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 A

December 1996

For Further Information Contact:
U.S. Department of Energy
Office of Fissile Materials Disposition, 1000 Independence Ave., SW, Washington, DC 20585

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

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CONTACTS:

For further information on this programmatic environmental impact statement (PEIS), call (202) 586-4513 or fax (202) 586-4078 or contact:
Mr. J. David Nulton
Director
Office of NEPA Compliance and Outreach
Office of Fissile Materials Disposition
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
(202) 586-4513

For further information on the U.S. Department of Energy/*National Environmental Policy Act* (NEPA) process, call (800) 472-2756 or contact:
Ms. Carol Borgstrom
Director
Office of NEPA Policy and Assistance (EH-42)
Office of Environment, Safety and Health
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
(202) 586-4600

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

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

Volume II - Part A

United States Department of Energy
Office of Fissile Materials Disposition

December 1996

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

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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}

Chapter 4
Environmental Consequences

The potential environmental consequences resulting from the proposed weapons-usable fissile materials storage alternatives, the Pu disposition alternatives, and the No Action Alternative are described in this chapter for each of the sites, environmental settings, and resource/issue areas described in Section 3.0. The impact methodology applied for each of these resource/issue areas is described in Section 4.1. In addition, descriptions of methodologies applied and the resulting environmental consequences for intersite transportation and environmental justice are found in Sections 4.4 and 4.5, respectively.

Section 4.2 describes the environmental consequences associated with the No Action Alternative and the long-term storage alternatives. Table 4–1 identifies the pages within the document where environmental consequences of the alternatives are analyzed for each of the sites. [Text deleted.] Environmental impacts of each long-term storage alternative and the No Action Alternative are analyzed for each of the six candidate storage sites to allow (1) the comparison of impacts by sites for each alternative and (2) the comparison of impacts by alternatives for each site. As a result, decisions can be made to select a single storage alternative for all sites, or a combination of different alternatives for different sites.

Table 4–1. Key to Locating Information on Environmental Consequences and Mitigation Measures for Storage Alternatives by Page Number[a]

	Sites							
Alternatives	Hanford	NTS	INEL	Pantex	ORR	SRS	RFETS	LANL
No Action Alternative	4–23	4–83	4–131	4–182	4–240	4–291	4–343	4–363
Preferred Alternative	4–859	4–859	4–859	4–859	4–859	4–859	4–859	4–859
Upgrade at Multiple Sites Alternative	4–23	NA	4–131	4–182	4–240	4–291	NA	NA
Consolidation of Pu Alternative	4–23	4–83	4–131	4–182	NA[b]	4–291	NA	NA
Collocation of Pu and HEU Alternative	4–23	4–83	4–131	4–182	4–240	4–291	NA	NA

[a] See also Sections 4 4 (Intersite Transportation) and 4.5 (Environmental Justice).
[b] Consolidated Pu storage at ORR would create an HEU collocation condition and is analyzed as part of the Collocation Alternative.
Note: NA=alternative does not apply at the site.

For the Pu disposition alternatives analyzed in Section 4.3, specific site characteristics, as well as generic representative environmental settings, have been used in this PEIS for analyzing the potential environmental impacts of disposition technology alternatives. Six DOE sites and other generic and specific sites were used for assessing the environmental impacts of various disposition technologies and strategies. The locations of the new facilities considered for the various disposition technologies are representative and for analysis purposes only. Table 4–2 identifies the locations in this document where the disposition alternatives and common activities, and sites and environmental settings, have been analyzed. Since the disposition decision to be made encompasses the programmatic strategy and technology or technology mix that would be employed for disposition of the various forms of surplus weapons-usable Pu materials, generic cumulative environmental impact analysis of locating more than one disposition facility at a single site is described in Sections 4.6 and 4.7. Site-specific analysis would be made in follow-on tiered NEPA documentation.

Although analyzed individually, both pit disassembly/conversion and Pu conversion are front-end processes common to all of the disposition alternatives (except No Action). MOX fuel fabrication is a common activity to all of the reactor alternatives. In addition to a potential new MOX fuel fabrication facility that would be built in the United States, the Existing LWR Alternative initially could include MOX fuel fabrication abroad on an interim basis.

Table 4–2. Key to Locating Information on Environmental Consequences and Mitigation Measures for Disposition Alternatives by Page Number

	Analysis Sites and Environmental Settings						
Alternatives and Common Activities	**Hanford**	**NTS**	**INEL**	**Pantex**	**ORR**	**SRS**	**Generic**
Preferred Alternative	4–859	NA	4–859	4–859	NA	4–859	NA
Common Activities							
Pit Disassembly/Conversion Facility	4–383	4–383	4–383	4–383	4–383	4–383	NA
Pu Conversion Facility	4–427	4–427	4–427	4–427	4–427	4–427	NA
Deep Borehole Category							
Direct Disposition Alternative	NA	NA	NA	NA	NA	NA	4–474
Immobilized Disposition Alternative							
Ceramic Immobilization Facility (for Borehole)	4–496	4–496	4–496	4–496	4–496	4–496	NA
Deep Borehole Complex	NA	NA	NA	NA	NA	NA	4–543
Immobilization Category							
Vitrification Alternative	4–561	4–561	4–561	4–561	4–561	4–561	NA
Ceramic Immobilization Alternative	4–605	4–605	4–605	4–605	4–605	4–605	NA
Electrometallurgical Treatment Alternative[a]	NA	NA	4–657	NA	NA	NA	NA
Reactor Category and Common Activities							
MOX Fuel Fabrication							
New Domestic Facility	4–673	4–673	4–673	4–673	4–673	4–673	4–673
Existing European Facility	NA	NA	NA	NA	NA	NA	NA
Existing LWR Alternative	NA	NA	NA	NA	NA	NA	4–720
Partially Completed LWR Alternative	NA	NA	NA	NA	NA	NA	4–735
Evolutionary LWR Alternative	4–749	4–749	4–749	4–749	4–749	4–749	NA
CANDU Reactor Alternative[b]	NA	NA	NA	NA	NA	NA	4–809

[a] INEL is a representative site for the Electrometallurgical Treatment Alternative. If this alternative is selected, any of the six DOE sites could be used and subsequent NEPA documents would be prepared, as appropriate.

[b] Activities in Canada are not fully analyzed in this PEIS but are discussed in Section 4.3.5 5 and Appendix I.

Note: NA=not applicable.

For the ocean transportation of fissile materials associated with the European MOX fuel fabrication option, the intersite transportation section (Section 4 4) analyzes potential impacts to the global commons, pursuant to Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*. Although actions proposed in other countries are not analyzed in this PEIS, changes in CANDU reactor operations due to the use of MOX fuel are described in Appendix I.

As noted in Section 2.4, the final disposal of immobilized forms and domestically produced spent fuel for some disposition alternatives would be accomplished by sending the materials to a geologic repository pursuant to NWPA.[1] Since a repository site has not yet been recommended by the President and approved by Congress, this PEIS does not analyze impacts to a repository. Such a geologic repository, if approved under the provisions of the NWPA, would serve primarily as the disposal site for commercial and DOE-owned spent nuclear fuel and HLW. This impact analysis would be done in a separate EIS for the repository. Operation issues regarding the repository, however, are described in Appendix H.

A summary of the environmental consequences for all the proposed storage and disposition alternatives and the preferred alternative is presented in Section 4.6. Cumulative impacts associated with the alternatives are described in Section 4.7. Sections 4.8 through 4.11 provide descriptions of the following with regard to the alternatives: unavoidable adverse environmental impacts, avoided environmental impacts, relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitment of resources. Section 4.12 provides energy requirements and conservation potential of the various alternatives and mitigation measures.

4.1 METHODS FOR ASSESSING ENVIRONMENTAL IMPACTS

The environmental impact assessment methodologies discussed in this section address the full range of natural and human resource and issue areas pertinent to the sites considered for constructing and operating weapons-usable fissile materials storage and disposition alternatives. These resource/issue areas are 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. A summary of major Federal and State environmental, safety, and health statutes, regulations, and orders applicable to the various resource/issue areas is provided in Appendix J.

As part of the impact assessment process, mitigation measures are identified that could be used to reduce and minimize potential impacts. Because these mitigation measures vary from site to site, some mitigation strategies may need to be addressed in subsequent site-specific environmental documents and/or through agency coordination, as required.

4.1.1 LAND RESOURCES

The land resources analysis assesses land use and visual resources for the defined ROI. The ROI for land use includes land within 3.2 km (2 mi) of a given candidate site; the ROI for visual resources includes those lands within the affected viewshed of the proposed action. Land resources impacts are analyzed within the context of NEPA and other related Federal legislation and executive orders. Land-use impacts associated with site-specific alternatives are compared to existing land-use patterns and densities, and to land-use plans, policies, and controls. Visual resource impacts are associated with changes in the existing landscape character that could result from the proposed action. Land resources impacts associated with alternatives for which site-specific locations have not been identified are assessed generically. For example, based on technology descriptions and site infrastructure requirements, likely land resources impacts are characterized for a range of land-use and

[1] Under the NWPA, NRC may determine by rule that highly radioactive material requires permanent isolation as HLW in a geologic repository. Such a determination or legislative clarification may be required in order for the immobilized forms generated by the Immobilization Alternatives to be disposed of in a repository pursuant to NWPA.

visual resources conditions that could support the specific technology. The No Action Alternative is based on the most current site development and facility utilization plans.

Land Use. The land-use analysis estimates the magnitude and extent of potential impacts to current land-use patterns and densities due to the implementation of the alternative under consideration. The impact analysis identifies the amount of land disturbed during construction and used during operation; the total amount of land required; and potential changes in land use and conflicts with land-use plans, policies, and controls. Potential impacts to special status lands, including prime farmland, are emphasized. Possible conflict with any related legislation or regulation is assessed since major regulatory conflicts could conceivably impede or prevent implementation. Conflicts with State and local land-use plans, policies, and controls could result in potential impacts. Conflicts with site development and facility utilization plans could result in potential impacts.

For storage alternatives, the Storage and Disposition PEIS identifies the land area required for operation as the area occupied by the footprint of each building and nonbuilding support areas. In conjunction with paved road, parking areas, graveled areas, and any land graded and cleared of vegetation, they constitute the total land area requirements. Of the land required during operation, the "disturbed area" is the land that was not in use and was previously undisturbed natural habitat. Previously disturbed areas, include graveled areas and any land previously graded and cleared of vegetation. All areas within the existing perimeter intrusion detection boundaries are classified as already disturbed areas. The construction laydown area accommodates material and equipment storage, and provides limited onsite fabrication areas and temporary construction buildings to support construction activities. The criteria for determining disturbed and undisturbed land area during construction is the same as for operation. Therefore, facilities or construction laydown areas proposed to be situated entirely on previously disturbed land area would not create any newly disturbed area.

Visual Resources. The visual resources analysis identifies and evaluates the magnitude and extent of potential changes to the visual environment that could result from implementation of the proposed alternative. Visual resources assessments are based on the BLM VRM methodology. The existing landscape at each analysis site was assigned a VRM classification as defined in Section 3.1.1, ranging from 1 (pristine areas including designated wilderness and wild and scenic rivers) to 5 (areas where the natural character of the landscape no longer exists). Important objectives of visual resources analysis are the identification of the degree of contrast between the proposed action and the existing landscape, the location and sensitivity levels of viewpoints accessible to the public, and the visibility of the proposed action from the viewpoints. Sensitivity levels of viewpoints are based on the number and concerns of the observers. The distance from a viewpoint to the affected area and atmospheric conditions are also taken into consideration because distance and haze can diminish the degree of contrast and visibility.

The Storage and Disposition PEIS does not include a complete and detailed VRM assessment for each disposition alternative because design plans are not available. An assessment of visual impacts is performed using the degree of visual contrast between the proposed facilities or activities and the existing landscape character as seen from viewpoints accessible to the public, such as public roadways, recreation areas, special status lands, and residential areas. Sensitivity levels of the viewpoints and visibility of the affected area from those viewpoints are also taken into consideration. The reduction of assigned VRM classification could result if the affected area could be seen from a viewpoint with a high sensitivity level.

4.1.2 SITE INFRASTRUCTURE

Site infrastructure impacts are assessed by overlaying the support requirements of the various alternatives on the projected site infrastructure capacities. These impact assessments focus on electrical power requirements, road networks, rail interfaces, and fuel requirements. Projection of electricity availability, site development plans, and other DOE mid- and long-range planning documents are utilized to describe existing site infrastructure conditions. Tables are presented depicting additional infrastructure requirements estimated for each alternative. Data for these comparison tables were obtained from detailed data input reports describing each potential facility that would be required under the various alternative actions. Design mitigation considerations that might reduce infrastructure demand are identified, where possible, on a site-by-site basis.

Under some Pu disposition alternatives, specific analysis sites are not identified. As a result, no planning documents are available to provide descriptions of the site infrastructure or to establish a detailed baseline from which environmental consequences can be estimated. For these cases, generic environmental baselines were developed to define conditions for analysis purposes. Site infrastructure impacts are assessed by analyzing the specific facilities and activities associated with the alternative that are necessary to locate new missions at the unspecified sites. As stated above, tables are presented to depict the additional infrastructure requirements for each alternative as a result of the new missions. Impact assessments focus on the additional electrical power, road networks, rail interfaces, and fuel required to perform the new missions located at the unspecified sites.

Detailed assessments of the availability of electric power for the various storage and disposition facilities' electrical power requirements in the year 2005 timeframe are not considered practical. Electric utilities would not be expected to reliably project how they would meet the needs of these facilities (that is, whether by new power generation, power imports, or demand-side management). Therefore, the basis for this PEIS assessment is the supply and demand projections of the U.S. electric utilities published annually by the North American Electric Reliability Council.

For purposes of analysis, electricity generation is based on the assumption that electricity would be supplied by the power pool currently supplying the facility in question by using a mix of fuels and generating sources representative of those projected. These data are used to determine whether there would be enough reserve margin within a particular power pool to accommodate electrical requirements or if additional power is required. A detailed analysis, based on the proportional contributions from each fuel source, would be conducted in site-specific NEPA documents, as appropriate.

Four of the Pu disposition alternative technologies, specifically the existing LWR, evolutionary LWR, partially completed LWR, and CANDU reactor, have the ability to produce electricity while using Pu as MOX fuel. The environmental effects of this steam production are included in the analysis of the basic technologies since design of these reactors includes steam turbines to generate electricity. Selection of either of two alternatives, the partially completed LWR or the evolutionary LWR, would result in additional power line construction to distribute electricity to the power grid. The environmental impacts of this additional power line construction for these two alternative actions are not addressed in this PEIS but would be assessed in tiered, site-specific NEPA documents should either be chosen for implementation.

4.1.3 AIR QUALITY AND NOISE

Air Quality. Potential effects on the environment associated with air pollutant emissions from normal operations for each alternative are evaluated, and effects of construction emissions are discussed. The assessment of air quality impacts requires identification of applicable criteria for assessing impacts, the development of emission inventories, and the estimation of air pollutant concentrations. The assessment of impacts is based on the estimated concentrations, data on the existing environment, and the assessment criteria. Human health effects due to air pollutant emissions are discussed in the Public and Occupational Health and Safety sections and include consideration of airborne radioactive chemical releases and from accidents initiated by natural phenomenon (for example, tornadoes).

The assessment of potential impacts to air quality is based upon comparison of effects of each alternative with applicable State, local, or NAAQS. Assessment criteria for air pollutants include the EPA primary and secondary ambient air quality standards for criteria pollutants, specified in 40 CFR 50, and ambient standards established by each State. The more stringent of either the EPA or State standards serve as the assessment criteria. The assessment criteria for hazardous or toxic pollutants include guidelines or standards adopted or proposed by each State. Hazardous and toxic air pollutants include those listed in Title III of the 1990 CAA Amendments, in the NESHAP, in 40 CFR 61, and in standards or guidelines proposed or adopted by the respective states.

Certain hazardous pollutants for specific industrial processes are regulated by NESHAPs. No sources to which NESHAPs apply have been identified for the alternatives being evaluated except for sources of beryllium which are discussed in the health effects sections. Some of the sites have existing NESHAPs sources for which emissions are quantified under the No Action alternative.

