the radiological risk assessment differs from the analysis of other resources, which are analyzed based on a generic deep borehole site. Because the analysis of radiological dose impacts requires site-specific conditions, such as meteorology and surrounding populations, a generic site analysis would not be possible because of the infinite number of site-specific conditions.

Summaries of the radiological impacts to the public and to workers associated with normal operation during the assumed 10-year campaign time are presented in Tables 4.3.3.1.9–1 and 4.3.3.1.9–2, respectively. [Text deleted.] Impacts from hazardous chemicals to these same groups are given in Table 4.3.3.1.9–3. Summaries of impacts associated with postulated accidents are given in Table 4.3.3.1.9–4. Detailed results are presented in Section M.

Normal Operation. There would be no radiological releases associated with the construction of the deep borehole complex. Construction worker exposures to material potentially contaminated with radioactivity (for example, from construction activities involved with existing contaminated soil) would be limited to assure that doses are maintained ALARA. Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be both radiological and hazardous chemical releases to the environment as well as direct in-plant exposures. The resulting doses and potential health effects to the public and workers at each site are described below.

Radiological Impacts. Radiological impacts to the average and maximally exposed members of the public resulting from the normal operation of the deep borehole complex are presented in Table 4.3.3.1.9–1. The impacts from all site operations, including the new borehole complex, are also given. Comparisons of operational doses with natural background radiation doses are included in the table.

The dose to the maximally exposed member of the public due to annual operation of the borehole complex would range from 2.7×10^{-9} to 9.4×10^{-8} mrem. From 10 years of operation, the risk of fatal cancer to this individual would range from 1.4×10^{-14} to 4.7×10^{-13}. The impacts to the average individual would be less. As a result of annual operations, the population dose would range from 5.3×10^{-9} to 1.8×10^{-6} person-rem/yr. The number of fatal cancers in the population due to 10 years of operation would range from 2.7×10^{-11} to 9.0×10^{-9}.

The upper bounding dose of 3.2 mrem to the maximally exposed member of the public due to annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5. The risk of fatal cancer to this individual from 10 years of operation would be 1.6×10^{-5}. The impacts to the average individual would be less. This activity would be included in a program to ensure that doses to the public are ALARA. As a result of annual total site operations, the upper bounding population dose would be within the limit in proposed 10 CFR 834 and would be 44 person-rem. The number of fatal cancers in this population due to 10 years of operation would be 0.22.

Table 4.3.3.1.9–1. Potential Radiological Impacts to the Public During Normal Operation of the Deep Borehole Complex—Direct Disposition Alternative

Receptor	Generic Site[a]	
	Borehole Complex	**Total Site[b]**
Annual Dose to the Maximally Exposed Individual Member of the Public [c]		
Atmospheric release pathway (mrem)	2.7×10^{-9} to 9.4×10^{-8}	6.1×10^{-5} to 1.5
Drinking water pathway (mrem)	0	0 to 0.10
Total liquid release pathway (mrem)	0	0 to 1.7
Atmospheric and liquid release pathways combined (mrem)	2.7×10^{-9} to 9.4×10^{-8}	6.1×10^{-5} to 3.2
Percent of natural background[d]	8.6×10^{-10} to 3.2×10^{-8}	1.8×10^{-5} to 1.1
10-year fatal cancer risk	1.4×10^{-14} to 4.7×10^{-13}	3.1×10^{-10} to 1.6×10^{-5}
Annual Population Dose Within 80 Kilometers [e]		
Atmospheric release pathways (person-rem)	5.3×10^{-9} to 1.8×10^{-6}	2.8×10^{-4} to 40
Total liquid release pathways (person-rem)	0	0 to 4.7
Atmospheric and liquid release pathways combined (person-rem)	5.3×10^{-9} to 1.8×10^{-6}	2.8×10^{-4} to 44
Percent of natural background[d]	5.7×10^{-11} to 4.7×10^{-10}	2.4×10^{-7} to 0.017
10-year fatal cancers	2.7×10^{-11} to 9.0×10^{-9}	1.4×10^{-6} to 0.22
Annual Dose to the Average Individual Within 80 Kilometers[f]		
Atmospheric and liquid release pathways combined (mrem)	1.8×10^{-10} to 1.4×10^{-9}	8.0×10^{-7} to 0.049
10-year fatal cancer risk	9.0×10^{-16} to 7.0×10^{-15}	4.0×10^{-12} to 2.5×10^{-7}

[a] Ranges for the "Borehole Complex" and "Total Site" doses may not necessarily reflect the same respective sites.

[b] Includes impacts from No Action baseline facilities (refer to Sections 4.2.1.9 through 4.2.6.9) if the borehole were located on a DOE site, shown for comparison purposes only, and would not apply if a generic non-DOE site were selected for the borehole complex.

[c] The applicable radiological limits for an individual member of the public from total site operations are 10 mrem per year from the air pathways, as required by NESHAPS (40 CFR 61, Subpart H) under the CAA, 4 mrem per year from the drinking water pathway, as required by the SDWA; and 100 mrem per year from all pathways combined. Refer to DOE Order 5400.5.

[d] The annual natural background radiation level: the average individual receives a dose that could range from 295 to 338 mrem; the population within 80 km receives a dose that could range from 9,190 to 379,000 person-rem.

[e] For DOE activities, proposed 10 CFR 834 (see 58 FR 16268) would generally limit the potential annual population dose to 100 person-rem from all pathways combined, and would require an ALARA program.

[Text deleted.]

[f] Obtained by dividing the population dose at a site by the number of people projected to be living within 80 km of that site. The number of people ranges from 29,400 to 1,285,000.

Source: Section M.2.

Doses to onsite workers due to normal operations are given in Table 4.3.3.1.9–2. Included are involved workers directly associated with the deep borehole complex, workers who are not involved with the deep borehole complex, and the entire workforce at the site. All doses fall within regulatory limits.

The annual dose to the average borehole complex worker would be 13 mrem; the entire borehole complex workforce would receive 2.7 person-rem annually. The annual dose to the noninvolved worker would range from 2.6 to 32 mrem depending on the borehole site (if an existing DOE site were chosen), and the annual total dose to all noninvolved workers would range from 3.0 to 250 person-rem. The annual dose to the total site workforce would range from 5.7 to 253 person-rem. The risks and numbers of fatal cancers among the different workers due to 10 years of operation are included in Table 4.3.3.1.9–2. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also workers rotations. As a result of the implementation of these mitigation measures, the actual number of fatal cancers calculated would be lower for the operation of this facility.

Table 4.3.3.1.9–2. Potential Radiological Impacts to Workers During Normal Operation of the Deep Borehole Complex—Direct Disposition Alternative

Receptor	Generic Site
Involved Workforce[a]	
Average worker dose (mrem/yr)[b]	13
10-year risk of fatal cancer	5.2×10^{-5}
Total dose (person-rem/yr)	2.7
10-year fatal cancers	0.011
Noninvolved Workforce[c]	
Average worker dose (mrem/yr)[b]	2.6 to 32
10-year risk of fatal cancer	1.0×10^{-5} to 1.3×10^{-4}
Total dose (person-rem/yr)	3.0 to 250
10-year fatal cancers	0.012 to 1.0
Total Site Workforce[d]	
Dose (person-rem/yr)	5.7 to 253
10-year fatal cancers	0.023 to 1.0

[a] The involved worker is a worker associated with operations of the proposed action. The estimated number of badged in-plant workers is 205.

[b] The radiological limit for an individual worker is 5,000 mrem/year (10 CFR 835). However, DOE has also established an administrative control level of 2,000 mrem/yr (DOE 1992t); the sites must make reasonable attempts to maintain worker doses below this level.

[c] The noninvolved worker is an onsite worker not associated with operations of the proposed operations of the borehole complex. The ranges for noninvolved workers are based on No Action values for Hanford, NTS, INEL, Pantex, ORR, and SRS. Noninvolved worker doses are shown for comparison purposes and would not apply if the borehole were located at a separate dedicated site. The noninvolved workforce is equivalent to the No Action workforce.

[d] The impact to the total site workforce is the summation of the involved worker impact and the noninvolved worker impact.

[Text deleted.]

Source: LLNL 1996a for involved workers. For the noninvolved workers the ranges are based on the No Action values for Hanford, NTS, INEL, Pantex, ORR, and SRS given in Sections 4.2.1.9, 4.2.2.9, 4.2.3.9, 4.2.4.9, 4.2.5.9, and 4.2.6.9, respectively.

Hazardous Chemical Impacts. The hazardous chemical impacts to the public due to normal operation of the deep borehole facility at the generic site are presented in Table 4.3.3.1.9–3. Included are the impacts due only to operation of the deep borehole facility and the site's total hazardous chemical impact. The total site impacts are provided to demonstrate the estimated level of health effects expected and the risk of cancer due to the total chemical exposures on each site. All supporting impact analyses are provided in Section M.3.

The HI to the MEI is 1.2×10^{-3} at the borehole complex generic site. The cancer risk from hazardous chemicals to the MEI is zero (because no carcinogens are released from hazardous chemicals) at the borehole complex generic site. The HI to the onsite worker is 0.29 at the borehole complex generic site, and the cancer risk to the onsite worker is zero (because no carcinogens are released from hazardous chemicals).

Facility Accidents. A set of potential accidents for a deep borehole complex for which there may be a release of radioactivity that could impact onsite workers and the offsite population has been postulated. Accident scenarios considered are Pu storage container breakage during storage; Pu storage container breakage during handling; nuclear criticality during emplacement canister filling; criticality during Pu storage container spill; fire in process area; canister string dropped during emplacement and ruptured in emplacement zone; canister string dropped during emplacement and stuck in isolation zone; Pu container criticality during storage; emplacement canister nuclear criticality in storage; and nuclear criticality of canister contents at bottom of emplacement zone upon rupture of dropped canister string. The range of consequences and risks for a set of accidents at the generic site is presented in Table 4.3.3.1.9–4. The estimated range of environmental data (wet-to-dry site) and the general public population density data (low-to-high density) for the generic site envelopes the site characteristics expected for the direct emplacement site.

Table 4.3.3.1.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation of the Deep Borehole Complex—Direct Disposition Alternative

Receptor	Facility[a]	Total Site[b]
Maximally Exposed Individual (Public)		
Hazard Index[c]	1.2×10^{-3}	1.2×10^{-3}
Cancer Risk[d]	0	0
Worker Onsite		
Hazard Index[e]	0.29	0.29
Cancer Risk[f]	0	0

[a] Facility=Contribution from the proposed new facility operation only.

[b] Total=Includes the contributions from the No Action and the proposed new facility operation.

[c] Hazard Index for MEI=Sum of individual Hazard Quotients (noncancer health effects) for the maximally exposed individual.

[d] Cancer Risk for MEI=(Emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor [SF]). [Text deleted.]

[e] Hazard Index for Workers=Sum of individual Hazard Quotients (noncancer health effects) for workers.

[f] Cancer Risk for Workers=(Emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (SF). [Text deleted.]

Note: Where there are no known carcinogens among the hazardous chemicals emitted, there are no slope factors; therefore, the calculated cancer risk value is 0.

Source: Section M.3, Table M.3.4–40.

[Text deleted.] The location of workstations, number of workers, personnel protective features, engineered safety features, and other design details affect the extent of worker exposures to accidents. Certain accidents such as fires, explosions, and criticality could cause fatalities to workers close to the accident. Before construction and operation of a new facility, DOE Orders require detailed safety analyses to assure that facility designs and operating procedures limit the number of workers in hazardous areas and minimize risk of injury or fatality in the event of an accident.

Table 4.3.3.1.9–4. Range of Accident Impacts for a Set of Accidents for the Deep Borehole Complex—Direct Disposition Alternative

Accident Scenario	Worker at 1,000 m: Risk of Cancer Fatality (per 10 yr)[a] High	Low	Worker at 1,000 m: Probability of Cancer Fatality[b] High	Low	Maximum Offsite Individual: Risk of Cancer Fatality (per 10 yr)[a] High	Low	Maximum Offsite Individual: Probability of Cancer Fatality[b] High	Low	Population to 80 km: Risk of Cancer Fatality (per 10 yr)[a] High	Low	Population to 80 km: Number of Cancer Fatalities[c] High	Low	Accident Frequency (per yr)
Pu storage container breakage during storage	5.1×10^{-16}	2.1×10^{-16}	5.1×10^{-14}	2.1×10^{-14}	1.0×10^{-16}	4.7×10^{-18}	1.0×10^{-14}	4.7×10^{-16}	9.0×10^{-14}	8.4×10^{-16}	9.0×10^{-12}	8.4×10^{-14}	1.0×10^{-3}
Pu storage container breakage during handling	5.1×10^{-14}	2.1×10^{-14}	5.1×10^{-12}	2.1×10^{-12}	1.0×10^{-14}	4.7×10^{-16}	1.0×10^{-12}	4.7×10^{-14}	9.0×10^{-12}	8.4×10^{-14}	9.0×10^{-10}	8.4×10^{-12}	1.0×10^{-3}
Nuclear criticality during emplacement canister filling	1.4×10^{-9}	6.2×10^{-10}	1.4×10^{-5}	6.2×10^{-6}	2.9×10^{-10}	1.0×10^{-11}	2.9×10^{-6}	1.0×10^{-7}	6.3×10^{-8}	2.3×10^{-9}	6.3×10^{-4}	2.3×10^{-5}	1.0×10^{-5}
Nuclear criticality during Pu storage canister spill	1.4×10^{-9}	6.2×10^{-10}	1.4×10^{-5}	6.2×10^{-6}	2.9×10^{-10}	1.0×10^{-11}	2.9×10^{-6}	1.0×10^{-7}	6.0×10^{-8}	3.3×10^{-10}	6.0×10^{-4}	3.3×10^{-6}	1.0×10^{-5}
Fire in process area	4.6×10^{-13}	1.9×10^{-13}	4.6×10^{-9}	1.9×10^{-9}	9.3×10^{-14}	4.2×10^{-15}	9.3×10^{-10}	4.2×10^{-11}	8.1×10^{-11}	3.3×10^{-10}	8.1×10^{-7}	3.3×10^{-6}	1.0×10^{-5}
Canister string dropped during emplacement, ruptured in emplacement zone	4.6×10^{-12}	1.9×10^{-12}	4.6×10^{-8}	1.9×10^{-8}	9.3×10^{-13}	4.2×10^{-14}	9.3×10^{-9}	4.2×10^{-10}	8.1×10^{-10}	7.6×10^{-12}	8.1×10^{-6}	7.6×10^{-8}	1.0×10^{-5}
Canister string dropped during emplacement, ruptured in isolation zone	2.8×10^{-15}	1.1×10^{-15}	2.8×10^{-11}	1.1×10^{-11}	5.6×10^{-16}	2.5×10^{-17}	5.6×10^{-12}	2.5×10^{-13}	4.9×10^{-13}	4.5×10^{-15}	4.9×10^{-9}	4.5×10^{-11}	1.0×10^{-5}
Pu container nuclear criticality in storage	1.4×10^{-10}	6.2×10^{-11}	1.4×10^{-5}	6.2×10^{-6}	2.9×10^{-11}	1.0×10^{-12}	2.9×10^{-6}	1.0×10^{-7}	6.3×10^{-9}	3.3×10^{-11}	6.3×10^{-4}	3.3×10^{-6}	1.0×10^{-6}
Emplacement canister nuclear criticality in storage	1.4×10^{-10}	6.2×10^{-11}	1.4×10^{-5}	6.2×10^{-6}	2.9×10^{-11}	1.0×10^{-12}	2.9×10^{-6}	1.0×10^{-7}	6.3×10^{-9}	3.3×10^{-11}	6.3×10^{-4}	3.3×10^{-6}	1.0×10^{-6}
Nuclear criticality of canister contents at bottom of emplacement zone upon rupture of dropped canister string	1.4×10^{-10}	6.2×10^{-11}	1.4×10^{-5}	6.2×10^{-6}	2.9×10^{-11}	1.0×10^{-12}	2.9×10^{-6}	1.0×10^{-7}	6.3×10^{-9}	3.3×10^{-11}	6.3×10^{-4}	3.3×10^{-6}	1.0×10^{-6}
Expected risk[d]	3.2×10^{-9}	1.4×10^{-9}	–	–	6.7×10^{-10}	2.3×10^{-11}	–	–	1.4×10^{-7}	3.1×10^{-9}	–	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the maximum offsite individual or the number of cancer fatalities [for the population to 80 km]) by the accident frequency and the number of years of operations.