No Action concentrations of pollutants were determined by modeling site emissions. Site-specific emissions are modeled in accordance with the guidelines presented in the EPA's *Guidelines on Air Quality Models*. The EPA recommended Industrial Source Complex Short Term Model, Version 2 (ISCST2) was selected as the most appropriate model to perform the air dispersion modeling analysis because it is designed to support the EPA regulatory modeling program and is capable of handling multiple sources, including different source types. The air quality modeling analysis performed for the sites is a "screening level" analysis incorporating conservative assumptions applied to each of the sites so that the impacts associated with the respective alternatives could be compared among the sites. The "highest-high" concentration for each pollutant and averaging time is selected for comparison to the applicable assessment criteria, instead of the less conservative EPA-recommended "highest-high" and "highest second-highest" concentration for longer-term and short-term averaging times, respectively. The concentrations evaluated are the maximum occurring at or beyond the site boundary or public access road and include the contribution from the alternative and the baseline concentration. Concentrations presented for each alternative include the criteria pollutants CO, Pb, NO_2, PM_{10}, SO_2; pollutants for which there are State-mandated standards; and hazardous and other toxic pollutants that are emitted for the specific alternative. Appendix F contains additional information on the ISCST2 model.

Ozone is a secondary pollutant formed in the atmosphere and is not directly emitted as a pollutant from the candidate sites. The primary pollutants contributing to ozone formation are NO_x and VOCs. The formation of ozone in the atmosphere is a regional issue and is contributed to by vehicular sources (mobile sources), natural sources, and stationary sources in a region. Ozone, as a criteria pollutant, was not evaluated for this programmatic evaluation since it is not directly emitted or monitored by the candidate sites, but NO_2 and VOC emissions were analyzed where applicable.

Additional assumptions incorporated into the air quality modeling at each site include: major source criteria pollutant emissions were modeled using actual source locations and stack parameters to determine environmental baseline and No Action criteria pollutant concentrations; toxic/hazardous pollutant emissions and sources with incomplete source characteristic information were modeled from a single source centrally located within the complex of facilities on each site assuming a 10-m (33-ft) stack height, a stack diameter of 0.3 m (1 ft), stack exit temperature equal to ambient temperature, and a stack exit velocity equal to 0.03 m/s (0.1 ft/s).

Input data for the model representing site emission rates were provided by the individual sites. Air emissions data for each alternative, other than No Action, are based on preconceptual design reports. Onsite or representative NWS meteorological data are used to define the dispersion characteristics of the site. Actual terrain heights are used for those sites not considered "flat."

The environmental consequences of construction activities on air quality are also described. Source control measures are described that are commonly used to control air pollutant emissions from construction activities. The concentrations presented in this document are the highest concentrations predicted by the model to present conservative estimates of pollutant concentrations.

The CAA, as amended in 1990 (U.S.C. 7506(c)), requires Federal actions to conform with the host State's "State Implementation Plan" (SIP). A SIP provides for the implementation, maintenance, and enforcement of NAAQS for the six criteria pollutants (that is, SO_2, PM_{10}, CO, O_3, NO_2 and Pb). The SIP's purpose is to eliminate or reduce the severity and number of violations of NAAQS and to expedite the attainment of these standards. No department, agency, or instrumentality of the Federal Government shall engage in, support in any way, or provide financial assistance for, license or permit, or approve any activity that does not conform to an applicable implementation plan.

The final rule for *Determining Conformity of General Federal Actions to State or Federal Implementation Plans* was established by EPA in November 30, 1993 (58 FR 63214), and took effect on January 31, 1994 (40 CFR Parts 6, 51, and 93). This rule establishes the conformity criteria and procedures necessary to meet the CAA until the required conformity SIP revision by each State is approved by EPA. Criteria for determining conformity are specified in some detail in the final rule, but basically ensure that emissions of all criteria air pollutants and VOCs from the action are specifically identified and accounted for in the SIP's attainment or maintenance demonstration.

The EPA has striven to ensure that the new conformity procedures are consistent with NEPA. This way, Federal agencies can incorporate the new conformity procedures into their existing NEPA procedures.

The EPA has limited the Conformity Rule to "nonattainment" areas or those areas classified after November 15, 1990, as "maintenance" areas. An area is designated as nonattainment for a criteria pollutant if it does not meet national primary or secondary ambient air quality standards for the pollutant (or if the area contributes to the ambient air quality of a nearby area that does not meet national primary or secondary ambient air quality standards). A "maintenance" area is an area a State has redesignated from nonattainment to attainment; accordingly, the State must submit to EPA a plan for maintaining NAAQS as a revision to the SIP.

The candidate sites at Hanford, NTS, INEL, Pantex, ORR, and SRS are within existing attainment areas. Therefore, in regard to these criteria pollutants, the proposed storage and disposition action is not affected by the provisions of this rule.

Toxic air pollutants are addressed in both the Air Quality and Noise sections and the Public and Occupational Health and Safety sections for each of the potential sites. In the Air Quality sections, the maximum concentrations of toxic air pollutants at or beyond the site boundary are compared with the most stringent standard or guidance. VOCs are not addressed because there are no regulatory standards and because they are a secondary source of ozone. In addition, there is a wide variety of VOCs that could be emitted.

For the disposition facilities, the maximum concentrations of hazardous pollutants, including cleaning solvents and hydrocarbons, are also not addressed because there are no regulatory standards. There are a wide variety of cleaning solvents and hydrocarbons available. However, DOE would use cleaning solvents that would reduce the chemical exposure to the public and to workers to the maximum extent possible. Specific cleaning solvents would be identified and analyzed in detail in tiered NEPA documentation. In the Public and Occupational Health and Safety sections, a health risk is calculated based upon chemical concentration, toxicity, and PEL and RfC for non-cancer effects and a cancer risk based on the slope factor (cancer potency) of those compounds that are regulated or carcinogenic.

These differences in analytical method result in the presentation of pollutants that differ between the air quality analysis and public and occupational health analysis. In the air quality analysis, toxic pollutants with low emission rates and high toxicity will, in most cases, result in extremely low concentrations at or beyond the site boundary and are therefore not presented in the air quality analysis. On the other hand, these chemical pollutants may expose an onsite worker located 100 m (328 ft) from the emission source to an unacceptable risk and therefore are presented in the analysis, hence the type and form of data used to evaluate these two areas can and will be different and may require different data sources. For example, compliance to standards neither considers what health effects are expected nor the interaction between several chemicals that may cumulatively cause health responses even if they separately are at acceptable concentrations.

Noise. The acoustical environment both onsite and offsite may be affected during construction and operations of the proposed facilities. Construction and operation noise sources and the potential for onsite and offsite impacts are discussed. The discussion is based on information available on the potential types of noise sources and the location of the proposed facilities relative to the site boundary and noise-sensitive locations. Acoustics impacts are assessed on the basis of the potential degree of change in noise levels at sensitive receptors (for example, residences near the site boundary) with respect to ambient conditions. Most nontraffic noise sources associated with construction and operation of the proposed storage and disposition facilities are located at sufficient distances from offsite noise-sensitive receptors that the contribution to offsite noise levels is expected to be small. The analysis uses available information on the potential types of noise sources and the location of proposed alternative facilities relative to the site boundary and noise-sensitive locations.

4.1.4 WATER RESOURCES

The availability and quality of water resources (surface water and groundwater) and the presence of floodplains may play a significant role in the acceptability of sites for this program. Impacts to water resources at a site could affect surrounding communities as well as the proposed project. Important legislation that protects water resources includes the CWA, especially Sections 402 (NPDES) and 307(b) (Pretreatment Standards), and the SDWA. In addition, DOE regulations 10 CFR 1022, *Compliance with Floodplains/Wetlands Environmental Review Requirements*, which implement Executive Orders 11988 and 11990, require evaluation of the potential effects of their actions in floodplains and wetlands.

Water resources include both surface water and groundwater. The main issues related to water resources include the following: (1) whether there is sufficient water available for both the proposed alternative and local domestic consumption, (2) whether water quality will be degraded or further degraded, (3) whether proposed actions challenge legislative or regulatory compliance, and (4) whether actions are threatened by flooding.

Surface Water Availability. Impact assessment on water availability was analyzed by comparing the rates of water consumption and wastewater discharge during construction and operation of proposed long-term storage and disposition facilities to volumes or use rates for No Action water sources. For sites that obtain water from surface water sources, a comparison was performed for both No Action water use and stream flow. For each storage and disposition alternative, water-use rates for construction and operation activities at each site or for each technology under each option or alternative were taken from technical reports prepared for specialized alternatives. The water use at a site was the sum of water use for waste treatment, storage, or disposal operations. The existing water supply is evaluated to determine its capacity to support an increased demand by comparing a projected increase with the capacity of the supplier and with existing water rights, agreements, and allocations.

The analysis assumed that water for the proposed long-term storage and disposition activities would be withdrawn from the current water source at each site. The surface water, groundwater, or municipal water source is part of the water resources affected and described in Chapter 3. However, at Pantex, the city of Amarillo has offered the use of reclaimed wastewater from the Hollywood Road Waste Treatment Plant as a potential source of water when large water requirements are needed. Where surface water is the current source, surface flow data were also evaluated.

Domestic consumption of regional water supplies by the anticipated workforce is addressed to determine if the projected supply of public water might result in or intensify potential water shortages. The impact assessment methodology presented is applied for all alternatives, including No Action.

Surface Water Quality. The assessment of potential water quality impacts include the type (for example, wastewater effluent, or stormwater runoff, or cooling tower blowdown [rapid discharge of water from the cooling tower to the receiving water body]), rate, and concentrations of potential discharge constituents, including sediment loading. Water quality management practices employed at each site also are reviewed. Parameters with the potential to further degrade existing water quality, along with parameters that could violate existing NPDES permit limits, are identified.

During the construction period, impacts to surface water resources could occur from runoff and sedimentation as a result of site clearing. During operations, impacts to water resources could occur through increased runoff from buildings, parking lots, and cleared areas. These impacts would be proportional to the amount of land disturbed and would be minimized by application of standard management practices for stormwater runoff and erosion control.

During operations, stormwater runoff could be contaminated with materials deposited from airborne pollutants. Impacts from stormwater runoff are expected to be minor, but they are highly site-specific and would depend on the design, precipitation, topography, and surface water body.

Floodplains. Floodplains are identified from maps and existing environmental documents. Any facility operating within a 100-year floodplain, or a critical action within a 500-year floodplain, is analyzed for the environmental consequence to the floodplain. [Text deleted.]

If possible, no new storage or disposition facilities would be located in 100-year or 500-year floodplain areas identified from maps and existing environmental documents. The impacts of disposition activities on floodplains cannot be determined at this time because the specific locations of the disposition facilities for generic sites have not been selected. Therefore, the requirements of Executive Order 11988 *(Floodplain Management)* and 10 CFR 1022 *(Compliance with Floodplain/Wetland Environmental Review Requirements)* would be examined in follow-on NEPA documentation, as appropriate.

Groundwater Availability. Environmental impacts to groundwater availability and usage are determined by addressing the potential change in demand as a result of program activities during the construction and operation phases. Estimates of drawdowns in the affected aquifers, both onsite and offsite, are calculated. Instances are identified where groundwater use may exceed locally developed groundwater supplies. Existing water rights for the major water users, as well as contractual agreements for water supply to the sites from support communities, are summarized. Impacts associated with construction and operation withdrawals are described, including potential effects on existing areas of contaminated groundwater. Withdrawals of groundwater to supply water for the storage and disposition facilities could cause movement of existing groundwater contamination plumes. This could occur where water levels are lowered by withdrawals. If necessary, potential impacts on existing areas of contamination would be evaluated in detail in site-specific environmental documents.

Groundwater Quality. Potential groundwater quality impacts associated with pollutant discharges during construction and operation phases (for example, sanitary wastes) are examined. The results of the groundwater quality projections then are compared to Federal and State groundwater quality standards, effluent limitations, and safe drinking water standards to assess the impacts of each alternative.

4.1.5 GEOLOGY AND SOILS

The geology and soil resource impact analysis consists of an evaluation of the effects generated by the construction and operation of a proposed alternative on specific geologic and soil resource attributes. Construction activities represent the principal means by which an effect to the geologic resource (limiting access to mineral or energy resources) and the soil resource (increasing the potential for soil erosion) would occur. The impact analysis also considers the effects on these attributes resulting from other past, present, and reasonably foreseeable future site improvements within the defined ROI. The principal element in assessing the effect on the geologic and soil resource is the amount and location of land disturbed during construction of the alternative.

Key factors in the impact analysis of geologic and soil resources for the disposition alternatives focus on the amount of land disturbed during construction and operations. For the soil resource impact analysis, the climatic conditions at the sites are considered. Since these key factors varied only slightly for the disposition alternatives, the impact analysis is similar for all alternatives.

Geology. Impact analysis on the geologic resource by a proposed alternative involves the evaluation of potential effects to critical geologic resource attributes such as access to mineral and energy resources, destruction of unique geologic features, vibratory ground motion induced by seismic activity, subsidence induced by groundwater, and mass movement or ground shifting induced by the construction of facilities associated with an alternative. The impact analysis includes the analysis of large-scale geological conditions such as earthquakes, volcanism, geological resources, and sinkhole development. Human health effects from accidents initiated by natural phenomenon (for example, earthquakes) are discussed in the Public and Occupational Health and Safety sections. These conditions tend to affect broad expanses of land and are not typically restricted to smaller discrete areas of land. The analysis of these conditions is provided for the storage alternatives and also applies to the disposition alternatives as appropriate.

Soil. Impact analysis on the soil resource by a proposed alternative involves the evaluation of potential effects to specific soil attributes such as soil erosion and shrink-swell potential by construction activities. [Text deleted.] Affects to the soil resource occur to small, discrete areas of land. The impact analysis for the soil resource is provided for each alternative.

4.1.6 BIOLOGICAL RESOURCES

During construction of storage and disposition facilities, impacts to biological resources may result from land-clearing activities, erosion and sedimentation, human disturbance and noise, and dewatering of foundations. Operations may affect biological resources as a result of changes in land use, salt drift from cooling systems, emissions of radionuclides, water withdrawal, wastewater discharge, and human disturbance and noise. In general, potential impacts are assessed based on the degree to which various habitats or species could be affected by an alternative. Where appropriate, impacts are evaluated with respect to Federal and State protection regulations and standards. The ROI for site-specific alternatives includes the entire DOE site under consideration, while the ROI for non-site-specific alternatives includes conditions representing various regions of the United States within which the alternative could be located.

Terrestrial Resources. Impacts of project activities on terrestrial plant communities are evaluated by comparing data on site or regional vegetation communities to proposed land requirements for both construction and operation. The analysis of impacts to wildlife is based to a large extent on plant community loss or modification, which directly affects animal habitat. The loss of important or sensitive habitats and species is considered more important than the loss of a regionally abundant type. Where alternatives are associated with specific sites, the disturbance, displacement, or loss of wildlife is evaluated. Migratory birds are discussed in a broader sense where alternatives are not site-specific, since they encompass a wide geographic area. Alternatives that may cause salt deposition are identified. [Text deleted.] Impacts on biotic resources from the release of radionuclides would be expected to be less than that on the human population. Humans have generally been shown to be the most sensitive organism to radiation release (AEC 1968a:220; NAS 1972a:34); radiological effects on humans are addressed in the human health sections.

Wetlands. The potential direct loss of wetlands resulting from construction and operation of storage and disposition facilities is addressed in a similar fashion as for terrestrial plant communities, that is, by comparing data on site or regional wetlands to proposed land requirements. Sedimentation impacts are evaluated based on the proximity of wetlands to project areas and the knowledge that erosion and sedimentation controls will be required. Where alternatives are site-specific, impacts resulting from increased flows are evaluated based on a relative comparison of expected discharge rates with stream flow rates. Impacts resulting from the introduction of thermal and chemical pollution into a wetland system are addressed recognizing that effluents are required to meet Federal and State standards. DOE regulations concerning proposed actions in wetlands (10 CFR 1022) were also considered.

Aquatic Resources. Impacts to aquatic resources resulting from sedimentation, increased flows, and the introduction of waste heat and chemicals are evaluated as described for wetlands. Potential impacts from radionuclides are not addressed for the same reasons described for terrestrial resources. Where alternatives are site-specific, impingement and entrainment impacts are evaluated based on a relative comparison of stream flow and intake volumes, recognizing that when intake volumes represent a large percentage of stream flow, the possibility of impingement and entrainment impacts exists. Compliance with protective measures, such as the *Anadromous Fish Conservation Act* (Appendix J), are addressed, as appropriate.

Threatened and Endangered Species. Impacts on threatened and endangered species are determined in a manner similar to that described for terrestrial and aquatic resources because the sources of potential impacts are similar. A list of species potentially present on each site or in each region was developed using information obtained from the USFWS, National Marine Fisheries Service, and appropriate State agencies and site-specific reports. This list, along with consideration of site environmental and engineering data, is used to evaluate whether the various alternatives could impact any threatened or endangered plant or animal (or its habitat). Consultations with USFWS and State agencies would be conducted at the site-specific level, as appropriate.

4.1.7 CULTURAL AND PALEONTOLOGICAL RESOURCES

The cultural and paleontological resources impact analysis evaluates the potential effects of the construction and operation of a proposed alternative on prehistoric, historic, Native American, and paleontological resources. Appropriate information regarding cultural resources includes the possibility that NRHP-eligible sites or important Native American resources may be affected, as well as the procedures for successful completion of the NHPA Section 106 identification or mitigation process. Section 106 requires Federal agencies to take into account the effects of their activities and programs on NRHP-eligible properties. Section 106 procedures include identification of resources, evaluation for NRHP eligibility, assessment of project effects, preservation or mitigation of affected eligible resources, and coordination and consultation with the appropriate SHPO and the Advisory Council on Historic Preservation.

Compliance with the *American Indian Religious Freedom Act* and the *Native American Graves Protection and Repatriation Act* is also part of the regulatory process. These acts require that consultation with interested Native American groups be initiated as part of the compliance process.

Information collected to identify relevant cultural and paleontological resources includes the general prehistory and history of a region, results of previous cultural or paleontological resources surveys or studies within or near the affected project area, and identification of any resources eligible for or currently on the NRHP, or part of the National Natural Landmarks Program.

Impacts to prehistoric and historic resources are postulated if alternatives could substantially add to existing disturbance of resources in the project areas, could affect NRHP-eligible resources, or could cause loss or destruction of important scientific, cultural, or historic resources. Impacts to Native American resources are postulated if alternatives have the potential to affect sites important for their position in the Native American physical universe or religion, or to reduce access to traditional use areas, plant or animal communities, or sacred sites. Impacts to paleontological resources are postulated if alternatives could affect deposits with high research potential.

[Text deleted.] On a programmatic level specific detail on the types and locations of resources within the proposed project areas is not available for all locations, and the level of detail varies by facility or alternative. General information concerning site types and NRHP eligibility of those types in the region, however, is appropriate for the PEIS. At the site-specific level and depending on the alternative, more detailed information may be required including file investigations, Native American consultation, implementation of the DOE American Indian Policy, or predictive modeling to determine the types, numbers, locations, and NRHP eligibility or importance of cultural resources in the proposed project area.

4.1.8 SOCIOECONOMICS

The socioeconomic impact analysis assesses the environmental consequences of demographic and economic changes resulting from implementing a proposed alternative. Developing a new facility or adding new operations to an existing DOE or commercial facility may create new jobs. The creation of new jobs may affect the economy of the regional economic area and may place an increased demand on housing, community services, and local transportation within the ROI, if the local labor market is unable to meet the labor requirements. Therefore, this study assesses the potential impacts of each proposed alternative on these characteristics. The socioeconomic environment is defined for two geographic regions: the REA and the ROI. REAs are used to assess potential effects on the regional economy, and ROIs are used to assess effects that are more localized in political jurisdictions surrounding the sites.

The REA for each site encompasses a broad market that involves trade among and between regional industrial and service sectors and is characterized by strong economic linkages between the communities in the region. These linkages determine the nature and magnitude of multiplier effects of economic activity (purchases, earnings, and employment) at each site. REAs are defined by BEA and consist of an economic node that serves as the center of economic activity and the surrounding counties that are economically related and include the places of work and residences of the labor force.

Potential demographic impacts were assessed for the ROI, a smaller geographic area where the housing market and local community services would be the most affected. Site-specific ROIs were identified as those counties where approximately 90 percent of the current DOE and/or contractor employees reside. This residential distribution reflects existing commuting patterns and attractiveness of area communities for people employed at each site and is used to estimate the future distribution of in-migrating workers.

The following sections summarize the methodology used for assessing the potential socioeconomic impacts from the alternatives.

Baseline Comparisons. Data on the current socioeconomic conditions were compiled for each ROI and REA. The data were then projected out to the period of full operation for the alternatives based on population forecasts developed by BEA. These projections were compared with the estimates of project-related impacts.

Proposed project alternatives may require additional workers during the construction and operation phases. An analysis of the projected labor availability was performed to determine the number of workers that may in-migrate to the region to meet employment needs. In addition to jobs and income directly created by the proposed project alternatives, other jobs and income may be created indirectly within the REA. These indirect jobs and resulting income are measured by employing the most recent version of the Regional Input-Output Modeling System developed by the BEA.

Population increases due to in-migration of new workers and their families are estimated by the number of new workers and the national average household size. The national average is used because the new population would come from unknown locations outside the region.

The impact on community services is assessed by determining the increase in each community service required to maintain the level of service that currently exists within the ROI, such as student-to-teacher ratio, police officer-to-population ratio, and hospital capacity.

Local Transportation. Traffic impacts are modeled using a proprietary transportation model developed in accordance with the *Highway Capacity Manual* methodology for freeways, multilane roads, and two-lane roads. Average Annual Daily Traffic (AADT) volumes are projected for 1995 and the impact year using No Action population projections.

The AADT for impacts beyond the No Action alternative are calculated from the direct employment and direct in-migrating population associated with each alternative. Only roads in the vicinity of the site on which at least 5 percent of workers travel were modeled. It was assumed that any additional workers required for a proposed alternative would use the same roads as the current workforce.

Service flow, the maximum hourly rate at which vehicles can reasonably be expected to cross a point or uniform section of a lane during a given time period under current roadway and traffic conditions, is calculated for the road segments. Capacity of the road segments is calculated from the number of lanes and capacity per lane. The service flow equation is solved for the volume-to-capacity ratio.

Level of service is a measure describing operational conditions within a traffic stream. A level of service describes these conditions in terms of factors such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. The level of service designations range from A to F, with each level defined by a range of volume to capacity ratios. The level of service designations, given in Table 4.1.8–1, are based primarily on the *Highway Capacity Manual* Special Report 209.

Table 4.1.8–1. Level of Service Letter Designations and Definitions

Letter Designation	Operating Conditions	Level of Service Definition
A	Good	This is a condition of free flow, accompanied by low volumes and high speeds.
B	Good	This occurs in the zone of stable flow, with operating speeds beginning to be restricted somewhat by traffic conditions.
C	Good	This is still in the zone of stable flow, but speeds and maneuverability are more closely controlled by the higher volumes.
D	Below average	This level of service approaches unstable flow, with tolerable operating speeds maintained, though considerably affected by changes in operating conditions.
E	Maximum capacity	This cannot be described by speed alone, but represents operations at lower operating speeds, typically, but not always, in the neighborhood of 30 miles per hour, with volumes at or near the capacity of the highway.
F	Traffic jam	This describes a forced-flow operation at low speeds, where volumes are above capacity.

Source: National 1985a.

4.1.9 PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY

The scope of the public and occupational health and safety analysis includes a determination of effects on human health that result from exposures to ionizing radiation and hazardous chemicals. Storage and disposition alternatives addressed in this PEIS use a broad variety of processes involving both radioactive and chemical materials that can be hazardous to human health. The degree of hazard is directly related to the type and quantity of the particular radioactive or chemical material to which a person is exposed. The health effects that may be associated with radiation and chemical induction of cancer are determined by estimating the radiological and chemical doses to workers and the general public that result from these exposures. The risk from these doses is then converted to potential cancers. This is done for normal operations and postulated accident scenarios. Additionally, for hazardous chemicals, a Hazard Quotient (HQ) is calculated based on the exposure concentration of each chemical; the HQs are calculated for all known noncancer adverse effects. The HQs are then summed to obtain the Hazard Index (HI) for each operation at a given site. The HI is used as an indicator of safe exposure levels to avoid noncancer effects of an acute or chronic nature, and is independent of the cancer risk. More detailed information about the public and occupational health safety analysis for this PEIS is found in Appendix M.

Computer models and operational histories are used to predict the impacts on the health of workers and the public due to both normal operation and postulated accidents. The computer models include GENII and Melcor Accident Consequence Code System (MACCS) for airborne and liquid radioactive releases during normal operation and accident conditions, respectively; and ISCST2 for hazardous chemical releases.

Since direct chemical monitoring data on worker exposure is not available for specific operations, the onsite worker is assumed to receive the maximum exposure that any involved (the workers directly involved in the proposed facility) or noninvolved (the workers onsite but not directly involved in the proposed facility) onsite person will receive. OSHA-regulated levels (that is, the PEL) are applied to all hazardous chemicals that are released at the site. This includes both the process-specific releases as well as those that are a result of other site operations. All onsite exposures are assumed to occur at a distance of 100 m (330 ft) from a centralized point of release, which will yield a conservative concentration level for each chemical. The concentrations are derived through the ISCST 2 model recommended by EPA. The noncancer risks to the MEI of the public consist of HQs that compare chemical exposure levels to the RfC values published by EPA in the Integrated Risk Information System (IRIS). For the onsite worker, the HQ values are calculated by comparing the calculated chemical exposure levels to the PEL established by OSHA. The HI for either the MEI or the onsite worker is the sum of the HQs for every hazardous chemical analyzed. If the HIs are 1.0 or less, then the noncancer regulated levels for all hazardous chemicals have been met and no health effects are expected.

The lifetime cancer risk to the MEI and the onsite worker from exposure to a carcinogenic chemical can be derived from either of the two following ways. The calculated exposure dose in mg/kg of body weight is multiplied by that individual chemical's slope factor published in EPA's IRIS or the EPA's yearly published Health Effects Summary Tables (HEAST), or the exposure concentration in mg/m^3 is multiplied by unit risk (found in IRIS or HEAST) to give the lifetime cancer risk. Only carcinogenic chemicals will have slope factors and/or unit risk values. The cancer risk coming from all carcinogenic chemicals is derived by summing up the risks from all individual carcinogenic chemicals.

The chemical pollutant exposures to the public are considered to be for 24 hours a day, 52 weeks per year, and 70 years for a lifetime. The worker exposure is based on an 8-hour day and 52 weeks of 40 hours each (0.237 fractional year). The HI values and cancer risks are conservative because all emissions are assume to come from a centralized source term. The cancer risks to the noninvolved worker for each chemical are computed from the dose (converted from air concentrations) and the unit risk or slope factors to yield a probable risk. The risks are also conservative because a single point at or near the maximum onsite concentration is selected for exposure of the noninvolved facility worker. Actual risks are likely lower than estimated risks.

The HI is the sum of the HQs for every hazardous chemical analyzed, the HQ being the ratio of the actual (or calculated) concentration to the regulated concentration value. Even if OSHA PELs and EPA RfCs for several hazardous chemicals are met, but they affect the same target organ or tissue, they may be expected to collectively cause injury or ill health because their damage will be cumulative. Thus, an HI of much greater than 1.0 is meaningful because the sum of the effects has the same effect as that of a single hazardous chemical exceeding the OSHA PEL or the RfC. The HI and HQ are not regulated values, but serve to assess whether regulated values have been met and whether there is a potential for a detrimental health effect to occur.

Toxic air pollutants are addressed in the Air Quality and Noise sections and the Public and Occupational Health sections for each of the potential sites. In the Air Quality sections, the maximum concentration of toxic air pollutants at or beyond the site boundary are compared with a standard to determine compliance. In the Public and Occupational Health sections, a health risk is calculated based upon chemical concentration, toxicity, and PEL or RfC for noncancer effects and a cancer risk based on the slope factor (cancer potency) of those compounds which are regulated or carcinogens.

These differences in analytical method result in the presentation of pollutants that differ between the air quality analysis and public and occupational health analysis. In the air quality analysis, toxic pollutants with low emission rates and high toxicity will, in most cases, result in extremely low concentrations at or beyond the site boundary and are therefore not presented in the air quality analysis. On the other hand, these chemical pollutants may expose an onsite worker located 100 m (330 ft) from the emission source to an unacceptable risk, and therefore are presented in the analysis. Hence, the type and form of data used to evaluate these two areas can and will be different and may require different data sources.

The assessments use technology-specific releases of radioactivity and hazardous chemicals and site-specific factors such as meteorology, population distribution, agricultural production, and an assumed facility location on the site. Atmospheric dispersion modeling performed for the Air Quality section is also utilized to develop exposure concentrations in the evaluation of impacts to workers from hazardous chemicals.

A discussion of calculational uncertainties is included to provide an understanding of how the various steps of an impact analysis can lead to predictions different from those presented in this PEIS. However, efforts have been made in all assessments to choose conservative assumptions and parameters so that impacts are not underestimated. Further discussions of assessment methodologies, including values of parameters used in the various computer models, are presented in Appendix M.

Health Impacts on Plant Workers During Normal Operation. Because radiation workers are individually monitored, experiences from past and current operations that are similar to future operations are used to estimate the radiological doses to workers directly involved with fissile material storage and disposition activities. Doses are also determined for noninvolved workers (that is, workers who are onsite but not involved with the proposed storage and disposition activities).

Radiological doses are converted to health effects using appropriate health risk estimators. Health effects from chemicals are predicted by applying appropriate risk estimators to modeled concentrations. Radiological and chemical impacts are also compared with applicable regulatory compliance and guidance requirements. The health risk estimators and applicable standards are presented and discussed in detail in Appendix M.

Health Impacts on the Public During Normal Operation. Public health impacts could result from exposure to radioactive or hazardous chemical materials released during operation. The effect is the sum of internal exposure resulting from breathing air, eating food, and drinking water; and of external exposure from standing on contaminated ground, being exposed to the air, and being submerged in water.

Impacts to the MEI and to the population around each site are calculated. The differences in impacts among the various sites are the result of many site-specific factors including the distance to the site boundary, the population distribution, and meteorological dispersion.

Modeling is used to estimate the type and amount of material released and the associated radiological doses and chemical concentrations and doses. The predictive models used to calculate radiological doses have been found to give results that tend to be higher than if calculated by converting actual measured concentrations to doses. The radiological doses and the chemical doses and concentrations are converted to health effects using appropriate health risk estimators. Radiological doses, chemical concentrations, and health risks are compared with regulatory limits and, for perspective, with background levels in the vicinity of the site. The health risk estimators used in the assessments and the applicable regulatory standards are presented and discussed in detail in Appendix M.

Accident Analysis for Postulated Accident Scenarios. The relative consequences of postulated accidents are considered in the evaluation of each alternative. In evaluating the magnitude and consequences of each alternative, accident analysis is performed. The concepts used are analogous to a formal Probabilities Risk Assessment, which would be appropriate for a project-level analysis, although the accident analysis involves considerably less detail for programmatic decision-making. The accident analysis addresses only a spectrum of bounding accidents (high consequence, low probability) and a representative spectrum of possible operational accidents (low consequence but high probability of occurrence). The technical approach for the selection of accidents is consistent with the DOE Office of NEPA Oversight *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (May 1993) guidance that recommends consideration of two major categories of accidents: within design basis accidents (also referred to as evaluation basis accidents) and beyond design basis accidents (also referred to as beyond evaluation basis accidents).

For the purpose of this assessment, risk is defined as the mathematical product of the probability and consequence of an accident. The risk-contributing scenarios consider both evaluation basis and beyond evaluation basis accidents. The specific accidents consider the types of facilities. Examples of accidents include those resulting from operator errors, spills, criticalities, fire, explosions, airplane crashes, common-cause failures, severe weather, earthquakes, and transportation. Information on potential accidents includes those that have been postulated and analyzed for similar facilities. The risks of the various storage and disposition facilities are evaluated in terms of the incremental increase in risk from postulated accidents with respect to normal day-to-day risks to which the general population is exposed

For each alternative, a number of evaluation basis and beyond evaluation basis accidents have been identified and are analyzed to define the accident consequences and risks. Evaluation basis accidents are generally in a frequency range of greater than 10^{-6} per year, while beyond evaluation basis accidents are generally in a frequency range of 10^{-7} to 10^{-6} per year. In some cases, accidents less than 10^{-7} are included in the set of beyond evaluation basis accidents when their impacts are relevant to decisionmaking.

Uncertainties. The sequence of analyses performed to generate the radiological and hazardous chemicals impacts estimates from normal operation and facility accidents include (1) selection of normal operational modes and accident scenarios and their probabilities, (2) estimation of source terms, (3) estimation of environmental transport and uptake of radionuclides and hazardous chemicals, (4) calculation of radiation and chemical doses to exposed individuals, and (5) estimation of health effects. There are uncertainties associated with each of these steps. Uncertainties exist in the way the physical systems being analyzed are represented by the computational models and in the data required to exercise the models (due to measurement errors, sampling errors, or natural variability).