[b] Increased likelihood (or probability) of cancer fatality to a hypothetical individual (a single onsite worker at a distance of 1,000 m or the site boundary, whichever is smaller, or to a hypothetical individual in the offsite population located at the site boundary) if exposed to the indicated dose. The value assumes the accident has occurred.

[c] Estimated number of cancer fatalities in the entire offsite population out to a distance of 80 km if exposed to the indicated dose. The value assumes the accident has occurred.

[d] Expected risk is the sum of the risks under the lifetime of the facility.

Note: The impacts shown are the maximum for the reference sites. All values are mean values.

Source: Section M.5.

4.3.3.1.10 *Waste Management*

This section summarizes the waste management impacts for the construction and operation of a deep borehole complex for the Direct Disposition Alternative. There is no spent nuclear fuel or HLW associated with the operation of the deep borehole disposal facility. Table 4.3.3.1.10–1 provides the estimated operational waste volumes projected to be generated as a result of the deep borehole complex for direct disposal. Facilities that would support the deep borehole complex would treat and package all waste generated into forms that would enable long-term storage and/or disposal in accordance with the regulatory requirements of RCRA and other applicable statutes. Depending in part on decisions in waste-type-specific RODs for the Waste Management PEIS, waste could be treated, and depending on the type of waste, disposed of onsite or at regionalized or centralized DOE sites. For the purpose of analyses only, this PEIS assumes that TRU and mixed TRU waste would be treated onsite to the current planning-basis WIPP WAC, and shipped to WIPP for disposal. For purposes of analysis, a pristine site with no waste management infrastructure was assumed for No Action because the deep borehole disposal facility was assumed to be a rural setting where no waste is currently being generated. The incremental waste volumes generated from the deep borehole complex and the resultant waste effluent used for the waste impact analysis can be found in Section E.3.3.1. A detailed description of the waste management activities that would be required to support the deep borehole disposal facility for direct disposal can also be found in Section E.3.3.1.

Table 4.3.3.1.10–1. Estimated Annual Generated Waste Volumes for the Deep Borehole Complex—Direct Disposition Alternative[a]

Category	New Facility (m^3)	No Action (m^3)
Transuranic		
Liquid	0.2[b]	None
Solid	0.2	None
Mixed Transuranic		
Liquid	0	None
Solid	0.04	None
Low-Level		
Liquid	2[b]	None
Solid	5	None
Mixed Low-Level		
Liquid	0	None
Solid	0	None
Hazardous		
Liquid	110	None
Solid	17	None
Nonhazardous (Sanitary)		
Liquid	10,600	None
Solid	306	None
Nonhazardous (Other)		
Liquid	6,800	None
Solid	1,250[c]	None

[a] No waste generation was assumed for No Action. Waste generation volumes for deep borehole disposal facility for direct disposal are from Table E.3.3.1–1. Waste effluent volumes (that is, after treatment and volume reduction) which are used in the narrative description of the impacts are also provided in Table E.3.3.1–1.

[b] Liquid TRU and LLW would be treated and solidified prior to disposal.

[c] Includes rock cuttings, bentonite, and polymers from drilling and emplacing borehole sealing facilities.

Construction and operation of a deep borehole complex for direct disposal would require the construction of waste management facilities to treat and store generated TRU, low-level, mixed, hazardous, and nonhazardous wastes. Waste generated during construction would consist of wastewater, solid nonhazardous, and hazardous wastes. The nonhazardous wastes would be disposed of as part of the construction project by the contractor, and the hazardous wastes would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous or radioactive constituents is expected to be generated during construction. However, if any is generated it would be managed in accordance with all applicable Federal and State regulations.

Less than 1 m^3 (40 gal) of liquid TRU waste generated per year from equipment decontamination would be treated in a waste handling facility to form grout. In the solids treatment area of the waste handling facility less than 1 m^3 (<1 yd^3) of solid TRU waste from process and facility operations, equipment decontamination, failed equipment, and used tools would be compacted as appropriate, then packaged, assayed, and certified to the current planning-basis WIPP WAC or alternative treatment level. A small quantity (<0.1 m^3[<0.1 yd^3]) of solid mixed TRU waste would require treatment and packaging to meet the current planning-basis WIPP WAC. Mixed TRU waste would be principally rubber gloves and leaded box gloves. To transport the TRU and mixed TRU wastes to WIPP (depending on decisions made in the ROD associated with the supplemental EIS being prepared for the proposed continued phased development of WIPP for disposal of TRU waste), one truck shipment every 45 years would be required.

Approximately 2 m^3 (600 gal) of liquid LLW from process wash liquids and excess water from the borehole would be solidified in the waste handling facility. The solidified liquid LLW and solid LLW comprised of sealant residues, contaminated reagent containers, deformed Pu shipping containers, wipes, rags, and paper clothing would result in approximately 5 m^3 (6 yd^3) of LLW that would require disposal at a DOE LLW disposal facility. It would take approximately 4 years to accumulate sufficient quantity for one truck shipment. Using the land usage factors from Section E.1.4, the area required for LLW disposal would be 0.001 ha/yr (0.003 acre/yr) at Hanford and ORR, 0.0008 ha/yr (0.002 acre/yr) at NTS and INEL, and 0.0005 ha/yr (0.001 acre/yr) at SRS. The ultimate disposal of LLW will be in accordance with waste-type-specific ROD(s) from the Waste Management PEIS.

Approximately 110 m^3 (29,000 gal) of liquid hazardous waste consisting of 2 m^3 (500 gal) of chemical makeup and reagents from the surface facility and 108 m^3 (28,500 gal) of oil, antifreeze, and hydraulic fluid from the drilling and emplacing-borehole sealing facilities would be treated onsite or collected in DOT-approved containers and shipped to offsite RCRA-permitted treatment facilities. After treatment, the waste would be disposed of off-site in commercial, RCRA-permitted disposal facilities. An estimated 17 m^3 (22 yd^3) of solid hazardous waste such as wipes contaminated with oils, lubricants, and cleaning solvents would be compacted as appropriate and then packaged in DOT-approved containers treated onsite or offsite, and shipped to offsite RCRA-permitted treatment and disposal facilities.

Approximately 10,600 m^3 (2.8 million gal) of liquid nonhazardous sanitary and industrial wastewater and 6,800 m^3 (1.8 million gal) of steam plant blowdown and evaporator condensate would require treatment in accordance with standard industrial practices. Treated wastewater would be designated as reclaimed water recycle and would be used as makeup to the cooling tower. Construction of sanitary, utility, and process wastewater treatment systems would be required. The 306 m^3 (400 yd^3) of solid nonhazardous waste such as paper, glass, discarded office material, and cafeteria waste would be shipped to a permitted landfill. The drilling and emplacing-borehole sealing facilities would generate approximately 1,250 m^3 (1,630 yd^3) of rock cuttings, bentonite and polymers. As per customary drilling industry practices, these wastes would end up in mud pits that would then be filled with earth and leveled.

4.3.3.2 Immobilized Disposition Alternative

The environmental impacts described in the following sections are based on the analysis of two facilities for the Immobilized Disposition Alternative. These two facilities are the ceramic immobilization facility (Section 4.3.3.2.1) and the deep borehole complex (Section 4.3.3.2.2).

4.3.3.2.1 *Ceramic Immobilization Facility (for Borehole)*

The environmental impacts described in the following sections are based on the analysis of the ceramic immobilization facility for the Immobilized Disposition Alternative as described in Section 2.4.3.2.1. No radioactive isotopes would be included in the ceramic matrix. The representative sites used for this analysis are Hanford, NTS, INEL, Pantex, ORR, and SRS.

4.3.3.2.1.1 *Land Resources*

A new ceramic immobilization facility would disturb 28.3 ha (70 acres) of land during construction of which 18.2 ha (45 acres) would be used during operations. The need for buffer zones would be determined during site-specific, tiered NEPA documentation. This section describes the impacts of constructing and operating the ceramic immobilization facility to land resources for each representative site.