Of particular interest are the uncertainties in the estimate of cancer deaths from exposure to radioactive materials. The numerical values of the health risk estimates used in this PEIS (refer to Appendix M) were obtained by the practice of linear extrapolation from the nominal risk estimate for lifetime total cancer mortality at 10 rad. Other methods of extrapolation to the low-dose region could yield higher or lower estimates of cancer deaths. Studies of human populations exposed at low doses are inadequate to demonstrate the actual level of risk. There is scientific uncertainty about cancer risk in the low-dose region below the range of epidemiological observation, and the possibility of no risk or even health benefits (hormesis effects) cannot be excluded. Because the health risk estimators are multiplied by conservatively calculated radiological doses to predict fatal cancer risks, the fatal cancer values presented in this PEIS are expected to be overestimates.

The widely used algorithms for estimating the risk of latent cancers from radiation are based on high dose rates, and the impacts are then extrapolated to low rates by presumed linear response models. These models are known to overestimate the risk for low dose rates, and the actual risk may be zero.

For the purposes of presentation in this PEIS, the impacts calculated from the linear model are treated as an upper bound case, consistent with the widely used methodologies for quantifying radiogenic health impacts. This does not imply that health effects are expected. Moreover, in cases where the upper bound estimators predict a number of latent cancer deaths that is greater that 1, this does not imply that the latent cancer death(s) are identifiable to any individual.

Uncertainties are also introduced when accident analyses performed for similar existing facilities have been used as a major source of data. Although the radionuclide composition of source terms are reasonable estimates, there are uncertainties in the radionuclide inventory and release fractions that affect the estimated consequences. Accident frequencies for low probability sequences of events are always difficult to estimate, even for operating facilities, because there is little or no record of historical occurrences. For a new facility, such as a Pu storage facility or an LWR for Pu disposition, any use of accident frequencies that are estimated from similar existing facilities would tend to further compound the effects of uncertainties. There are also uncertainties attributed to information for designs that are in the conceptual stage.

In summary, the radiological and hazardous chemical impact estimates presented in this document were obtained by:

- Using the latest available data
- Considering the processes, events, and accidents reasonably foreseeable for the storage and disposition facilities described in this PEIS
- Making conservative assumptions when there is doubt about the exact nature of the processes and events taking place, such that the chance of underestimating health impacts is small.

4.1.10 WASTE MANAGEMENT

Waste management facilities that support the long-term storage or disposition of weapons-usable fissile materials would treat and package all waste generated in support of this activity into forms that enable long-term storage and/or disposal in accordance with the *Atomic Energy Act* (AEA), RCRA, and other applicable statutes as outlined in Section E.1.2. The preconceptual designs of the new facilities provide their own waste treatment capability and incorporate waste minimization and pollution prevention practices.

Since any changes in wastes volumes could have an impact on the existing and projected waste activities at DOE sites, the PEIS assesses the impacts on waste management from the waste streams generated by all alternatives, including the No Action Alternative. All alternatives would be required to fully comply with all current applicable regulations. The waste management assessment is very important to the overall DOE decisionmaking process and is being coordinated with EM, which evaluates alternatives for implementing an integrated waste management program. The Draft Waste Management PEIS (DOE/EIS-0200-D) focuses on waste management strategies required to treat, store, or dispose of existing wastes and wastes that will be generated in the future as a result of DOE operations. The Draft Waste Management PEIS also evaluates the environmental impacts of transporting wastes. [Text deleted.]

Waste management activities that would support the long-term storage or disposition of weapons-usable fissile materials program are assumed to be per current site practices and are contingent upon decisions to be made through the Waste Management PEIS. Any future waste management facilities that may be required to support the long-term storage or disposition of weapons-usable fissile materials program would be coordinated with any decisions resulting from the Waste Management PEIS and any respective site-specific NEPA documentation. For example, depending on decisions in the waste-type-specific RODs for the Waste Management PEIS and in subsequent waste-type-specific RODs and NEPA documents, wastes could be treated and disposed of onsite or at regionalized or centralized DOE sites.

The construction and operation of facilities to support the storage and disposition of weapons-usable fissile material program would generate spent nuclear fuel and several types of wastes, depending on the alternative. [Text deleted.] Construction wastes would be similar to those generated by any construction project of comparable scale. Spent nuclear fuel and the following waste categories are analyzed: TRU, mixed TRU, low-level, mixed low-level, hazardous, and nonhazardous. This PEIS also analyzes the management and onsite storage of wastes and spent nuclear fuel, until DOE either disposes of the wastes or places them in long-term retrievable storage. To provide a framework for addressing the impacts of waste management, descriptive information is presented on waste management activities anticipated for each DOE site and for each storage or disposition alternative. Operational waste generation and effluent data are estimated and vary according to the storage or disposition technology and site. These estimates have included waste minimization provisions. The impact assessment compares the projected waste type and waste volume generation from the various disposition facilities at each site with that of the No Action Alternative. Impacts are assessed in the context of existing site practices for treatment, storage, and disposal, including current Federal, State, and local regulations and agreements.

The number of TRU waste shipments to WIPP (depending on decisions from the Supplemental EIS for the disposal phase of WIPP) was estimated by using data in the *Comparative Study of Waste Isolation Pilot Plant Transportation Alternatives* (DOE/WIPP 93-058). From this report, the PEIS uses 8.7 m^3 (11.4 yd^3) per truck shipment, 17.5 m^3 (22.9 yd^3) per regular train shipment, and 52.4 m^3 (68.6 yd^3) per dedicated train shipment (rail shipment may not be applicable at all sites). DOE sites used in the analysis (with the exception of Pantex) either have, or have planned, an onsite LLW disposal facility. As discussed in Section E.1.4, land-usage factors for the disposal of LLW were developed from data in the DOE Integrated Data Base Program for each existing DOE LLW disposal facility (Hanford, INEL, NTS, and SRS). For the proposed Class II LLW disposal facility at ORR, a 3,300 m^3/ha (1,700 yd^3/acre) usage factor was assumed (OR DOE 1995e:1). For the purposes of this

PEIS, it was assumed that all LLW generated at Pantex would be shipped to NTS per current practice. The number of additional shipments required to transport LLW from the site to a DOE LLW disposal facility is estimated. A typical shipment was assumed to consist of eighty 208-l (55-gal) drums, which results in a total shipment volume of approximately 16.6 m^3 (21.7 yd^3). The risks associated with additional shipments are addressed as part of the intersite transportation assessment.

Under some PEIS alternatives, specific candidate sites are not identified. As a result, no planning or environmental documents are available to provide descriptions of the waste management activities or to establish a detailed baseline from which environmental consequences can be estimated. For these cases, generic environmental baselines are presented to define conditions. Waste management impacts are assessed by analyzing the specific waste management facilities and activities associated with the alternative that are necessary to locate new missions at the unspecified sites.

4.2 NO ACTION ALTERNATIVE AND LONG-TERM STORAGE ALTERNATIVES

This section describes the potential environmental consequences of the No Action Alternative and of constructing and operating various long-term storage alternatives. A key for locating information on the storage alternatives and candidate sites analyzed is shown in Table 4–1. Included in the analysis of each site is storage phaseout. The phaseout of Pu storage at Hanford, INEL, Pantex, SRS, RFETS, and LANL, and HEU storage at ORR, is a common activity associated with both storage and disposition when the storage requirements for these fissile materials are eliminated at a particular site. The impact analysis in this section is organized by site.

4.2.1 HANFORD SITE

A listing of the proposed long-term storage alternatives, subalternatives, and related actions, including the No Action Alternative, at Hanford is provided below. The potential impacts of implementing these alternatives and related actions at Hanford are described in the following sections: 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. The specific long-term storage alternatives proposed for Hanford are the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative.

Preferred Alternative

No Action Alternative:

Continue to store Hanford Pu material within the scope of this PEIS in the PFP in stabilized form pursuant to DNFSB Recommendation 94-1.

Proposed Storage Activities at Hanford Site

- **No Action Alternative (Preferred Alternative):** Continue to store Hanford Pu material within the scope of this PEIS in the PFP in stabilized form pursuant to DNFSB Recommendation 94-1.
- **Upgrade Alternative:** There are two subalternatives under this storage alternative.
  - *Upgrade Without RFETS Pu or LANL Pu Subalternative:* Two options to accommodate Hanford Pu material: Modify selected areas of FMEF in 400 Area; or construct a new facility in 200 West Area.
  - *Upgrade With All or Some RFETS Pu and LANL Pu Subalternative:* Two options to accommodate Hanford, RFETS and LANL Pu material: Increase modification of selected areas of the FMEF in 400 Area; or construct a larger new facility in 200 West Area.

Proposed Storage Activities at Hanford Site—Continued

- **Consolidation Alternative:** Construct a new facility adjacent to 200 East Area to accommodate all Pu material within the scope of this PEIS.

- **Collocation Alternative:** Construct a new facility adjacent to 200 East Area to accommodate all Pu and HEU material within the scope of this PEIS.

- **Subalternatives Not Including Strategic Reserve and Weapons Research and Development Materials:** Facility and other resource requirements would be smaller than the Upgrade With All or Some RFETS Pu and LANL Pu subalternatives, the Consolidation Alternative, and the Collocation Alternative.

- **Phaseout:** Hanford Pu material within the scope of this PEIS would be moved out of Hanford to the Consolidation or Collocation site (located at another DOE site) or to disposition (for surplus Pu).

4.2.1.1 Land Resources

Preferred Alternative: No Action Alternative

Under this alternative, Pu storage would continue at the current interim storage location in stabilized form at the PFP pursuant to DNFSB Recommendation 94-1 and the Record of Decision for the *Plutonium Finishing Plant Stabilization Environmental Impact Statement* (PFP EIS). The ongoing (no new action) activities conform with present and future land-use plans, policies, and controls. Therefore, no impacts on land resources would be anticipated at Hanford beyond the effects of existing activities and future activities that are independent of the proposed action.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Part of the existing FMEF, located in the 400 Area of Hanford, would be converted into a Pu storage facility. The modified FMEF would house the Pu storage vault and all the functions needed to support storage. No new land disturbance would occur during construction nor would additional land not previously disturbed be used during operations.

Land Use. Modifying the FMEF for Pu storage would conform with existing and future land use as described in the current *Hanford Site Development Plan* and with ongoing discussions in the CLUP Process. According to the *Hanford Site Development Plan*, 400 Area land use is identified as reactor operations, which can include other operational uses such as material storage (HF DOE 1993c:13,14). Since this option would involve the modification of an existing facility, construction would occur completely within an existing, but not operating, protected area and would use the same areas previously disturbed during original construction (for example, laydown areas). During operation, the entire previously disturbed protected area (6.25 ha [15 45 acres]) would be required. In addition, there could be dedicated areas outside the fence (for example, parking lot). Other Hanford land uses or special status lands will not be affected. As discussed in Section 4.2.1.8, no in-migration of workers would be required during the construction and only a small increase in population would occur during operation. There would be no change to the region's housing market during construction and an insignificant effect during operation. Therefore, no indirect impacts to the offsite land use would be anticipated.

Construction and operation 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. This alternative would not result in new land disturbance or new structures, so the existing landscape would remain virtually unchanged. No impacts to visual resources caused by construction and operation would occur. The appearance of the upgraded facilities would remain consistent with the industrialized landscape character and the current VRM Class 5 designation of the developed areas of Hanford.

Construct New 200 West Area Facility for Plutonium Storage

The new Pu storage facility would be a two-level facility that would be located on vacant land within the 200 West Area northwest of the 234-5Z building. No new land disturbance would occur during construction nor would additional land not previously disturbed be used during operations.

Land Use. Construction of a new facility for Pu storage would conform with existing and future land use as described in the current *Hanford Site Development Plan* and with ongoing discussions in the CLUP Process. According to the *Hanford Site Development Plan*, 200 Area land use is identified as waste operations, which includes radioactive material management and storage (HF DOE 1993c:13,14). Although existing land use would change from unused to developed land, the proposal would be consistent with land-use plans and construction and operation would occur completely within an existing protected area and would not involve new disturbed land. During operation, the entire 10.5 ha (26 acres) protected area would be required. In addition, there could be dedicated area outside the fence (for example, parking lot). Other Hanford land uses or special status lands would not be affected. As discussed in Section 4.2.1.8, workforce requirements for construction and operation would be the same as modification of the FMEF. Therefore, no offsite land use would be indirectly affected. [Text deleted.]

Construction and operation 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.] The appearance of the proposed facility would be consistent with the existing industrialized landscape character, and the current VRM Class 5 designation of the 200 West Area would remain. Because of the existing industrial character of the 200 West Area and the distance to any sensitive viewpoints, no visual impacts would occur.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

This option would modify selected areas of the existing FMEF for Pu storage. Although the additional interior area needed to accommodate the RFETS and LANL material would slightly increase footprint, the facility would still be contained within the existing protected area. Therefore, land area requirements during modification and operations would be equal to the Upgrade Without RFETS or LANL Pu Subalternative. Potential impacts to land resources would be the same as the Upgrade Without RFETS Pu or LANL Pu Subalternative.

Construct New 200 West Area Facility for Plutonium Storage

A new facility to accommodate Hanford, RFETS, and LANL Pu material would be constructed in the 200 West Area. Land area requirements during construction and operations would be equal to that of the Upgrade Without RFETS Pu or LANL Pu Subalternative. Therefore, potential impacts to land resources would be similar to the Upgrade Without RFETS Pu or LANL Pu Subalternative.

Consolidation Alternative

Construct New Plutonium Storage Facility

Under this alternative, all Pu within the scope of this PEIS would be stored at a new storage facility to be constructed at Hanford west of the 200 East Area. The potential facility location has been improved with a railroad spur and utility line (HF 1996a:1). The alternative would disturb 58.5 ha (144 acres) of land area during construction of which 56 ha (138 acres) would be used during operations. A buffer zone would be provided between operations and the Hanford site boundary. Pu storage in existing DOE storage facilities would be phased out.

Land Use. Construction and operation of a new consolidated facility for Pu storage would conform with existing and future land use as described in the current *Hanford Site Development Plan* and in the CLUP Process. The *Hanford Site Development Plan*, identifies land use in the 200 Area as waste operations, which includes radioactive material management and storage (HF DOE 1993c:13,14). Although existing land use would change from undeveloped to industrial, this alternative conforms with land-use plans. As discussed in Section 4.2.1.8, no in-migration of workers would be required during the construction phase, and only a small in-migration would occur during operations, with no effect on the housing sector. Therefore, no indirect offsite land-use effects would occur. Compatibility with the use of special status lands, and consistency with State and local land-use plans, policies, and controls would be similar to the Construct New 200 West Area Facility for Pu Storage option of the Upgrade Alternative.

Visual Resources. The appearance of the proposed action would be consistent with the industrial landscape character and current VRM Class 5 designation of the 200 Area. Potential impacts to visual resources would be similar to the Construct New 200 West Area Facility for Pu Storage option of the Upgrade Alternative.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

All HEU within the scope of the PEIS would be stored at a new storage facility at Hanford collocated with the Pu storage facility. The facilities would be located west of the 200 East Area. The potential facility location has been improved with a railroad spur and utility line (HF 1996a:1). The facilities would disturb 89.5 ha (221 acres) of land area during construction of which 87 ha (215 acres) would be used during operations. A buffer zone would be provided between the facilities and the Hanford site boundary. Pu storage in existing facilities at Hanford would be phased out.

Land Use. Construction and operation of new collocated facilities would conform with existing and future land-use plans as described in the current *Hanford Site Development Plan* and in the CLUP Process. The *Hanford Site Development Plan* identifies land use in the 200 Area as waste operations, which includes radioactive material management and storage (HF DOE 1993c:13,14) Vacant land would be used. As discussed in Section 4.2 1.8, no in-migration would occur during construction. A small number of workers are projected to in-migrate during operation. Projected housing vacancies would be sufficient to accommodate this growth. Therefore, no indirect impacts to offsite land uses would be anticipated. Compatibility with the use of special status lands, and consistency with land-use plans, policies, and controls, would be similar to the Construct New 200 West Area Facility for Pu Storage option of the Upgrade Alternative.

Visual Resources. The appearance of the proposed action would be consistent with the industrial landscape character and current VRM Class 5 designation of the 200 Area. Potential impacts to visual resources would be similar to the Construct New 200 West Area Facility for Pu Storage option.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, land effects during construction and operation would be almost the same in extent and magnitude to the No Action Alternative, Upgrade with All or Some RFETS Pu and LANL Pu Subalternative, Consolidation Alternative, and Collocation Alternative because the facility would be almost the same. However, because the smaller quantity of material would require smaller facilities, it is likely that less land area would be disturbed during construction and used during, operations. [Text deleted.]

Phaseout

No new construction or upgrade of existing facilities would occur under the phaseout of the Pu mission. Hanford Pu would be moved out of Hanford to the Consolidation or Collocation site or to disposition. Therefore, no impacts to land resources would be anticipated at Hanford beyond the effects of existing activities and future activities that are independent of the proposed action.

[Text deleted.]

4.2.1.2 Site Infrastructure

For selected site infrastructure parameters, Table 4.2.1.2–1 shows the site availability, projected usage under No Action, and projected usage associated with each storage alternative at Hanford, including phaseout of the Pu storage mission. Adequate infrastructure is available to accommodate all long-term storage alternatives. In addition, there is adequate space for any new facilities required to support the various storage alternatives.

Preferred Alternative: No Action Alternative

The infrastructure currently in place at Hanford is capable of handling all anticipated missions and functions associated with the No Action Alternative. However, certain actions could result in changes to the site infrastructure under No Action. Some of these actions are described below. Since the PFP processing facilities (234-5Z) were designed and constructed in 1947, it is reasonably foreseeable that upgrades of the PFP and support services/utilities could be required to complete stabilization and packaging activities for the current inventory of weapons-usable Pu. These activities are described in the *Hanford Site Integrated Stabilization Management Plan* (SISMP). In addition, glovebox-scale processing and a new packaging capability are required to implement the DOE-STD-3013-94 storage standard in SISMP timeframes.

In the PFP-EIS, DOE has assessed impacts of activities required at Hanford to remove and stabilize readily retrievable Pu residues in the nonstorage portions of the PFP (that is, 234-5Z processing facility) while its current material storage capability is maintained. The actions resulting from the PFP-EIS could affect certain site infrastructure parameters. Hanford will continue to evaluate low-assay, non-weapons usable, Pu materials currently in storage for potential treatment, packaging, and disposal as TRU waste to WIPP to avoid unnecessary costs, handling, and personnel exposure. [Text deleted.]

There could be additional changes to Hanford's site infrastructure under No Action resulting from construction of safe, environmentally sound, and economic, dry interim storage of the K-East Basin (105-KE Basin) spent fuel. The Hanford SISMP outlines plans to remove the spent nuclear fuel from the 105-KE Basin by December 1999. Such removal will resolve the safety and environmental concerns identified in DNFSB Recommendation 94-1 that are associated with the deteriorating spent fuel in the 105-KE Basin and would occur under No Action.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium subalternatives

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Modifying selected areas of the FMEF to accommodate long-term storage of existing quantities of Pu at Hanford would not affect the site infrastructure. Data for construction are presented in Appendix C. Operations impacts to the Hanford infrastructure under this option would be minimal. This is because the FMEF is a fully capable nuclear materials facility with the required infrastructure, including access roads, in place. All infrastructure requirements for this subalternatives are within site capacities.

Construct New 200 West Area Facility for Plutonium Storage

Constructing a new storage facility to accommodate long-term storage of existing quantities of Pu at Hanford would not impact the site infrastructure. Data for construction are presented in Appendix C. Operations impacts to the Hanford infrastructure under this subalternatives would be minimal. [Text deleted.] As shown in Table 4.2.1.2–1, less than 5 km (3 mi) of roads would need to be constructed. All other infrastructure requirements are within site capacities.

Table 4.2.1.2–1. Site Infrastructure Changes Required for Operation at Hanford Site (Annual)—No Action (2005) and Storage Alternatives

Alternative	Transportation		Electrical		Fuel		
	Roads (km)	Railroads (km)	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
No Action							
Site availability	420	204	1,678,700	281	14,775,000	21,039,531	91,708
Projected usage	420	204	345,500	58	9,334,800	21,039,531	0
Upgrade (without RFETS or LANL Pu material)							
Modify FMEF							
Projected usage with upgrade facility	420	204	365,500	63	9,338,740	21,039,531	0
Amount required in excess to site availability	0	0	0	0	0	0	0
New Pu Storage Facility							
Projected usage with upgrade facility	425	204	365,500	63	9,338,740	21,039,531	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
Upgrade (with RFETS and LANL Pu material)							
Modify FMEF							
Projected usage with upgrade facility	420	204	366,650	63	9,338, 740	21,039,531	0
Amount required in excess to site availability	0	0	0	0	0	0	0
New Pu Storage Facility							
Projected usage with upgrade facility	425	204	366,650	63	9,338,740	21,039,531	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
Consolidation							
Projected usage with consolidated facility	425	204	416,500	67	9,372,800	21,039,531	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
Collocation							
Projected usage with collocated facilities	425	204	437,500	76	9,372,800	21,039,531	0
Amount required in excess to site availability	<5	0	0	0	0	0	0
Phaseout							
Projected usage with storage phaseout	420	204	345,500	58	9,334,800	21,039,531	0
Amount required in excess to site availability	0	0	0	0	0	0	0

Source: DOE 1996e; DOE 1996f; HF 1995a:1; HF DOE 1996a.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium subalternatives

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Construction to modify selected areas of the FMEF to accommodate existing quantities of Pu plus material relocated from RFETS and LANL would not impact the site infrastructure. Data for construction are presented in Appendix C. Operations impacts under this option would also be minimal. Requirements are within site capacities and would not impact the site infrastructure.

Since impacts associated with this option for storing all of the RFETS Pu and LANL Pu material at Hanford are minimal, storing only a portion of the RFETS Pu and LANL Pu material at Hanford would result in minimal impacts to the site infrastructures as well. Additional annual electrical energy requirements would be proportionately less than that required for storage of the full amount of RFETS Pu and LANL Pu material.

Construct New 200 West Area Facility for Plutonium Storage

Constructing a new storage facility to accommodate existing quantities of Pu plus material relocated from RFETS and LANL would not impact the site infrastructure. Data for construction are presented in Appendix C. Operations impacts under this option would also be minimal. Requirements are within site capacities and would not impact the site infrastructure. Less than 5 km (3 mi) of access road would need to be constructed.

Since impacts associated with this option for storing all of the RFETS Pu and LANL Pu material at Hanford are minimal, storing only a portion of the RFETS Pu and LANL Pu material at Hanford would result in minimal impacts to the site infrastructures as well. Additional annual electrical energy requirements would be proportionately less than that required for storage of the full amount of RFETS Pu and LANL Pu material.

Consolidation Alternative

Construct New Plutonium Storage Facility

The site infrastructure impacts of constructing a consolidated Pu storage facility at Hanford would be minimal. Data for this construction are located in Appendix C. The site infrastructure impacts of operating a consolidated Pu storage facility at Hanford are shown in Table 4.2.1.2–1. The Hanford site infrastructure would be fully capable of supporting the operations of such a new facility without major modifications to the existing site infrastructure and utility resource requirements. Less than 5 km (3 mi) of access road would need to be constructed.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The site infrastructure impacts of constructing consolidated Pu and collocated HEU storage facilities at Hanford would be minimal. Data for this construction are located in Appendix C. The site infrastructure impacts of operating consolidated Pu and collocated HEU storage facilities at Hanford are shown in Table 4.2.1.2–1. Hanford site infrastructure would be fully capable of supporting the operations of such new facilities without major modifications to the existing site infrastructure and utility resource requirements. Less than 5 km (3 mi) of access road would need to be constructed.

Subalternatives Not Including Strategic Reserve and Weapons Research and Development Materials

Since the existing Hanford site infrastructure would be fully capable of supporting construction/modification and operation of facilities for the Upgrade Alternative (both subalternatives), the Consolidation Alternative, and the Collocation Alternative, constructing and operating such facilities without including provisions for storage of strategic reserve and weapons R&D materials could be accommodated as well. Expected reductions in amounts of annual electrical energy requirements from those of the various storage alternatives for all the strategic reserve and weapons R&D materials are the only site infrastructure changes expected if this subalternatives is chosen because electric usage is dependent on the amount of material. [Text deleted.]

Phaseout

Phaseout of the Pu storage mission at Hanford would have no impact on the facilities and site infrastructure. While Pu storage operations would cease, the storage facilities would remain and utility service would continue at about the same usage level until D&D is accomplished.

4.2.1.3 Air Quality and Noise

Construction and operation activities associated with the No Action Alternative and the proposed storage alternatives would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts at Hanford, criteria and toxic/hazardous concentrations from the No Action Alternative and the proposed storage alternatives are compared with Federal and State standards and guidelines. Impacts to human health from radiological and chemical airborne emissions are described in Section 4.2.1.9.

In general, all of the proposed storage facilities would emit the same types of air pollutants during construction. It is expected emissions would not exceed Federal, State, or local air quality regulations. PM_{10} and TSP concentrations will be increased, especially during peak construction periods.

The principal sources of emissions during construction include the following:

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

During operation, impacts from each of the individual storage facilities with respect to the concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Table 4.2.1.3–1 presents the estimated pollutant concentrations for each of the proposed storage alternatives, indicating little difference between alternatives with respect to impacts to air quality.

Emission rates attributed to operation of the proposed storage facilities are presented in Tables F 1.3–1 to F.1.3–3. [Text deleted.] Air pollutant emission sources associated with operations include the following:

- Operation of boilers for space heating
- Operation of diesel generators and periodic testing of emergency diesel generators
- Exhaust and road dust generated by vehicles delivering supplies and bringing employees to work
- Toxic/hazardous pollutant emissions from facility processes

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

Air Quality

An analysis was conducted of the potential impacts on air quality from emissions from each of the storage alternatives described in Section 2.2.1.

Section 176 (c) of the 1990 CAA Amendments requires that all Federal actions conform with the applicable SIP. The EPA has implemented rules that establish the criteria and procedures governing the determination of conformity for all Federal actions in nonattainment and maintenance areas. These are discussed in Section 4.1.3. The attainment status of the area in which Hanford is located is discussed in Section 3.2.3. Since the area is considered to be an attainment area for the criteria pollutants, the proposed actions at this site do not require that a conformity analysis be performed.

Table 4.2.1.3–1. Estimated Operational Concentrations of Pollutants at Hanford Site and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] (µg/m³)	No Action (µg/m³)	Upgrade (µg/m³)	Consolidation (µg/m³)	Collocation (µg/m³)
Criteria Pollutants						
Carbon monoxide	8-hour	10,000[b]	0.08	0.09	0.17	0.17
	1-hour	40,000[b]	0.3	0.37	1.04	1.04
Lead	Calendar Quarter	1.5[b]	<0.01	<0.01	<0.01	<0.01
	24-hour	0.5[c]	<0.01	<0.01	<0.01	<0.01
Nitrogen dioxide	Annual	100[b]	0.03	0.03	0.04	0.04
Ozone	1-hour	235[b]	d	d	d	d
Particulate matter less than or equal to 10 microns in diameter	Annual	50[b]	<0.01	<0.01	<0.01	<0.01
	24-hour	150[b]	0.02	0.02	0.02	0.02
Sulfur dioxide	Annual	52[b]	<0.01	<0.01	<0.01	<0.01
	24-hour	260[b]	<0.01	<0.01	<0.01	0.01
	3-hour	1,300[b]	0.01	0.01	0.01	0.11
	1-hour	1,018[c]	0.02	0.02	0.22	0.22
	1-hour	655[c,e]	0.02	0.02	0.22	0.22
Mandated by Washington						
Total suspended particulates	Annual	60[c]	<0.01	<0.01	<0.01	<0.01
	24-hour	150[c]	0.02	0.02	0.02	0.02
Gaseous fluorides	30-day	0.8[c]	f	f	f	f
	7-day	1.7[c]	f	f	f	f
	24-hour	2.9[c]	f	f	f	f
	12-hour	3.7[c]	f	f	f	f
Hazardous and Other Toxic Compounds						
Ammonia	24-hour	100[c]	<0.01	<0.01	<0.01	<0.01
Chlorine	24-hour	5[c]	f	f	<0.01[g]	<0.01[g]

Table 4.2.1.3–1. Estimated Operational Concentrations of Pollutants at Hanford Site and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] (μg/m³)	No Action (μg/m³)	Upgrade (μg/m³)	Consolidation (μg/m³)	Collocation (μg/m³)
Hydrogen chloride	24-hour	7[c]	f	f	<0.01[g]	<0.01[g]
Hydrazine	Annual	0.0002[c]	f	f	<0.00001[g]	<0.00001[g]
Nitric acid	24-hour	17[c]	f	f	<0.01[g]	<0.01[g]
Phosphoric acid	24-hour	3.3[c]	f	f	<0.01[g]	<0.01[g]
Sulfuric acid	24-hour	3.3[c]	f	f	<0 01[g]	<0.01[g]

[a] The more stringent of the Federal and State standard is presented if both exist for the averaging time.

[b] Federal and State standard

[c] State standard or guideline.

[d] Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate site See Section 4 1 3 for a discussion of ozone-related issues.

[e] The standard is not to be exceeded more than twice in any seven consecutive days

[f] No sources of this pollutant have been identified

[g] The concentration represents the alternative contribution only.

Note· Concentrations are based on site contribution, including concentrations from ongoing activities (No Action), and do not include the contribution from non-facility sources (for example, traffic).

Source. 40 CFR 50; DOE 1996e, DOE 1996f; HF 1995a·1, HF DOE 1996a; WA Ecology 1994a.

Preferred Alternative: No Action Alternative

This alternative utilizes estimated air emissions data from total site operations at Hanford assuming continuation of site missions as described in Section 3.2. These data reflect conservative estimates of criteria and toxic/hazardous emissions at Hanford. The emission rates for the criteria and toxic/hazardous pollutants for No Action are presented in Table F.1.2.2–1. Table 4.2.1.3–1 presents the No Action concentrations. Increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside of the scope of the PEIS) under the No Action Alternative. Concentrations of all other criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable Federal, State, and local ambient air quality standards.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

It is expected that pollutant concentrations will remain within applicable Federal and State ambient air quality standards during modification of the FMEF.

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. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.1.3–1. Concentrations of air pollutants are expected to be the same with or without the RFETS or LANL material.

Construct New 200 West Area Facility for Plutonium Storage

In addition to the types of sources of emissions during construction associated with the No Action Alternative and the storage upgrade alternatives, fugitive dust resulting from the operation of a concrete batch plant would be an additional emission source associated with construction of a new facility.

Increased PM_{10} and TSP concentrations may occur during the peak construction period, and during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations during construction. Concentrations of all pollutants at the site boundary or public access highways would remain within applicable Federal and State ambient air quality standards during construction.

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. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.1.3–1. Concentrations of air pollutants are expected to be similar with or without the RFETS or LANL material since pollutant emissions are the result of combustion of fossil fuels for heating the facility.

Upgrade With All or Some Rocky Flats Environmental Technology Site and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Air quality impacts for construction and operation for this option are expected to be similar to those previously described for modifying the FMEF.

Construct New 200 West Area Facility for Plutonium Storage

Air quality impacts for construction and operation for this option are expected to be similar to those previously described for the new Pu storage facility.

Consolidation Alternative

Construct New Plutonium Storage Facility

Air quality impacts for construction and operation for this option are expected to be similar to those for the options previously discussed for the Upgrade Alternative.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The collocation of Pu and HEU materials facilities would be located in the same area as the consolidated Pu materials facilities and would have similar air quality impacts, with the following exceptions.

During operation, emissions would be slightly higher, as shown in Appendix F. Concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative and No Action are presented in Table 4.2.1.3–1.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Air quality impacts for construction and operation for this subalternative are expected to be similar to those previously described for the Upgrade With All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. Since the same facility or a slightly smaller facility would be constructed or upgraded, the construction activities would be expected to have the same or less emissions. Storage of a smaller quantity of material would be expected to result in less emissions during operation of the facility as a result of reduced combustion emissions, laboratory operations, and other activities. [Text deleted.]

Phaseout

Phaseout of existing Pu inventories as a result of consolidating Pu at another site is expected to result in a small reduction in air pollutant concentrations from the No Action concentrations and would be in compliance with Federal and State standards. Some emissions may occur as a result of transporting materials from Hanford. Quantity of emissions is dependent on transportation mode.

NOISE

The location of the storage facilities relative to the site boundary and sensitive receptors was examined to evaluate 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 local and regional transportation routes used to bring construction material and workers to the site.

Preferred Alternative: No Action Alternative

Nontraffic noise sources associated with continued interim storage (No Action) and other ongoing missions are the same as described in Chapter 3. The continuation of operations at Hanford would result in no appreciable change in traffic noise and onsite operational noise sources from current levels. Nontraffic noise sources are 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 site, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may be located close enough to onsite noise sensitive areas to result in impacts, such as disturbances of wildlife.