Construction and operation of the ceramic immobilization facility should not cause indirect land use impacts at the analysis sites. As discussed in Section 4.3.3.2.1.8, in-migration of workers would be required during the operational phase at all sites analyzed. In-migration would occur during construction only at INEL and Pantex. However, it is expected that historic housing construction rates at each analysis site should accommodate the in-migrating population. Therefore, offsite land use at the analysis sites would not be affected.

Hanford Site

Land Use. The ceramic immobilization facility would utilize vacant land in the 200 Area adjacent to 200 East. Construction and operation of the ceramic immobilization facility would be in conformance with the existing and future land use as described in the current *Hanford Site Development Plan* and with ongoing discussions in the comprehensive land-use planning process. According to the *Hanford Site Development Plan*, 200 Area's land use is identified as waste operations, which includes radioactive material management, processing, and storage (HF DOE 1993c:13,14). [Text deleted.]

Construction and operation would not affect other Hanford or offsite land uses. No prime farmlands exist onsite. Construction and operation of the facility would be compatible with State and local (Benton, Franklin, and Grant Counties and the City of Richland) land use plans, policies, and controls since Hanford provides information to these jurisdictions for use in their efforts to comply with the GMA (HF DOE 1993c:17).

Visual Resources. [Text deleted.] Construction and operation would be consistent with the industrialized landscape character of the 200 Areas and current VRM Class 5 designation. A potential visual impact during operation would be from stack plumes which could be visible from public viewpoints with high sensitivity levels including State Highways 24 and 240, and the City of Richland; however, because of the viewing distance and compatibility of the proposal with existing industrial character, visual impacts would not occur.

Nevada Test Site

Land Use. The ceramic immobilization facility would be on undeveloped land in Area 6 adjacent to the DAF. Construction and operation of the facility in Area 6 would not be in conformance with the *Nevada Test Site Development Plan*, which designates the southeast area of NTS as a nonnuclear test area. [Text deleted.] However, Area 6 is a potential site for long-term storage and disposition of weapons-usable fissile materials as

part of the NTS defense program material disposition activities considered under the Expanded Use Alternative (part of the Preferred Alternative) of the NTS EIS (NT DOE 1996c:3-8,3-9; NT DOE 1996e:A-18). [Text deleted.]

Construction and operation would not affect other NTS or offsite land uses. No prime farmlands exist onsite. The alternative would not be in conflict with land-use plans, policies, and controls of adjacent jurisdictions since none of these counties or municipalities currently undertake land-use planning.

Visual Resources. [Text deleted.] Construction and operation of the facility would be compatible with the industrial landscape character of the adjacent DAF and the current VRM Class 5 designation of Area 6. [Text deleted.] Views of the proposed action would be blocked from sensitive viewpoints accessible to the public by mountainous terrain.

Idaho National Engineering Laboratory

Land Use. The ceramic immobilization facility would be located on undeveloped land in the ICPP security area, which is situated within the central core area/Prime Development Land Zone of INEL (IN DOE 1992g:12). Construction and operation of the facility would be consistent with the current *Idaho National Engineering Laboratory Site Development Plan*, which designates the future land use of the ICPP as receiving and storing spent nuclear fuels and radioactive wastes (IN DOE 1994d:9-8). [Text deleted.]

Construction would not affect other INEL or offsite land uses. No prime farmlands exist onsite. Construction would not be in conflict with land-use plans, policies, and controls of adjacent counties and the City of Idaho Falls since they do not address the potential site.

Visual Resources. [Text deleted.] Construction and operations would be compatible with the present visual character of INEL, which consists of large industrial facilities and stack plumes. Potential visual impacts during operation could occur from the additional stack plumes; however, the proposal would be consistent with the existing Class 5 industrial character of the ICPP.

Pantex Plant

Land Use. The ceramic immobilization facility would be located on undeveloped land in Zone 4. The potential action would be inconsistent with the current *Pantex Site Development Plan* master plan, which designates Zone 4 for weapons and weapon components staging (PX DOE 1995g:16). However, Pantex could revise the site development plan should Pantex be selected for this alternative.

Construction and operation would not affect other Pantex or offsite land uses. There would be no impacts to prime farmland. The alternative would not be in conflict with the city of Amarillo's land-use plans, policies, and controls since they do not address Pantex.

Visual Resources. [Text deleted.] Potential visual impacts could occur during operation from the additional stack plumes; however, the visual environment would be consistent with the existing industrialized landscape character, and current VRM Class 5 designation of Zone 4.

Oak Ridge Reservation

Land Use. The ceramic immobilization facility would be located on undeveloped land at the northwest quadrant of the Route 95/Bear Creek Road intersection. The alternative would be in conformance with the future land-use plan of the current *Oak Ridge Reservation Site Development and Facilities Utilization Plan*, which designates a portion of the site as a major waste management area (OR DOE 1991f:1-7). Vacant land would be used. [Text deleted.]

Construction and operation would be compatible with other ORR and offsite land uses. No prime farmlands exist onsite. The ceramic immobilization facility would not be in conflict with city of Oak Ridge land use plans, policies, and controls since the current *Oak Ridge Area Land Use Plan* designates the potential site for Industrial and Public land use.

Visual Resources. [Text deleted.] Construction and operation of the facility would change the current VRM Class 4 designation of the Bear Creek Road/Route 95 site to Class 5. Additionally, potential visual impacts could occur during operation from the new stack plumes. Construction and operation activities would be highly visible from Bear Creek Road and Route 95, public roadways with high sensitivity levels.

Savannah River Site

Land Use. A new ceramic immobilization facility would be located on undeveloped land in the F-Area. Facility construction and operation would conform with existing and future land use as designated by the current *Savannah River Site Development Plan*. According to the plan, current F-Area land use is designated industrial operations, while the future land use category is primary industrial mission. Specifically, the F-Area is one of four SRS Waste Management facilities (SR DOE 1994d:2,11,12). Vacant land would be used.

Construction and operation would not affect other SRS or offsite land uses. There is no prime farmland on SRS. Construction would not be in conflict with land-use plans, policies, and controls of adjacent counties and cities since they do not address SRS.

Visual Resources. [Text deleted.] Construction and operation would occur within an area of similar industrial landscape character. Potential visual impacts could occur during operation from additional stack plumes; however, the proposal would be consistent with the VRM Class 5 designation of the F-Area.

[Text deleted.]

4.3.3.2.1.2 *Site Infrastructure*

The potential impacts to the site infrastructure at six representative DOE sites for construction and operation of a ceramic immobilization facility are described below. Data for construction and annual operations are presented in Appendix C. Site infrastructure changes resulting from such construction are presented in Table 4.3.3.2.1.2–1 and changes from operations in Table 4.3.3.2.1.2–2 for the six representative sites.

Hanford Site

[Text deleted.] Construction and operation of this new facility would require construction of transportation links to the existing road and rail networks. DOE would site this facility close to existing roads and railroads to ensure that such construction and operations impacts would be negligible to the site infrastructure. Hanford would require additional natural gas supplies to operate the ceramic immobilization facility. Since natural gas availability is governed by usage and not by storage capacity onsite, the additional natural gas required for operations could be procured through normal contractual means.

Nevada Test Site

[Text deleted.] Construction and operation of this new facility would require construction of transportation links to the existing road and rail networks. Additional oil would be required during the period of construction and during operations. Since oil availability is governed by usage and not by storage capacity onsite, the additional oil required could be procured through normal contractual means or the construction companies could provide for this additional oil from local suppliers. Since NTS does not use natural gas, this facility would be designed to burn fuel oil if NTS were selected as the site. [Text deleted.]

Idaho National Engineering Laboratory

[Text deleted.] Construction and operation of this facility would require construction of transportation links to the existing road and rail networks. INEL plans to site this facility close to existing roads and railroads to ensure that such construction and operations impacts would be negligible to the site infrastructure. Since INEL does not use natural gas, this facility would be designed to burn fuel oil if INEL were selected as the ceramic immobilization facility site.

Pantex Plant

[Text deleted.] Construction and operation of this facility would require construction of transportation links to the existing road and rail networks. DOE would site this facility close to existing roads and railroads to ensure that such construction and operations impacts would be negligible to the site infrastructure. Additional oil would be required during the period of construction. Since oil availability is governed by usage and not by storage capacity onsite, the additional oil required for construction could be procured through normal contractual means or the construction companies could provide for this additional oil from local suppliers.