Upgrade, Consolidation, and Collocation Alternatives

Nontraffic noise sources associated with the storage alternatives would be similar to those for existing facilities as discussed in Chapter 3. Nontraffic, operational noise sources associated with the alternatives include new or existing equipment and machines (cooling systems, vents, motors, and material handling equipment). These noise sources would be located at sufficient distance from offsite areas that the contribution to offsite noise levels would be small. 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.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Noise impacts for construction and operations for this option are expected to be almost the same to those previously described for the Upgrade With All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative because noise impacts are based on the use of the facility and not the size. [Text deleted.]

Phaseout

A reduction in noise levels associated with facility operations may result from the phaseout of storage facilities.

4.2.1.4 Water Resources

Construction and operation of the potential long-term storage facilities at Hanford would affect water resources. All facility options (in either the 400 or 200 Areas) are above the 100-year, 500-year, probable maximum flood (40,000 m^3/s [1.4 million ft^3/s]), flooding from dam failures, and flooding from a landslide resulting in river blockage. At Hanford, surface water resources, primarily the Columbia River, would be used to meet all construction and operation water requirements for facilities located in the vicinity of the 200 Area. The Columbia River has sufficient flow to support any of the alternatives. No construction- or operation-related impacts would exceed 1.1 percent of the Columbia River's average flow. Groundwater would be used to meet water requirements for facilities located in the 400 Area. During construction and operation of the facilities, treated wastewater would continue to be discharged in compliance with NPDES permit requirements, to infiltration ponds in the 200 Area, or nearby streams, or would be recycled at newly constructed wastewater treatment facilities. Stormwater runoff would be collected and treated, if necessary, before discharge to natural drainage channels in accordance with permit requirements. [Text deleted.]

Minimal impacts to groundwater are anticipated because no direct discharges would occur during construction and operation. Table 4.2.1.4–1 presents No Action water resources uses and discharges and the potential changes to water resources at Hanford resulting from the long-term storage alternatives.

Preferred Alternative: No Action Alternative

Surface Water. [Text deleted.] A description of the activities that would continue at Hanford is provided in Section 3.2. Under this alternative, surface water withdrawals from the Columbia River are not expected to increase from the current usage of 13,511 million l/yr (3,569 million gal/yr) by 2005. Treated wastewater discharged to infiltration/evaporation ponds is expected to remain at 246 million l/yr (65 million gal/yr). Under this alternative, current restoration programs would continue, and water quality is anticipated to improve.

Groundwater. Under this alternative, no additional impacts to groundwater resources are anticipated. Withdrawals from current operations in the 400 Area (195 million l/yr [51.6 million gal/yr]) are not anticipated to increase by 2005.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Surface Water. There are no unique construction characteristics associated with water requirements and discharges from the modify FMEF option. Since the facilities are located in the 400 Area, no surface water would be withdrawn for any modification or operation activities. Groundwater from the unconfined aquifer would be used to meet water requirements. Since upgrades will take place in an existing facility, no impact to surface water would result from soil erosion of disturbed land and siltation of surface drainage channels during modifications. During operation, stormwater runoff would be collected and treated, if necessary, before discharge to natural drainage channels.

During modification of selected areas of the FMEF, sanitary wastewater (approximately 3.9 million l/yr [1.0 million gal/yr]) would be generated and discharged to the existing wastewater treatment systems at the 400 Area. This would cause a 1.6-percent increase in the effluent discharged at Hanford. During operation, wastewater would be discharged to infiltration/evaporation ponds. [Text deleted.]

Table 4.2.1.4–1. No Action and Potential Changes to Water Resources at Hanford Site—No Action (2005) and Storage Alternatives

Affected Resource Indicator	No Action	Upgrade: Without RFETS or LANL Pu Material: Modify FMEF	Upgrade: Without RFETS or LANL Pu Material: New Storage Facility	Upgrade: With RFETS and LANL Pu Material: Modify FMEF	Upgrade: With RFETS and LANL Pu Material: New Storage Facility	Consolidation	Collocation	Phaseout
Water Source	Surface/ Ground	Ground	Surface	Ground	Surface	Surface	Surface	Surface
Construction								
Water Availability and Use								
Total water requirement (million l/yr)	NA[a]	5.0	5.0	7.8	7.8	85	105	0
Percent increase in projected water use[b]	NA[a]	2.6	0.04	4.0	0.06	0.6	0.8	0
Water Quality								
Total wastewater discharge (million l/yr)	NA[a]	3.9	3.9	5.9	5.9	7.7	12.5	0
Percent change in wastewater discharge[c]	NA[a]	1.6	1.6	3.0	0.04	3.1	5.1	0
Operation								
Water Availability and Use								
Total water requirement (million l/yr)	13,511/195	8.4	8.4	8.9	8.9	110	150	0
Percent increase in projected water use[d]	0/0	4.3	0.06	4.6	0.07	0.8	1.1	0
Water Quality								
Total wastewater discharge (million l/yr)	246	0	0	0	0	0	0	0
Percent change in wastewater discharge[c]	0	0	0	0	0	0	0	0
Floodplain								
Is action in 100-year floodplain?	NA	No	No	No	No	No	No	No

Table 4.2.1.4–1. No Action and Potential Changes to Water Resources at Hanford Site—No Action (2005) and Storage Alternatives—Continued

Affected Resource Indicator	No Action	Upgrade				Consolidation	Collocation	Phaseout
		Without RFETS or LANL Pu Material		With RFETS and LANL Pu Material				
		Modify FMEF	New Storage Facility	Modify FMEF	New Storage Facility			
Is critical action in 500-year floodplain?	NA	No	No	No	No	No	No	No

[a] See operations section of table for No Action water data.

[b] Percent increases in water requirements for construction at Hanford are calculated by dividing No Action water requirements (13,511 million l/yr for surface water and 195 million l/yr for groundwater) with that for each storage alternative: Modify FMEF without RFETS or LANL Pu material (5.0 million l/yr), new Pu storage facility without RFETS or LANL Pu material (5.0 million l/yr), Modify FMEF with all RFETS and LANL Pu material (7.8 million l/yr), new Pu storage facility with all RFETS and LANL Pu material (7.8 million l/yr), new Pu storage facility (85 million l/yr), new Pu and HEU storage facility (105 million l/yr), and storage phaseout (0 l/yr).

[c] Percent changes in wastewater discharged during construction at Hanford are calculated by dividing No Action wastewater discharges (246 million l/yr) with that for each storage alternative: modify FMEF without RFETS or LANL Pu material (3.9 million l/yr), new Pu storage facility without RFETS or LANL Pu material (3.9 million l/yr), modify FMEF with all RFETS and LANL Pu material (5.9 million l/yr), new Pu storage facility with all RFETS and LANL Pu material (5.9 million l/yr), new Pu storage facility (7.7 million l/yr), new Pu and HEU storage facility (12.5 million l/yr), and storage phaseout (0 l/yr [0 gal/yr]).

[d] Percent increases in water requirements for operation at Hanford are calculated by dividing No Action water requirements (13,511 million l/yr for surface water and 195 million l/yr for groundwater) with that for each storage alternative: modify FMEF without RFETS or LANL material (8.4 million l/yr), new Pu storage facility without RFETS or LANL material (8.4 million l/yr), modify FMEF with all RFETS and LANL Pu material (8.8 million l/yr), new Pu storage facility with all RFETS and LANL Pu material (8.9 million l/yr), new Pu storage facility (110 million l/yr), new Pu and HEU storage facility (146 million l/yr), and storage phaseout (0 l/yr).

[e] Percent changes in wastewater discharged during operation at Hanford are calculated by dividing No Action wastewater discharges (246 million l/yr) with that for each storage alternative: modify FMEF without RFETS or LANL Pu material (0 million l/yr), new Pu storage facility without RFETS or LANL Pu material (0 million l/yr), modify FMEF with all RFETS and LANL Pu material (0 million l/yr), new Pu storage facility with all RFETS and LANL Pu material (0 million l/yr), new Pu storage facility (0 l/yr), new Pu and HEU storage facility (0 l/yr), and storage phaseout (0 l/yr).

Note: NA=not applicable. During operation of the new facilities, all wastewater will be recycled; construction impacts are considered to be temporary, lasting only throughout the construction period. Impacts from operations occur continuously.

Source: DOE 1996e; DOE 1996f; HF 1995a:1; HF DOE 1995e:1; HF DOE 1996a.

Fire sprinkler water and truck hose-down water would be collected in tanks, monitored for radioactivity, and if uncontaminated, discharged to storm drains that discharge to local drainage channels. If contaminated, this water would be treated as required.

The FMEF is located in the 400 Area above the floodplain from the probable maximum flood of 40,000 m^3/s (1.4 million ft^3/s), which is greater than the 500-year flood. The possibility of flooding from dam failures with a flood wave of 600,000 m^3/s (21 million ft^3/s) has been studied by the COE. In addition to the areas inundated by the probable maximum flood, the remainder of the 100 Area, the 300 Area, and nearly all of Richland, but not the 400 Area, would be flooded. A landslide resulting in river blockage downstream of the 400 Area, and flooding along the Columbia River during a river flood flow of 17,000 m^3/s (600,000 ft^3/s), would not inundate the FMEF. Additionally, it is unlikely that the landslide would be downstream.

Groundwater. During modification activities, the quantity of water required would be approximately 5.0 million l/yr (1.3 million gal/yr), which would represent a 2.6-percent increase over the projected No Action groundwater withdrawal (195 million l/yr [52 million gal/yr]). During operation, groundwater would be obtained from existing supply systems in the 400 Area. The total annual requirement for the modified FMEF would be 8.4 million l/yr (2.2 million gal/yr), which would represent a 4.3-percent increase over the projected groundwater withdrawal (195 million l/yr [52 million gal/yr]). It is not expected that these small increases would impact regional groundwater levels.

No wastewater would be discharged directly to groundwater, so groundwater quality would not be affected. However, some of the treated wastewater discharged to evaporation/percolation ponds would percolate downward into the groundwater. The water discharged to and from the ponds 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.

Similarly, some stormwater runoff and other discharges routed to storm drains could percolate into the subsurface. Storm sewer and storm drain discharges would be monitored under the NPDES stormwater regulations. No impacts to groundwater quality are expected.

Construct New 200 West Area Facility for Plutonium Storage

Surface Water. Because the new Hanford Pu storage facility would be located in the 200 West Area, surface water would be used to meet water requirements. During construction, approximately 5 million l/yr (1.3 million gal/yr) of water would be required. This represents a much less than 1-percent increase in the projected No Action surface water withdrawal. This additional withdrawal would not cause any impacts. During operation, approximately 8.4 million l/yr (2.2 million gal/yr) of water would be required. This represents a much less than 1-percent increase in the projected annual surface water withdrawal, and it would increase Hanford's total withdrawal from the Columbia River to less than 1.0×10^{-6} of the river's average minimum flow. This would not cause any impacts to surface water availability.

During construction of the new Hanford Pu storage facility, sanitary wastewater (approximately 3.9 million l/yr [1.0 million gal/yr]) would be generated and discharged to the existing wastewater treatment systems at the 200 West Area. This would cause a 1.6-percent increase in the effluent discharged at Hanford. During operation, treated wastewater would be discharged to evaporation/infiltration ponds. [Text deleted.] All discharges would be monitored to comply with discharge requirements. Makeup water for the closed-cycle cooling system would be recycled.

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

Groundwater. Because surface water would be used during construction and operation, no impact on groundwater availability is anticipated. No wastewater would be discharged from the ponds directly to groundwater, so groundwater quality would not be affected. However, some of the treated wastewater discharged to evaporation/percolation ponds could percolate downward into the groundwater. The water would be monitored and would not be discharged until contaminant levels were within the limits specified in the NPDES 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. Similarly, some stormwater runoff routed to storm drains could percolate into the subsurface. These discharges would be monitored under the NPDES stormwater regulations. No impacts to groundwater quality are expected.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Modification activities would require 7.8 million l/yr (2.1 million gal/yr) of water, a 4.0-percent increase over the projected No Action water use. This is approximately 2.8 million l/yr (0.74 million gal/yr) of water more than that required for the Pu storage upgrade without RFETS Pu or LANL Pu material water requirements. During operations, 8.9 million l/yr (2.4 million gal/yr) of water would be required, a 4.6-percent increase over projected No Action water use. All other water requirements of the Pu storage upgrade with RFETS Pu and LANL Pu material are identical to the modified FMEF without RFETS Pu or LANL material.

Modifying FMEF to store RFETS Pu and LANL Pu material would increase water discharges by 5.9 million l/yr (1.6 million gal/yr) or 1.9 percent during construction activities over the projected No Action discharge. During operations, wastewater would be discharged to infiltration/evaporation ponds. All other wastewater requirements of the upgrade with RFETS Pu and LANL Pu material are similar to the modified FMEF without RFETS Pu or LANL Pu material.

Construct New 200 West Area Facility for Plutonium Storage

During construction, the facility would require 7.8 million l/yr (2.1 million gal/yr), a much less than 1-percent increase over projected No Action water use. All other water requirements of the new Pu storage upgrade with RFETS Pu and LANL Pu material are identical to the new Hanford Pu facility without RFETS Pu or LANL Pu material. During operations, 8.9 million l/yr (2.4 million gal/yr) of water would be required. This represents a less than 1-percent increase in surface water withdrawal.

Water resources impacts during construction and operation with RFETS Pu and LANL Pu material would increase water discharges by 5.9 million l/yr (1.6 million gal/yr) or 1.9 percent of the projected No Action discharge. During operations, wastewater would be discharged to infiltration/evaporation ponds. All other wastewater discharges of the upgrade with RFETS Pu and LANL Pu material are the same as previously discussed for the new Hanford Pu storage facility without RFETS Pu or LANL Pu material.

Consolidation Alternative

Construct New Plutonium Storage Facility

The new consolidated Pu storage facility would be located west of the 200 East Area of Hanford. Impacts associated with it are the same as those discussed above for the upgrade of the existing Pu storage area, with the following exceptions. The water requirements for construction and operation of this option are approximately 85 million l/yr (22.5 million gal/yr) and 110 million l/yr (29 million gal/yr), respectively. These additional requirements represent 0.6- and 0.8-percent increases, respectively, in the projected annual surface water withdrawals from the Columbia River and should not cause any impacts.

The quantity of sanitary wastewater generated during construction of this option would be approximately 7.7 million l/yr (2 million gal/yr). This represents a 3.1-percent increase in the projected annual wastewater effluent that would be discharged to evaporation/infiltration ponds. During operations, sanitary, utility, and process wastewaters would be recycled. No impacts to groundwater are expected from discharges. Groundwater would not be used for this alternative, so no impacts to groundwater availability or quality would be expected.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

These storage facilities would be located west of the 200 East Area of Hanford, and the impacts associated with them are the same as those discussed above, with the following exceptions. The water requirements for construction and operation of this option are greater, approximately 105 million l/yr (27.7 million gal/yr) and 150 million l/yr (39.6 million gal/yr), respectively. These additional requirements represent 0.8- and 1.1-percent increases, respectively, in the projected annual surface water withdrawals from the Columbia River and should not cause any impacts.

The quantity of sanitary wastewater generated during construction of this option would be approximately 12.5 million l/yr (3.3 million gal/yr). This represents a 5.1-percent increase in the projected annual wastewater effluent that would be discharged to evaporation/infiltration ponds. During operations, sanitary, utility, and process wastewater would be recycled at newly constructed wastewater treatment systems. No impacts are expected. Groundwater would not be used for this alternative. Therefore, no impacts to groundwater availability or quality would be expected.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Water resource impacts for construction and operation of this subalternative are expected to be slightly less than those for the Upgrade With All or Some RFETS Pu and LANL Pu, the Pu Consolidated, and the Pu and HEU Collocation Storage Alternatives at Hanford described previously because of the reduction in the amount of material. [Text deleted.]

Phaseout

Should the current Pu storage mission at Hanford be phased out, surface water withdrawals from the Columbia River and nonhazardous wastewater discharge to evaporation/percolation ponds would decrease by negligible quantities. No noticeable impacts would occur or be alleviated due to these decreases.

[Text deleted.]

4.2.1.5 Geology and Soils

Construction and operation of the alternatives at Hanford would have no effect on the geologic resources. A low seismic risk exists, but would be considered in the design of the proposed alternatives. The existing seismic risk does not preclude the safe construction and operation of the proposed alternative facilities. The facilities would be designed for earthquake-generated ground accelerations in accordance with DOE O 420.1, *Facility Safety.* Intensities of approximately V to VII on the MMI scale are possible in the general region. This could affect the integrity of poorly designed or nonreinforced structures, but should not affect newly designed facilities. Human health effects from accidents initiated by natural phenomenon (for example, earthquakes) are discussed in Section 4.2.1.9. A volcanic event of the Mt. St. Helens type could occur in the Cascade Mountain region to the west, resulting in a possible ashfall at Hanford. A recurrence of a similar event would not have an effect on the construction and operation of any of the proposed storage alternatives. It is highly unlikely that landslides, sinkhole development, or other nontectonic events would affect project activities. Slopes and underlying foundation materials are generally considered stable. Geologic resources at Hanford consist of crushed rock, sand, and gravel that have low economic value. New construction may increase the use of these materials; however, because large volumes of these materials are present, the impact is anticipated to be negligible.