Oak Ridge Reservation

[Text deleted.] Construction and operation of this facility would require construction of transportation links to the existing road and rail networks. DOE would site this facility close to existing roads and railroads to ensure that such construction and operation impacts would be negligible to the site infrastructure. Additional oil would be required during the period of construction and during operations. Since oil availability is governed by usage and not by storage capacity onsite, the additional oil required could be procured through normal contractual means or the construction companies could provide for this additional oil from local suppliers for construction use.

Savannah River Site

[Text deleted.] Additional oil would be required during the period of construction and during operations. Since oil availability is governed by usage and not by storage capacity onsite, the additional oil required could be procured through normal contractual means or the construction companies could provide for this additional oil from local suppliers for construction use. Construction and operation of this facility would require construction of transportation links to the existing road and rail networks. DOE would site this facility close to existing roads and railroads to ensure that such construction and operations impacts would be negligible to the site infrastructure. Since SRS does not use natural gas, this facility would be designed to burn fuel oil if SRS were selected as the site.

Table 4.3.3.2.1.2–1. Additional Site Infrastructure Needed for the Construction of the Ceramic Immobilization Facility (For Borehole)—Immobilized Disposition Alternative (Annual)

	Electrical		Fuel		
	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
Facility Requirement	10,200	2	3,000,000	0	0
Hanford					
Site availability	1,678,700	281	14,775,000	21,039,531	91,708
Projected usage without facility	345,500	58	9,334,800	21,039,531	0
Projected usage with facility	355,700	60	12,334,800	21,039,531	0
Amount required in excess to site availability	0	0	0	0	0
NTS					
Site availability	176,844	45	5,716,000	0	0
Projected usage without facility	124,940	25	5,716,000	0	0
Projected usage with facility	135,140	27	8,716,000	0	0
Amount required in excess to site availability	0	0	3,000,000[a]	0	0
INEL					
Site availability	394,200	124	16,000,000	0	11,340
Projected usage without facility	232,500	42	5,820,000	0	11,340
Projected usage with facility	242,700	44	8,820,000	0	11,340
Amount required in excess to site availability	0	0	0	0	0

Table 4.3.3.2.1.2–1. Additional Site Infrastructure Needed for the Construction of the Ceramic Immobilization Facility (For Borehole)—Immobilized Disposition Alternative (Annual)—Continued

	Electrical		Fuel		
	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
Pantex					
Site availability	201,480	23	1,775,720	289,000,000	0
Projected usage without facility	46,266	10	795,166	7,200,000	0
Projected usage with facility	56,466	12.1	3,795,166	7,200,000	0
Amount required in excess to site availability	0	0	2,019,446[a]	0	0
ORR					
Site availability	13,880,000	2,100	416,000	250,760,000	16,300
Projected usage without facility	726,000	110	379,000	95,000,000	16,300
Projected usage with facility	736,200	112	3,379,000	95,000,000	16,300
Amount required in excess to site availability	0	0	2,963,000[a]	0	0
SRS					
Site availability	1,672,000	330	28,390,500	0	244,000
Projected usage without facility	794,000	116	28,390,500	0	221,352
Projected usage with facility	804,200	118	31,390,500	0	221,352
Amount required in excess to site availability	0	0	3,000,000[a]	0	0

[a] Fuel oil requirements in excess to site availability could be procured through normal contractual means.

Source: HF 1995a:1; INEL 1995a:1; LLNL 1996e; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; PX DOE 1995g; SRS 1995a:2.

Table 4.3.3.2.1.2–2. Additional Site Infrastructure Needed for the Operation of the Ceramic Immobilization Facility (for Borehole)—Immobilized Disposition Alternative (Annual)

	Transportation		Electrical		Fuel		
	Roads (km)	Railroads (km)	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
Facility Requirement	< 5	< 5	35,000	5	210,000	3,800,000	0
Hanford							
Site availability	420	204	1,678,700	281	14,775,000	21,039,531	91,708
Projected usage without facility	420	204	345,500	58	9,334,800	21,039,531	0
Projected usage with facility	425	209	380,500	63	9,544,800	24,839,531	0
Amount required in excess to site availability	< 5	< 5	0	0	0	3,800,000[a]	0
NTS							
Site availability	1,100[b]	0	176,844	45	5,716,000	0	0
Projected usage without facility	645	0	124,940	25	5,716,000	0	0
Projected usage with facility	650	<5	159,940	30	5,926,000	3,800,000	0
Amount required in excess to site availability	0	< 5	0	0	210,000[c]	3,800,000[a]	0
INEL							
Site availability	445	48	394,200	124	16,000,000	0	11,340
Projected usage without facility	445	48	232,500	42	5,820,000	0	11,340
Projected usage with facility	450	53	267,500	47	6,030,000	3,800,000	11,340
Amount required in excess to site availability	< 5	< 5	0	0	0	3,800,000[a]	0
Pantex							
Site availability	76	27	201,480	23	1,775,720	289,000,000	0
Projected usage without facility	76	27	46,266	10	795,166	7,200,000	0
Projected usage with facility	81	32	81,266	15	1,005,166	11,000,000	0
Amount required in excess to site availability	< 5	< 5	0	0	0	0	0
ORR							
Site availability	71	27	13,880,000	2,100	416,000	250,760,000	16,300
Projected usage without facility	71	27	726,000	110	379,000	95,000,000	16,300
Projected usage with facility	76	32	761,000	115	589,000	98,800,000	16,300
Amount required in excess to site availability	< 5	< 5	0	0	173,000[c]	0	0

Table 4.3.3.2.1.2–2. Additional Site Infrastructure Needed for the Operation of the Ceramic Immobilization Facility (for Borehole)—Immobilized Disposition Alternative (Annual)—Continued

	Transportation		Electrical		Fuel		
	Roads (km)	**Railroads (km)**	**Energy (MWh/yr)**	**Peak Load (MWe)**	**Oil (l/yr)**	**Natural Gas (m^3/yr)**	**Coal (t/yr)**
SRS							
Site availability	230	103	1,672,000	330	28,390,500	0	244,000
Projected usage without facility	230	103	794,000	116	28,390,500	0	221,352
Projected usage with facility	235	108	829,000	121	28,600,500	3,800,000	221,352
Amount required in excess to site availability	< 5	< 5	0	0	210,000[c]	3,800,000[a]	0

[a] Facility would be adapted to use fuel oil instead of natural gas.

[b] Includes paved and unpaved roads.

[c] Fuel oil requirements in excess to site availability could be procured through normal contractual means.

Source: HF 1995a:1; INEL 1995a:1; LLNL 1996e; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; PX DOE 1995g; SRS 1995a:2.

4.3.3.2.1.3 *Air Quality and Noise*

Construction and operation of the ceramic immobilization facility would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts, criteria and toxic/hazardous concentrations from this facility have been compared with Federal and State standards and guidelines for each site. Impacts for radiological airborne emissions are discussed in Section 4.3.3.2.1.9.

Noise impacts during either construction or operation are expected to be low. Air quality and noise impacts are described separately. Supporting data for the air quality and noise analysis are presented in Appendix F.

AIR QUALITY

Construction and operation of the facility would result in the emission of some pollutants at each of the sites. Emissions would typically not exceed Federal, State, or local air quality regulations or guidelines.

The principal sources of emissions during construction include the following:

- Fugitive dust from land clearing, site preparation, excavation, wind erosion of exposed ground surfaces, and possible operation of a concrete batch plant

- Exhaust and road dust generated by construction equipment, vehicles delivering construction materials, and vehicles carrying construction workers

The PM_{10} and TSP concentrations are expected to increase during the peak construction period. Appropriate control measures would be followed. It is expected that the sites will continue to comply with applicable Federal and State ambient air quality standards during construction.

Emission rates for operation of the ceramic immobilization facility are presented in Table F.1.3–8. Air pollutant emissions sources associated with operations include the following:

- Increased operation of existing boilers for space heating

- Operation of diesel generators and periodic testing of emergency diesel generators

[Text deleted.]

During operation, concentrations of criteria air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. The estimated pollutant concentrations for facility operation plus the No Action concentrations are presented in Table 4.3.3.2.1.3–1. There are no toxic/hazardous chemical emissions associated with this facility.

NOISE

The location of the facilities associated with the ceramic immobilization facility relative to the site boundary and sensitive receptors was examined for each of the sites to evaluate the potential contribution to noise levels at these locations and the potential for onsite and offsite noise impacts. Noise sources during construction may include heavy-construction equipment and increased traffic. Increased traffic would occur onsite and along offsite major transportation routes used to bring construction material and workers to the site.

Non-traffic noise sources associated with operation of these facilities include ventilation systems, cooling systems, and material handling equipment. These noise sources would be located at sufficient distance from offsite areas that the contribution to offsite noise levels would continue to be small. Due to the size of the sites,

Table 4.3.3.2.1.3–1. Estimated Operational Concentrations of Pollutants and Comparison With Most Stringent Regulations or Guidelines—Ceramic Immobilization Facility and No Action Alternative (For Borehole)—Immobilized Disposition Alternative

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] (μg/m³)	Hanford No Action (μg/m³)	Hanford Total (μg/m³)	NTS No Action (μg/m³)	NTS Total (μg/m³)	INEL No Action (μg/m³)	INEL Total (μg/m³)	Pantex No Action (μg/m³)	Pantex Total (μg/m³)	ORR No Action (μg/m³)	ORR Total (μg/m³)	SRS No Action (μg/m³)	SRS Total (μg/m³)
Criteria pollutant														
Carbon monoxide	8-hour	10,000	0.08	5.15	2,290	2,294.03	284	296.7	602	650.7	5	6.26	22	65.35
	1-hour	40,000	0.3	40.58	2,748	2,776.46	614	646.2	2,900	3,155	11	13.6	171	375.1
Lead	Calendar Quarter	1.5	<0.01	b	b	b	0.001	0.001	0.09	0.09	0.05	0.05	<0.01	<0.01
	24-hour	0.5	<0.01	<0.01	c	c	c	c	c	c	c	c	c	c
Nitrogen dioxide	Annual	100	0.03	0.08	b	0.01[d]	4	4.07	2.15	2.43	3	3.01	5.7	5.92
Ozone	1-hour	235	e	e	c	c	c	c	c	c	c	e	e	e
Particulate matter less than or equal to 10 microns in diameter	Annual	50	<0.01	<0.01	9.4	9.4	5	5	8.73	8.74	1	1	3	3.01
	24-hour	150	0.02	0.04	106	106	80	80.06	88.5	88.71	2	2.01	50.6	50.79
Sulfur dioxide	Annual	52	<0.01	<0.01	8.4	8.4	6	6	<0.01	0.03	2	2	14.5	14.51
	24-hour	260	<0.01	0.04	94.6	94.62	135	135.1	<0.01	0.28	32.01	32.01	196	196.24
	3-hour	1,300	0.01	0.22	725	725.1	579	579.3	<0.01	1.50	80	80.03	823	824.53
	1-hour	1,018	0.02	0.65	c	c	c	c	c	c	c	c	c	c
	1-hour	655[f]	0.02	0.65	c	c	c	c	c	c	c	c	c	c
	30-minute	1,045	c	c	c	c	c	c	<0.01	4	c	c	c	c
Mandated by State														
Hydrogen fluorides (as HF)	30-day	0.8	b	b	c	c	c	c	<0.75	<0.75	0.2	0.2	0.09	0.09
	7-day	1.6	b	b	c	c	c	c	<0.75	<0.75	0.3	0.3	0.39	0.39
	24-hour	2.9	b	b	c	c	c	c	0.75	0.75	0.6[g]	0.6[g]	1.04	1.04
	12-hour	3.7	b	b	c	c	c	c	1.05	1.05	0.6[g]	0.6[g]	1.99	1.99
	8-hour	250	b	b	c	c	c	c	c	c	0.6	0.6	c	c
	3-hour	4.9	b	b	c	c	c	c	4.21	4.21	c	c	c	c

Table 4.3.3.2.1.3–1. Estimated Operational Concentrations of Pollutants and Comparison With Most Stringent Regulations or Guidelines—Ceramic Immobilization Facility and No Action Alternative (For Borehole)—Immobilized Disposition Alternative—Continued

			Hanford		NTS		INEL		Pantex		ORR		SRS	
Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)	No Action (μg/m³)	Total (μg/m³)
Hydrogen sulfide	1-hour	112	c	c	b	b	c	c	c	c	c	c	c	c
	30-minute	111	c	c	c	c	c	c	b	b	c	c	c	c
Total suspended particulates	Annual	60	<0.01	<0.01	c	c	5	5	c	c	c	c	12.6	12.61
	24-hour	150	0.02	0.04	c	c	80	80.06	c	c	2	2.01	c	c
	3-hour	200	c	c	c	c	c	c	b	1.19[d]	c	c	c	c
	1-hour	400	c	c	c	c	c	c	b	3.20[d]	c	c	c	c
[Text deleted.]														

[a] The more stringent of the Federal and State standards is presented for the averaging time.

[b] No sources of this pollutant have been identified.

[c] No State standard for indicated averaging time.

[d] The concentration represents the alternative contribution only.

[e] Ozone, as a criteria pollutant, is not directly emitted nor monitored by the sites. See Section 4.1.3 for a discussion of ozone-related issues.

[f] At Hanford, the level is not to be exceeded more than twice in any 7 consecutive days.

[g] 8-hour averaging time concentration was used.

[Text deleted.]

Note: Total concentrations are based on site contribution, including concentrations from ongoing activities (No Actions), and do not include the contribution from non-facility sources. Concentrations for other hazardous/toxic pollutants reported for No Action in Section 4.2 are unchanged for this alternative and are not shown here.

Source: 40 CFR 50; ID DHW 1995a; ID DHW 1995b; LLNL 1996e; LLNL 1996h; NV DCNR 1995a; SC DHEC 1991a; SC DHEC 1992b; TN DEC 1994a; TN DHE 1991a; TX ACB 1987a; TX NRCC 1992a; TX NRCC 1995a; WA Ecology 1994a.

noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may result in impacts such as disturbance of wildlife.

4.3.3.2.1.4 *Water Resources*

The construction and operation of a ceramic immobilization facility would affect water resources. Water resource requirements, and discharges provided in Tables C.1.1.3–3 and C.2.1.3–3 and Table E.3.3.3–1, were used to assess impacts to surface water and groundwater. The discussion of impacts is provided for each site separately. Table 4.3.3.2.1.4–1 presents No Action surface and groundwater uses and discharges at each site, and the potential changes to water resources resulting from construction and operation of the ceramic immobilization facility.

Hanford Site

Surface Water. Surface water would be used as the water source for construction and operation of the ceramic immobilization facility, and would be obtained from the Columbia River. During construction, the quantity of water required would be approximately 38 million l/yr (10 million gal/yr), which would represent less than a 0.3-percent increase over the existing annual surface water withdrawal. These additional withdrawals would cause negligible impact to surface water availability.

During operation, water requirements for the ceramic immobilization facility would be approximately 320 million l/yr (84.5 million gal/yr), which would represent a 2.4-percent increase over the existing surface water withdrawal.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (29.6 million l/yr [7.8 million gal/yr]), would be generated and discharged to percolation ponds at the 200 East Area. During operation, approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary and other wastewater would also be discharged to percolation ponds. All discharges would be monitored. Percolation of this treated wastewater into the unconfined aquifer could contribute to the rising, or mounding, of the water table at the 200 Areas. However, no other impacts to the aquifer would be expected.

Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater, when required. The wastewater would be monitored for radioactivity, and if uncontaminated, discharged to percolation ponds or storm drains that discharge to local drainage channels. Impacts to the unconfined aquifer would be the same as discussed above.

The ceramic immobilization facility would be located in the 200 Area which is above the 100-year, 500-year and probable maximum flood boundaries; flooding from dam failures; and flooding from a landslide resulting in river blockage.