Impacts to the geologic and soil resource occur during, or as a result of, ground-disturbing construction activities. Construction of the alternatives may involve ground disturbing activities that could affect the soil resources. The amount of land disturbed is specified below for each alternative. Impacts would depend on the specific soil units in the disturbed area, the extent of land disturbing activities, and the amount of soil disturbed. Control measures would be employed during construction activities to minimize soil erosion. [Text deleted.]

[Text deleted.]

Preferred Alternative: No Action Alternative

Under the No Action Alternative, DOE would continue current and ongoing activities at Hanford. There would be no ground-disturbing activities beyond those associated with existing and future site improvements. Because neither new construction nor the associated ground disturbance for potential soil erosion would occur, the No Action Alternative would have no effect on the geologic or soil resources at the site.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

No apparent direct or indirect effects on the geologic resources are anticipated because neither facility construction and operational activities nor site infrastructure improvements will limit access to potential geologic resources. Design of the facilities would preclude potential impacts by any potential hazardous geological conditions.

Construction activities will occur completely within FMEF protected area, using existing gravel areas for construction laydown. Modification of the existing FMEF for Pu storage may disturb as much as 6.3 ha (15.5 acres) from construction activities, which would affect the soil profile and lead to a possible increase in soil erosion as s result of stormwater runoff and wind action. Soil impacts during operation are expected to be minimal.

Construct New 200 West Area Facility for Plutonium Storage

No apparent direct or indirect effects on the geologic resource are anticipated because neither facility construction and operational activities nor site infrastructure improvements will limit access to potential geologic resources. Design of the facilities would preclude potential impacts by any potential hazardous geological conditions.

Construction activities will occur completely within PFP protected area and use existing gravel areas for construction laydown. Construction of the new Pu storage facility will involve ground-disturbing construction activities (approximately 10.5 ha [26 acres]) that will affect the soil profile and potentially cause a temporary increase in soil erosion. Construction activities (foundation preparation) and associated building construction laydown areas 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 (increases in wind velocities and durations increase potential soil erosion), and the size, location, and duration of ground-disturbing activities.

Net soil disturbance during operations would be considerably less than during construction because areas temporarily used for construction laydown would be restored. Although stormwater runoff and wind action could occur during operation, they are anticipated to be minimal. [Text deleted.]

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

The construction and operation land-use requirements to modify the FMEF are not affected by the inclusion of RFETS and LANL Pu material. Therefore, the impacts would be similar to those discussed for the modify FMEF without RFETS or LANL Pu material.

Construct New 200 West Area Facility for Plutonium Storage

The construction and operation land use requirements for the new Hanford Pu storage facility are not affected by the inclusion or exclusion of RFETS and LANL Pu material. Therefore, the impacts would be similar to those discussed for the new 200 West Area Pu storage facility without RFETS or LANL Pu material.

Consolidation Alternative

Construct New Plutonium Storage Facility

Construction of the new Pu storage facility will occur completely on previously undisturbed land as defined by Section 4.1.1 in a location west of the 200 East Area. Implementation of the Consolidation Alternative will involve ground-disturbing activities (58.5 ha [144 acres]) that will affect the soil profile and potentially cause a temporary increase in soil erosion. No apparent direct or indirect effects on the geologic resource are anticipated because neither facility construction and operational activities nor site infrastructure improvements will limit access to potential geologic resources. Analysis in this section is the same as that provided for the new 200 West Area Pu storage facility without RFETS or LANL Pu material.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction and operation effects on geologic and soil resources for the Collocation Alternative would be similar to those described for the Consolidation Alternative. However, additional soil impacts would be expected. Construction activities would occur completely on undisturbed land (west of the 200 East Area) as defined by Section 4.1.1 and involve approximately 89.5 ha (221 acres) of land disturbance for the new facilities, affecting the soil profile and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil impacts during operation are expected to be minimal.

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

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Exclusion of strategic reserve and weapons R&D materials would give almost the same effects to the geologic and soil resources for the Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. By excluding these materials, the size of a facility would be similar, thus not changing the amount of land disturbed by construction activities. No effect to the geologic resource is anticipated as a result of this subalternative. [Text deleted.]

Phaseout

The phaseout of storage capacity would have no apparent effects on the geologic resources. However, phaseout could result in beneficial effects on the soils of the area. Hazardous, radioactive, and mixed waste sources would be eliminated from the area, thus decreasing the potential for future soil contamination.

[Text deleted.]

4.2.1.6 Biological Resources

Preferred Alternative: No Action Alternative

Under No Action, the Pu storage mission described in Section 2.2.1 would continue at Hanford. These activities would result in no appreciable change to current conditions of biological resources at Hanford as described in Section 3.2.6.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Modifying selected areas of the FMEF within the 400 Area at Hanford would cause minimal disturbance to biological resources. This is because all activities would involve existing structures and would take place within an area that is currently disturbed. Noise associated with modifying the FMEF could cause some temporary disturbance to wildlife, but this impact would be minimal because animals living adjacent to the current facility have already adapted to its presence. Water withdrawal would be through wells and would involve relatively minor volumes, so wetlands and aquatic resources would not be affected. Wastewater would be discharged to evaporation/infiltration ponds. Since the upgrade would take place within a developed area, impacts to threatened and endangered species would not be expected.

Construct New 200 West Area Facility for Plutonium Storage

A new Pu storage facility would be constructed within the protected area of the PFP in the 200 West Area of Hanford. Although new construction would be involved in this option, it will take place within an area of the 200 West Area that is currently disturbed. Impacts to biological resources would be expected to be minimal and similar to those described above for the modification of the FMEF.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Upgrading with all or some RFETS and LANL materials would not be expected to change impacts to biological resources from those described above for the modification of the FMEF.

Construct New 200 West Area Facility for Plutonium Storage

Upgrading with all or some RFETS and LANL materials would not be expected to change impacts to biological resources from those described above for the new Pu storage facility.

Consolidation Alternative

Construct New Plutonium Storage Facility

Under this alternative, Pu would be consolidated in a new storage facility located adjacent to the 200 East Area. Impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species are discussed below.

Terrestrial Resources. Construction and operation of the consolidated Pu storage facility would disturb 58 5 ha (144 acres) of terrestrial habitat, or about 0.04 percent of Hanford. This includes areas on which plant facilities would be constructed, as well as areas revegetated following construction. Vegetation within the proposed location would be destroyed during land-clearing operations. The project site 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 storage 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 proposed location may not survive. The location would be surveyed as necessary for the nests of migrating 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 storage 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. Salt drift generated by mechanical draft cooling systems would be minimal, so impacts are not expected.

Wetlands. Construction and operation of the Pu storage facility would not affect wetlands since no wetlands exist near the proposed location. Due to the relatively small amount of water required during both construction and operation, existing intake structures would be used. It would not be necessary to disturb wetlands along the Columbia River. Construction- and operation-related discharges would be directed to evaporation ponds and, thus, would not impact wetlands. All wastewater discharges would be treated, as necessary, to meet NPDES permit requirements.

Aquatic Resources. Construction of a Pu storage facility at Hanford would not impact aquatic resources since there are no surface water bodies near the proposed location. Water requirements during both construction and operation would be met by existing site sources. Since new intake structures would not be required, direct disturbance of aquatic resources in the Columbia River would not occur. Water withdrawal during both construction and operation would represent a small percentage of the Columbia River's average flow and would have little effect on the flow of the river. Flow-related impacts to aquatic resources from impingement and entrainment impacts would be minimal and unlikely to affect fish populations in the Columbia River. In compliance with the *Anadromous Fish Conservation Act* (16 USC 757a et seq.), populations of anadromous fish species would be sustained, and their movement would be unobstructed by project construction and operation. All discharges would be to evaporation ponds, which would provide temporary aquatic habitat.

Threatened and Endangered Species. It is unlikely that federally listed threatened and endangered species would be affected by construction and operation of the Pu storage facility. However, this alternative would disturb 58.5 ha (144 acres) of sagebrush habitat. Sagebrush habitat 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 presence of plant species or animal species in the area to be disturbed. Consultation with the USFWS and State agencies would be conducted at the site-specific level, as appropriate.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Under this alternative, Pu would be stored with HEU inventories in a new collocated storage facility located in the 200 East Area. Construction and operation of collocated storage facilities at Hanford would have similar, but somewhat greater, effects on biological resources as those described for the consolidated storage facility alone. Construction of the collocated storage alternative would disturb 89.5 ha (221 acres) of habitat.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The exclusion of strategic reserve and weapons R&D materials would have almost the same effects to the Upgrade With All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. The size of facility would be similar and would not result in the reduction of disturbed habitat and fewer facility modifications and the potential impacts to biological resources would be similar. [Text deleted.]

Phaseout

The phaseout of Pu storage facilities at Hanford is not expected to affect biological resources, although increased human activity could temporarily disturb some wildlife species in the vicinity of the site.

4.2.1.7 Cultural and Paleontological Resources

Preferred Alternative: No Action Alternative

Under this alternative, DOE would continue the existing and planned missions at Hanford, which include continued storage of Pu material in the PFP in stabilized forms pursuant to DNFSB Recommendation 94-1. All inventory and evaluation of cultural resources at Hanford is conducted within the framework of the *Hanford Cultural Resources Management Plan* (PNL-6942 UC-600, June 1989), which has been in place since 1989. Any impacts to cultural or paleontological resources from these missions would be independent of the proposed action and would be addressed through separate NHPA, *American Indian Religious Freedom Act*, and *Native American Graves Protection and Repatriation Act* regulatory compliance procedures.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

The FMEF is located in the 400 Area of Hanford in an existing protected area. This option involves only modification to selected areas of the existing facility. No new construction would be necessary. Because it was recently built, the FMEF itself is not NRHP eligible. The 400 Area has been surveyed, and no archaeological or historic resources were identified. Consequently, any land-disturbing activity associated with building modification (such as equipment staging areas and temporary roads) should not affect cultural resources. Similarly, operation does not involve increased activity or ground disturbance, so it would not result in impact.

Construct New 200 West Area Facility for Plutonium Storage

The new Pu storage facility would be constructed in the 200 West Area northwest of the PFP facility within the existing protected area. The total land required during construction and operation is 10.5 ha (26 acres). All land was previously disturbed, and there will be no construction on undisturbed land.

[Text deleted.]

A non-systematic archaeological survey was conducted across 50 percent of the 200 West Area. No prehistoric or historic resources were identified, except for the White Bluffs Freight Road, which was used during both prehistoric and historic times. This portion of the road is a noncontributing element of the NRHP-listed resource, and has been given a buffer zone to protect it from development. The road is outside the proposed construction area and will not be affected. Depending on siting, construction, and operation, the new facility may affect the functional and historic setting of the PFP, which is an NRHP-eligible property. The PFP was constructed between 1947 and 1949 and was used to produce Pu metal during the Cold War Era. Some scientifically valuable Pliocene and Pleistocene paleontological deposits may also exist in the areas to be excavated during construction; although this is unlikely as previous construction activities did not reveal these kinds of resources. Archaeological and paleontological resources would not be affected by facility operation because operation does not involve additional ground disturbance or increased activity.

To date, no Native American groups have identified any areas of special concern in proximity to the 200 Areas. [Text deleted.] Operation may result in reduced access to traditional hunting, fishing, and gathering areas, or visual and auditory intrusion into sacred spaces.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

The inclusion of RFETS and LANL material would not increase the total area requirement of the Upgrade Without RFETS or LANL Subalternative, therefore, no ground-breaking construction would be necessary. All materials could be accommodated within existing facilities. Consequently, construction and operation are not expected to affect cultural or paleontological resources.

Construct New 200 West Area Facility for Plutonium Storage

Total land disturbed by construction and operation would not increase with the inclusion of RFETS and LANL materials. Construction of a slightly larger Pu storage facility is not expected to have more of an effect on cultural or paleontological resources, as discussed under the new Pu storage facility option.

Consolidation Alternative

Construct New Plutonium Storage Facility

This alternative would involve the construction of a new facility west of the 200 East Area. During construction, 58.5 ha (144 acres) would be disturbed. The total land required for operation is 56 ha (138 acres). A 1.6-km (1 mi) reduced-access buffer zone exists and would be maintained around the facility. Pu storage in existing DOE storage facilities would be phased out.

The 200 areas have been surveyed, and no prehistoric or historic resources were identified. The area is previously disturbed. Some significant paleontological materials may occur within this acreage. The potential for impacts to paleontological resources is greatest during construction. Operation would not have an additional impact on resources, should any be identified during construction. As discussed under the new Hanford Pu storage facility upgrade option, Native American groups have not identified any resources in proximity to the 200 Areas. Additional consultation may be necessary for resource identification.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

This alternative would involve the construction of a new HEU storage facility to be collocated with a consolidated special nuclear material plant adjacent to the 200 East Area. Land required during operation would be 87 ha (215 acres). Construction of this facility is expected to disturb 89.5 ha (221 acres). A 1.6-km (1-mi) reduced-access buffer zone exists and would be maintained around the facility. Pu and HEU storage in existing facilities would be phased out. Potential for impacts to these resources would be similar to that discussed under the previous Consolidation Alternative.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, facility and other resource requirements will be almost the same as the Upgrade With All or Some RFETS Pu and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. Therefore, impacts to cultural and paleontological resources would be equal to those previously discussed. [Text deleted.]

Phaseout

Impacts to archaeological resources are not anticipated because phaseout is not expected to result in ground-breaking activity. Likewise, no impacts to paleontological remains are expected. It may affect, through alteration, if subsequently proposed, some NRHP-eligible historic structures at Hanford. Impacts to Native American resources are not expected.

[Text deleted.]

4.2.1.8 Socioeconomics

Preferred Alternative: No Action Alternative

Under this alternative, the existing storage facility would remain operational. No new employment or in-migration of workers would be required.

Regional Economy Characteristics. Total employment in the REA is projected to increase by about 1.3 percent annually between 1995 and 2000, reaching 322,000 in the latter year. Long-range projections indicate slower growth after the year 2000, when employment will increase by less than 1 percent annually and reach 446,300 in 2040. Unemployment in the REA was 9.1 percent in 1994 and is expected to remain at this level into the near future. Per capita income is projected to increase from approximately $18,996 in 1995 to $28,079 in 2040. Projections for the No Action Alternative are presented in Table L.1–10.

Population and Housing. Population in the ROI is projected to increase from approximately 384,700 in 1995 to 568,600 by 2040. The total number of housing units in the ROI is projected to increase from approximately 140,900 to 208,200 during the same period. Population and housing projections for the No Action Alternative are presented in Tables L.1–11 and L.1–12, respectively.

Community Services. Education, public safety, and health care characteristics are used to assess the level of community services in the Hanford ROI. School enrollments are projected to increase from 76,891 students in 1995 to 113,659 students by 2040. To maintain the current student-to-teacher ratio of 18.9:1, the number of teachers in the ROI would need to increase from 4,077 in 1995 to 6,023 in 2040. These projections are presented in Tables L.1–13 and L.1–14, respectively.

The projected numbers of sworn police officers and firefighters serving in ROI communities over the period 1995 to 2000 are shown in Tables L.1–15 and L.1–16, respectively. Under No Action, the number of sworn police officers is projected to increase from 503 in 1995 to 742 in 2040 to maintain the current service level of 1.6 officers per 1,000 persons. The number of firefighters in the ROI would need to increase from 1,544 in 1995 to 2,281 in 2040 to maintain the current level of service of 4.0 firefighters per 1,000 persons.

Hospital occupancy rates are based on current capacity. Hospital occupancy rates and the estimated number of practicing physicians serving the ROI population between 1995 and 2040 are presented in Tables L.1–17 and L.1–18, respectively. Hospital occupancy rates for the ROI are projected to increase from 51 percent in 1995 to 75 percent in 2040. To maintain the current physician-to-population ratio of 1.2 physicians per 1,000 persons, the total number of physicians in the ROI would need to increase from 472 in 1995 to 696 in 2040.

Local Transportation. The worker population at Hanford would not increase. Therefore, any increases in traffic or air traffic would be due to the projected growth in the area unrelated to DOE activities. [Text deleted.]