Groundwater. No groundwater would be used for any project-related water requirements; therefore groundwater availability would not be affected. Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater. Treated wastewater which does not evaporate, however, could percolate downward toward the groundwater of the unconfined aquifer. This water would be monitored and would not be discharged until contaminant levels are within the limits. Impacts to groundwater quality would, therefore, not be expected. In addition, other factors limiting potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Table 4.3.3.2.1.4–1. Potential Changes to Water Resources Resulting From Ceramic Immobilization Facility (For Borehole)—Immobilized Disposition Alternative

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Water Source	Surface	Ground	Ground	Ground	Surface	Ground
No Action Water Requirements (million l/yr)	13,511	2,400	7,570	249	14,760	13,247
No Action Wastewater Discharge (million l/yr)	246	82	540	141	2,277	700
Construction						
Water Availability and Use						
Total water requirement (million l/yr)	38	38	38	38	38	38
Percent increase in projected water use[a]	0.3	1.6	0.5	15.2	0.3	0.3
Water Quality						
Total wastewater discharge (million l/yr)	29.6	29.6	29.6	29.6	29.6	29.6
Percent change in wastewater discharge[b]	12	36.1	5.5	21	1.3	4.2
Percent change in streamflow	neg	NA	NA	NA	0.06[c]	0.6[d]
Operation						
Water Availability and Use						
Total water requirement (million l/yr)	320	320	320	320	320	320
Percent increase in projected water use[e]	2.4	13.3	4.2	129	2.2	2.4
Water Quality						
Total wastewater discharge (million l/yr)	123.9	123.9	123.9	123.9	123.9	123.9
Percent change in wastewater discharge[f]	50.4	151	22.9	87.9	5.4	17.7
Percent change in streamflow	neg	NA	NA	NA	0.3[c]	2.5[d]

Table 4.3.3.2.1.4–1. Potential Changes to Water Resources Resulting From Ceramic Immobilization Facility (For Borehole)—Immobilized Disposition Alternative—Continued

Affected Resource Indicator	Hanford	NTS	INEL	Pantex	ORR	SRS
Floodplain						
Is action in 100-year floodplain?	No	No	No	No	No	No
Is critical action in 500-year floodplain?	No	Uncertain	Uncertain	No	Uncertain	Unlikely

[a] Percent increases in water requirements during construction of the ceramic immobilization facility are calculated by dividing water requirements for the facility (38 million l/yr) with that for No Action water requirement at each site: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

[b] Percent changes in wastewater discharged during construction for the ceramic immobilization facility are calculated by dividing wastewater discharges for the facility (29.6 million l/yr) with that for No Action discharge at each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

[c] Percent changes in stream flow from wastewater discharges are calculated from the average flow of Clinch River (132 m^3/s) and East Fork Poplar Creek (1.5 m^3/s). The comparison for the East Fork Poplar Creek is shown in the table.

[d] Percent changes in stream flow from wastewater discharges are calculated from the minimum flow of the Fourmile Branch (0.16 m^3/s).

[e] Percent increases in water requirements during operations of the ceramic immobilization facility are calculated by dividing water requirements for the facility (320 million l/yr) with that for No Action water requirement at each site: Hanford (13,511 million l/yr), NTS (2,400 million l/yr), INEL (7,570 million l/yr), Pantex (249 million l/yr), ORR (14,760 million l/yr), and SRS (13,247 million l/yr).

[f] Percent changes in wastewater discharged during operation of the ceramic immobilization facility are calculated by dividing wastewater discharge for the facility (123.9 million l/yr) with that for No Action discharge at each site: Hanford (246 million l/yr), NTS (82 million l/yr), INEL (540 million l/yr), Pantex (141 million l/yr), ORR (2,277 million l/yr), and SRS (700 million l/yr).

Note: NA=not applicable; neg=negligible. Construction impacts are considered to be temporary, lasting only throughout the construction period. Impacts from operations would occur continuously.

Source: HF 1995a:1; INEL 1995a:1; LLNL 1996e; NTS 1993a:4; OR LMES 1995e; PX 1995a:1; SRS 1995a:2.

Nevada Test Site

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the facility; groundwater would be used as the water source for construction and operation of the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (29.6 million l/yr [7.8 million gal/yr]) would be generated, treated, and discharged to evaporation/percolation ponds or be available for recycle. During operation, approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary and other wastewater would be discharged to the wastewater treatment system and would then be available for recycle. Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater when required. This wastewater would be monitored for radioactivity, and if uncontaminated, would be available for recycling or discharge to local drainage channels.

Because there are no continuously flowing streams on NTS and no designated floodplains, there are no studies to assess the 500-year floodplain boundaries. Studies of the 100-year floodplain showed it to be confined to the Jackass Flats and Frenchman Lake areas. The site for the ceramic immobilization facility would not be located in either of these areas. However, since the NTS is in a region where most flooding occurs by locally intense thunderstorms which can create brief (less than 6 hours) flash floods, the facilities would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater. Quantities required and the percent increase in projected water use are shown in Table 4.3.3.2.1.4–1. Annual construction water requirements for the facility (38 million l/yr [10 million gal/yr]), represent approximately 0.2 percent of the estimated minimal annual recharge (38 billion l/yr [10 billion gal/yr]) to the regional aquifer under the entire NTS. As shown in Table 4.3.3.2.1.4–1, the quantity of water which would be required for construction of the facility represents approximately a 1.6-percent increase over the projected No Action groundwater usage. Operating the facilities at NTS would require 320 million l/yr (84.5 million gal/yr), which is approximately 13.3 percent of the projected groundwater usage. This additional withdrawal would represent 0.8 percent of the estimated minimal annual recharge, and would increase the total amount withdrawn annually at NTS to 7.2 percent of the estimated annual recharge. These additional withdrawals would have minimal impacts on groundwater availability.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater. Treated wastewater discharged to disposal ponds, however, could percolate downward into the groundwater of the Valley-Fill Aquifer. This water would be monitored and would not be discharged until contaminant levels were within the limits specified. Impacts to groundwater quality are therefore not expected. Other factors limiting potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Idaho National Engineering Laboratory

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with the facility; groundwater would be used as the water source for the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (29.6 million l/yr [7.8 million gal/yr]), would be generated, treated, and discharged to evaporation/infiltration ponds or be available as recycle. During operation, a maximum of approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary and other wastewater would be discharged to this wastewater treatment system. All discharges would be monitored to comply with discharge limits. Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater, when required. This wastewater would be monitored for radioactivity, and if uncontaminated, discharged to evaporation ponds or storm drains which discharge to local drainage channels.

The site for the ceramic immobilization facility is not located in an area historically prone to flooding, but is within the flood zone that could occur as a result of the failure of the MacKay Dam during a maximum probable flood. This flood event would be more critical than either the 100- or 500-year flood. Because INEL is in a region where flash floods could occur, the facility would be designed to withstand such flooding.

Groundwater. All water required for construction and operation would be supplied from groundwater from the Snake River Plain Aquifer. During construction, water requirements for the facility (38 million l/yr [10 million gal/yr]) would represent a 0.5-percent increase over the projected annual groundwater usage. This would increase the total projected amount to be pumped at INEL to 17.7 percent of the total allotment. As discussed in Section 3.4.4, a groundwater allotment not to exceed 43,000 million l/yr (11,360 million gal/yr), has been negotiated by DOE with the Idaho Department of Water Resources (DOE 1991c:4-73). During operation, the water requirements for the facilities would be 320 million l/yr (84.5 million gal/yr). This amount would represent a 4.2-percent increase over the projected annual groundwater usage and would increase the total projected amount to be pumped at INEL to 18.3 percent of the total allotment. This increase should not have any impact on groundwater availability, as INEL would be well within its total allotment.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater and would not be expected to contribute to existing near surface contamination. Treated wastewater which does not evaporate, however, could percolate downward toward the groundwater of the Snake River Plain Aquifer. This water would be monitored and would not be discharged into the treatment ponds until contaminant levels are within the limits. Impacts to groundwater quality are therefore not expected. In addition, other factors limiting potential impacts to groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates.

Pantex Plant

Surface Water. No surface water would be withdrawn for any construction or operation activities associated with any of the facilities; groundwater would be used as the water source for construction and operation of the ceramic immobilization facility. Therefore, there would be no impacts to surface water availability.

[Text deleted.]

During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (29.6 million l/yr [7.8 million gal/yr]), would be generated and discharged to the existing wastewater treatment systems north of Zone 12 and then discharged to the playa lakes or would be available for recycling. During operation, approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary wastewater and other wastewater would be discharged to either of these wastewater treatment systems, and then discharged to the playa lakes or would be available for recycling. The expected quantity of additional wastewater potentially discharged to the playas during operation (approximately 339,500 l/day [89,700 gal/day]) should not cumulatively cause any exceedances of the monthly average limit of 2.46 million l/day (0.65 million gal/day). This is based on Pantex's 1994 discharges, which averaged approximately 1.4 million l/day (0.37 million gal/day), and are expected to decline in the future.

Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater, when required. This wastewater would be monitored for radioactivity, and if uncontaminated, discharged to natural drainage channels or the playas.

The proposed location for the ceramic immobilization facility is in Zone 4. Since no 100-year, 500-year, or standard project flood boundaries have been delineated in Zone 4, there would be no impacts to floodplains. However, flooding at Pantex could occur due to the runoff associated with precipitation and ponding in local playas (LLNL 1988a:XVI).

Groundwater. All water required for construction and operation would be supplied from groundwater using the existing supply system which obtains water from the Ogallala Aquifer. Construction water requirements for the ceramic immobilization facility would be small relative to the recoverable water in aquifer storage, which for the year 2010 was estimated to be 287 trillion l (75.8 trillion gal) (PX WDB 1993a:1). As shown in Table 4.3.3.2.1.4–1, construction of the facility would require 38 million l/yr (10 million gal/yr) of water, which represents approximately a 15.2-percent increase over the projected annual No Action groundwater usage. [Text deleted.] Previous studies have shown that when the Amarillo City Well Field pumped 18.5 billion l/yr (4.9 billion gal/yr) from the Ogallala Aquifer, an average of 1.8-m/yr (5.9-ft/yr) decline in the water table occurred over a 10-year period in the local well field area. This water level decline caused a shift in the groundwater flow direction beneath Pantex. Operating the ceramic immobilization facility at Pantex would require 320 million l/yr (84.5 million gal/yr), which represents approximately a 129-percent increase over the projected annual No Action groundwater usage and 16.9 percent of the capacity of the groundwater system. The small additional drawdown attributed to this additional withdrawal would add to the declining groundwater levels in the area thus decreasing regional availability. The total site groundwater withdrawal including this facility would be 569 million l/yr (150.3 million gal/yr) which because of expected cutbacks in other programs, would be 32 percent less than the 836 million l/yr (221 million gal/yr) currently being withdrawn from wells at Pantex.

Construction and operation of the ceramic immobilization facility would not result in direct discharges to groundwater. Treated wastewater discharged to playas, however, could percolate downward into the groundwater of the near surface aquifer. This water would be monitored and would not be discharged to the playas until contaminant levels are within the limits specified by the TNRCC. [Text deleted.]

Although the expected drawdowns caused by withdrawing the water required for this alternative are small, the overall decline in groundwater levels in the Amarillo area is of concern. Possible groundwater conservation measures at Pantex that could be considered include decreasing research farm irrigation demands through dry farming, installing dripless faucets, and process water reuse. In addition, to alleviate some of the effects from pumping groundwater from the Ogallala Aquifer, the city of Amarillo is considering supplying treated wastewater to Pantex from the Hollywood Road Wastewater Treatment Plant for industrial use. However, details of this measure have not been determined.

Oak Ridge Reservation

Surface Water. Water required for construction and operation of the ceramic immobilization facility would be provided by the Clinch River and its tributaries. Water required during construction would be approximately 38 million l/yr (10 million gal/yr) which would represent a 0.3-percent increase over the projected annual surface water withdrawal. This additional withdrawal would be approximately 0.0009 percent of the average flow of the Clinch River. During operation, water requirements would be approximately 320 million l/yr (84.5 million gal/yr) annually. This would represent a 2.2-percent increase over the projected annual surface water withdrawal. Including this increase, ORR's total annual withdrawal would be 0.4 percent of the average flow of the Clinch River (132 m^3/s [4,647 ft^3/s]). These additional water withdrawals from the Clinch River

would cause negligible impacts to surface water availability. [Text deleted.] During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (approximately 29.6 million l/yr [7.8 million gal/yr]) would be generated, treated, and discharged to the East Fork Poplar Creek and would represent a 1.3-percent increase in the amount being discharged. During operation, a total of 123.9 million l/yr (32.7 million gal/yr) of wastewater would be generated by the facility. This quantity would represent 0.3 percent of the average flow of East Fork Poplar Creek and a 5.4-percent increase in the amount of wastewater being discharged. All discharges would be monitored to comply with discharge requirements. No impacts are expected. Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored, sampled, and treated as process wastewater, when required. This wastewater would be monitored for radioactivity, and if uncontaminated, discharged to storm drains which discharge to local drainage channels.

The potential location for the ceramic immobilization facility would be located outside of the 100-year floodplain. The 500-year floodplain has not been determined in this area but could be developed in future studies.

Groundwater. No groundwater would be used for any project-related water requirements and no wastewater would be discharged directly to groundwater; therefore, neither groundwater quality nor availability would be affected.

Savannah River Site

Surface Water. No surface water withdrawals would be made; groundwater would be used for all construction and operational needs of the ceramic immobilization facility. [Text deleted.] During construction of the ceramic immobilization facility, sanitary and other nonhazardous wastewater (approximately 29.6 million l/yr [7.8 million gal/yr]), would be generated and discharged to the sitewide wastewater treatment system which would not require any modifications. This wastewater would represent a 4.2-percent increase in the effluent from the site. During operation, approximately 123.9 million l/yr (32.7 million gal/yr) of sanitary wastewater would be discharged to this wastewater treatment system. This would represent a 17.7-percent increase in the projected effluent discharged to Fourmile Branch from this facility. This additional quantity would represent approximately 2.5 percent of Fourmile Branch's minimum flow. All discharges would be monitored to comply with discharge requirements. [Text deleted.] Other nonhazardous wastewater effluents (for example, steam condensate from heating, condensation from air conditioning, fire sprinkler water) would be collected, monitored for radioactivity, and if uncontaminated, discharged to storm drains which discharge to local drainage channels. If contaminated, this wastewater would then be transferred by pipeline or tanker to treatment facilities as required.

The potential location of the ceramic immobilization facility is outside the 100-year floodplain. Information on the location of the 500-year floodplain at SRS is currently available only for a limited number of specific project areas. However, the ceramic immobilization facility at SRS would not likely affect, or be affected by the 500-year floodplain of either the Fourmile Branch or Upper Three Runs Creek because the facility would be located at an elevation of about 91 m (300 ft) above MSL and is approximately 33 m (107 ft) and 64 m (210 ft) above these streams and at distances from these streams of 0.8 km (0.5 mi) to 1.5 km (0.94 mi), respectively. The maximum flow that has occurred on the Upper Three Runs Creek was in 1990, with a flow rate of about 58 m^3/s (2,040 ft^3/s). At that time the creek reached an elevation of almost 30 m (98 ft) above MSL (SR USGS 1996a:1). The elevations of the buildings in F-Area are more than 63 m (202 ft) above the highest flow elevation of the Upper Three Runs Creek. The maximum flow that has occurred on the Fourmile Branch was in 1991 with a rate of approximately 5 m^3/s (186 ft^3/s), and an elevation of about 61 m (199 ft) above MSL (SR USGS 1996a:1). Elevations of the buildings in F-Area are more than approximately 31 m (101 ft) higher than the maximum flow level that has occurred.

Groundwater. During construction, the quantity of water required would be approximately 38 million l/yr (10 million gal/yr) which would represent less than a 0.3-percent increase over the projected annual No Action groundwater withdrawal. This additional withdrawal should cause negligible impacts to groundwater availability. During operation, water used for cooling system makeup would be obtained from existing supply systems in the F-Area. The water for these systems is groundwater from the Cretaceous aquifer. The total annual water requirements during operations would be 320 million l/yr (84.5 million gal/yr). As shown in Table 4.3.3.2.1.4–1, this would represent a 2.4-percent increase in the projected No Action groundwater usage at SRS. These additional water withdrawals from groundwater would not impact regional groundwater levels. Previous studies using numerical simulations of groundwater withdrawals up to 6 times greater than that required for the ceramic immobilization facilities from the Cretaceous aquifer indicate drawdown of almost 2.1 m (6.9 ft) at the well head, but smaller in overlying aquifers and not beyond SRS boundaries in any aquifer (DOE 1991c:5-196). Therefore, it is expected that the withdrawals attributed to these facilities would cause a small drawdown at the well head and would not impact aquifers in the area. No wastewater would be discharged directly to groundwater; therefore, groundwater quality would not be affected.

[Text deleted.]