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

[Text deleted.] A total of 54 workers would be employed during peak construction of the modified facility. During the operational phase, 225 workers would be required. Projections indicate that there would be sufficient available labor in the REA to fill both direct and indirect jobs generated as a result of construction and all indirect jobs generated by operation of the modified facility. Some workers would in-migrate to fill a portion of the direct jobs generated during operations.

Regional Economy Characteristics. During peak construction, the project would add up to 108 (54 direct and 54 indirect) jobs to the regional economy. All of these new jobs would be filled by available labor force in the REA and unemployment would fall from the No Action level of 9.1 percent to 9.0 percent (Socio 1996a). Per capita income would remain virtually unchanged, increasing by much less than 1 percent over the No Action Alternative.

Operation of the facility without storage of RFETS or LANL material would generate a total of 759 jobs (225 direct and 534 indirect) in the REA. These additional jobs would reduce regional unemployment by much less than 1 percent from the No Action level. Per capita income would increase by much less than 1 percent in the year 2005, when the facility would become fully operational (Socio 1996a).

Population, Housing, and Community Services. During construction, all newly created jobs would be filled by the resident labor force. Therefore, there would be no change to the region's population, housing market, or demand for community services beyond the No Action projections. A small increase in population would occur during operation of the facility due to the in-migration of five workers. Accordingly, there would be an insignificant effect on the housing market and the demand for community services (Socio 1996a).

Local Transportation. During the peak construction period, 104 vehicle trips per day would be generated by workers involved in facility modification. This increase would not affect level of service on the road segments analyzed. During operations, the workers would generate 432 vehicles trips per day. This increase over the No Action level would not affect the level of service on the local road segments analyzed (Socio 1996a).

Construct New 200 West Area Facility for Plutonium Storage

Work force requirements for the construction and operation of the new Pu storage facility are the same as for modification of the FMEF. Therefore, the magnitude of socioeconomic impacts for this option would be the same as those discussed above for the FMEF.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

A peak of 77 workers would be employed to modify the facility to store all of the RFETS and LANL material. During the operational phase, 252 workers would be required. Projections indicate that there would be sufficient labor available in the REA to fill all direct and indirect jobs generated by construction and all indirect jobs generated by operation of the modified facility. Some workers would in-migrate to fill a portion of the direct jobs generated by operation.

Regional Economy Characteristics. During peak construction, the project would generate 154 jobs (77 direct and 77 indirect) in the regional economy. All of these new jobs would be filled by available labor within the REA. Unemployment would fall from the No Action level of 9.1 percent to 9.0 percent (Socio 1996a). Per capita income would remain virtually unchanged, increasing by much less than one percent over the No Action Alternative.

Operation of the facility would generate a total of 850 (252 direct and 598 indirect) jobs. Regional unemployment would be reduced slightly from the No Action projection of 9.1 percent to 8.9 percent. Per capita income would increase by much less than 1 percent (Socio 1996a).

Population, Housing, and Community Services. All jobs generated by construction would be filled by the resident labor force. Therefore, there would be no change to the region's population from the No Action projections. Accordingly, there would be minimal effects on the housing market or demand for community services. A small increase in population would occur during operation of the facility due to the in-migration of eight workers. Such an increase would have an insignificant effect on the housing market and the demand for community services (Socio 1996a).

If only a portion of the RFETS or LANL materials were transferred to Hanford, between 225 and 252 workers would be required to operate the facility. The exact number of workers would depend on the amount of material that would actually reside at Hanford. The size of the construction workforce would be between 54 and 77 workers in the peak year of construction. Between 108 and 154 jobs (direct and indirect) would be generated during construction while between 759 and 850 jobs (direct and indirect) would be generated during operations. There would be no changes to the ROI population over the No Action projections during construction, but could be some in-migration during operations. In all cases, the socioeconomic impacts to the region would be slight.

Local Transportation. During the peak construction period, 148 vehicle trips per day would be generated by workers involved in facility modification. During operations, workers would generate 484 vehicle trips per day. These increases would not affect the level of service on the local road segments analyzed. (Socio 1996a).

Construct New 200 West Area Facility for Plutonium Storage

Workforce requirements for the construction and operation of the new Pu storage facility are the same as for the modification of the FMEF. Therefore, the magnitude of socioeconomic impacts for this option would be the same as those discussed above for the FMEF.

Consolidation Alternative

Construct New Plutonium Storage Facility

To consolidate storage of Pu that is currently stored at multiple DOE sites, a new storage facility would need to be constructed at Hanford. A few workers would in-migrate to fill a portion of the direct jobs created during the operation of the new facility.

Regional Economy Characteristics. Construction would involve over 1,000 workers on site and add a total of 2,129 jobs (1,064 direct and 1,065 indirect) to the REA during the peak period of activity, an increase of less than 1 percent over the No Action level. All of these jobs would be filled by available labor in the REA. Unemployment would drop from 9.1 percent to about 8.5 percent. Per capita income would increase by much less than 1 percent in the peak year of construction (Socio 1996a).

The operation of the facility would add a total of 1,495 jobs (443 direct and 1,052 indirect) to the regional economy, an increase of less than 1 percent over the No Action level. A small percentage of the direct workers would in-migrate to fill some specialized employment requirements. Operation workers would begin phasing in as construction nears completion. Unemployment would rise from 8.5 percent during peak construction to 8.7 percent during operation, but would remain lower than the No Action level of 9.1 percent. Per capita income would increase by much less than 1 percent over No Action (Socio 1996a).

Population, Housing, and Community Services. A small increase in population would occur during the operation phase due to the in-migration of 27 workers. Such an increase would have no effect on the housing sector and would have an insignificant effect on the demand for community services (Socio 1996a).

Local Transportation. During the peak construction period, workers would generate 2,043 vehicle trips per day. This increase would not affect the level of service on the local road segments analyzed. During operations, workers would generate 851 vehicles trips per day, and the increase to roadway traffic would be less than during construction (Socio 1996a).

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction of new storage facilities would be required in order to store Pu and HEU at Hanford. Workers would in-migrate to fill some of the direct jobs created during operation of the new storage facility. Construction employment would reach 1,076 during the peak period of activity. Operations would require 572 workers.

Regional Economy Characteristics. Construction of the new facility would generate a total of 2,153 jobs (1,076 direct and 1,077 indirect) during the peak construction year. The resident available labor force would be sufficient to fill all of the direct and indirect jobs created during the construction phase. Total employment in the REA would increase by less than 1 percent. Unemployment would decrease from 9.1 percent to 8.5 percent. Per capita income would increase by much less than 1 percent in the peak construction year (Socio 1996a).

Operation of the facility would produce a total of over 1,930 new jobs (572 direct and 1,358 indirect) within the REA. A majority of direct jobs and all of the indirect jobs generated would be filled by the resident labor force. Total employment in the REA would increase by less than 1 percent in the year 2005, when the facility would become fully operational. Operation workers would begin phasing in as construction nears completion. Unemployment would rise from 8.5 percent during peak construction to 8.6 percent during operation, but would remain lower than the No Action level of 9.1 percent. Per capita income is projected to increase by less than 1 percent (Socio 1996a).

Population and Housing. A small number of workers are projected to in-migrate during the operation period. The population increase would be negligible, and projected housing vacancies would be sufficient to accommodate the incremental population increase (Socio 1996a).

Community Services. The additional population would slightly increase demand for some community services. Worker in-migration would lead to an increase in ROI school enrollment by approximately 35 students during operation. In order to maintain the No Action student-to-teacher ratio, the number of teachers would have to increase by one (Socio 1996a). [Text deleted.]

In order to maintain the No Action level of service, two firefighters would need to be hired during the operational period. No additional police would be required to maintain the No Action level of service during the operational period (Socio 1996a).

The small population change would have a negligible effect on health services, increasing hospital occupancy by much less than 1 percent. The number of physicians in the ROI would be sufficient to maintain the No Action level of service.

Local Transportation. During the peak construction period, workers would generate 2,066 vehicle trips per day. This increase would not affect the level of service on the road segments analyzed. During operations, workers would generate 1,098 vehicles trips per day and the increase in roadway traffic would be less than during construction (Socio 1996a).

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

If strategic reserve and weapons R&D materials are not included in the storage requirements for Hanford, there would be a small reduction in worker requirements for construction and operation of the facility due to fewer workers being needed. Therefore, the socioeconomic effects would be less than under those alternatives that include storage of nonsurplus RFETS and LANL material for the Upgrade With All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. [Text deleted.]

Phaseout

Phaseout of the existing Pu storage facility at Hanford would result in the loss of 675 total jobs (200 direct and 475 indirect) in the REA. The total direct and indirect employment loss would be much less than a 1 percent reduction in the projected regional employment levels for the year 2005, when the phaseout would be implemented.

In the longer term, some unemployed workers may migrate out of the REA to seek new employment opportunities. Even if all of these workers were to leave the REA with their families, population would decrease by much less than 1 percent compared to No Action. The impact on housing and community services, including health care, education, and public safety would not be substantial. For example, there could be a slight increase in housing vacancies or a decline in new housing construction and also a small decrease in demand for educational and health services (for example, teachers and physicians). These minor impacts would be further reduced if the storage mission is phased out over more than 1 year.

Phaseout of the existing Pu storage facilities at Hanford would reduce the number of vehicle trips per day by 384. There would be no significant traffic impact to the local road network.

4.2.1.9 Public and Occupational Health and Safety

The assessments of potential radiological and chemical impacts associated with the storage alternatives at Hanford are presented in this section. Summaries of radiological impacts from normal operations are presented in Tables 4.2.1.9–1 and 4.2.1.9–2 for the public and workers, respectively. Impacts from hazardous chemicals are presented in Table 4.2.1.9–3. Summaries of impacts associated with postulated accidents are given in Tables 4.2.1.9–4 through 4.2.1.9–7. Detailed results are presented in Appendix M.

Preferred Alternative: No Action Alternative

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from normal operations involving the Hanford sitewide missions, including interim storage of Pu. The impacts would be within applicable regulatory limits. For facility accidents, the risks and consequences are described in site safety documentation.

Normal Operation. The current mission at Hanford, where Pu is in interim storage, is described in Section 3.2. The site has identified those facilities that will continue to operate under the No Action Alternative, including interim Pu storage facilities and others, if any, that will become operational by 2005. Based on that information, the radiological and chemical releases to the environment in 2005 and beyond (future operation) were developed and used in the impact assessments. The resulting doses and potential health effects on the public and workers at Hanford are described below.

Under the No Action Alternative, Hanford would continue to store Pu-bearing materials in the storage vaults and approved vault-type rooms of the PFP. All Pu materials would be stabilized and repackaged, as necessary, to ensure safe storage. Activities supporting stabilization, repackaging, and storage of the Pu materials are identified and discussed in the *DNFSB Recommendation 94-1 Hanford Site Integrated Stabilization Management Plan* (VHC-EP-0853). This plan calls for transforming the Pu-bearing materials to a stable form that meets the DOE standard *Criteria for Safe Storage of Pu Metals and Oxides* (DOE-STD-3013-94) by 2002 for materials with greater than 50 percent Pu. Some PFP plant systems that are required to provide basic facility services would be upgraded for storage facility operations for the No Action Alternative.

Radiological Impacts. Under this alternative at Hanford, Table 4.2.1.9–1 presents the calculated annual dose to the average and MEI of the public, from total site operation, the projected fatal cancer risks to these individuals from 50 years of operation, the dose to the population within 80 km (50 mi) due to total site operation in the year 2030, and the projected number of fatal cancers in this population from 50 years of operation. The annual dose of 5.3×10^{-3} mrem to the MEI is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.3×10^{-7}. The annual dose of 1.6 person-rem to the population of 621,000 would be within the limit in proposed 10 CFR 834. The corresponding number of fatal cancers in this population from 50 years of operation would be 0.039. To put operational doses into perspective, comparisons with natural background radiation doses are included in the table. The doses and projected fatal cancers associated with the storage component of the No Action Alternative are included in Table 4.2.1.9–1. These are seen to be much lower than those from total site operations.

Under the No Action Alternative shown in Table 4.2.1.9–2, the annual average dose to a noninvolved (No Action) site worker and the annual dose to the noninvolved (No Action) total site workforce would be 31 mrem and 296 person-rem, respectively. The associated risk of fatal cancer to the average worker from 50 years of total site operations would be 6.0×10^{-4} and the projected number of fatal cancers from 50 years of total site operations would be 5.1.

The annual average dose to a worker involved in No Action storage operations would be 250 mrem/year, with a total involved No Action workforce dose of 49 person-rem. The increased risk of latent cancer fatality to the

Table 4.2.1.9–1. Potential Radiological Impacts to the Public During Normal Operation at Hanford Site—No Action and Storage Alternatives

Receptor	No Action Storage Facility	No Action Total Site	Upgrade Storage Facility[a]	Upgrade Total Site[b]	Consolidation Storage Facility	Consolidation Total Site[b]	Collocation Storage Facility	Collocation Total Site[b]
Annual Dose to the Maximally Exposed Individual Member of the Public [c]								
Atmospheric release pathway (mrem)	4.1×10^{-4}	4.4×10^{-3}	1.8×10^{-6}	4.1×10^{-3}	2.5×10^{-6}	4.1×10^{-3}	2.5×10^{-6}	4.1×10^{-3}
Drinking water pathway (mrem)	0	0	0	0	0	0	0	0
Total liquid release pathway (mrem)	0	9.5×10^{-4}	0	9.5×10^{-4}	0	9.5×10^{-4}	0	9.5×10^{-4}
Atmospheric and liquid release pathways combined (mrem)	4.1×10^{-4}	5.3×10^{-3}	1.8×10^{-6}	5.1×10^{-3}	2.5×10^{-6}	5.1×10^{-3}	2.5×10^{-6}	5.1×10^{-3}
Percent of natural background[d]	1.4×10^{-4}	1.8×10^{-3}	6.0×10^{-7}	1.7×10^{-3}	8.3×10^{-7}	1.7×10^{-3}	8.3×10^{-7}	1.7×10^{-3}
50-year fatal cancer risk	1.0×10^{-8}	1.3×10^{-7}	4.5×10^{-11}	1.3×10^{-7}	6.2×10^{-11}	1.3×10^{-7}	6.2×10^{-11}	1.3×10^{-7}
Population Dose Within 80 Kilometers for Year 2030 [e]								
Atmospheric release pathway (person-rem)	0.047	0.46	4.7×10^{-5}	0.41	1.1×10^{-4}	0.41	1.1×10^{-4}	0.41
Liquid release pathway (person-rem)	0	1.1	0	1.1	0	1.1	0	1.1
Atmospheric and liquid release pathways combined (person-rem)	0.047	1.6	4.7×10^{-5}	1.5	1.1×10^{-4}	1.5	1.1×10^{-4}	1.5
Percent of natural background[d]	2.5×10^{-5}	8.4×10^{-4}	2.5×10^{-8}	8.1×10^{-4}	5.9×10^{-8}	8.1×10^{-4}	5.9×10^{-8}	8.1×10^{-4}
50-year fatal cancers	1.2×10^{-3}	0.039	1.2×10^{-6}	0.038	2.8×10^{-6}	0.038	2.8×10^{-6}	0.038
Annual Dose to the Average Individual Within 80 Kilometers [f]								
Atmospheric and liquid release pathways combined (mrem)	7.6×10^{-5}	2.6×10^{-3}	7.6×10^{-8}	2.4×10^{-3}	1.8×10^{-7}	2.4×10^{-3}	1.8×10^{-7}	2.4×10^{-3}
50-year fatal cancer risk	1.9×10^{-9}	6.0×10^{-8}	1.9×10^{-12}	6.0×10^{-8}	4.4×10^{-12}	6.0×10^{-8}	4.4×10^{-12}	6.0×10^{-8}

[a] The radiological impacts associated with the new Hanford Pu storage facility are smaller than for the modified FMEF (refer to the text). The impacts from total site operations are virtually the same with operations of either of the two storage alternatives. The radiological impacts are calculated based on measured releases from facilities at Hanford, RFETS, and LANL.

[b] Includes impacts from No Action facilities. The location of the MEI may be different under No Action than for the other alternatives. Therefore, the impacts may not be directly additive.

[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 the 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.

[Text deleted.]

[d] The annual natural background radiation level at Hanford is 300 mrem for the average individual; the population within 80 km in the year 2030 receives 186,400 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 by the number of people projected to live within 80 km of Hanford in 2030 (621,000).

Source: Section M.2.

Table 4.2.1.9–2. Potential Radiological Impacts to Workers During Normal Operation at Hanford Site—Storage Alternatives

Receptor	No Action[a]	Upgrade[b]	Consolidation[b]	Collocation[b]
Involved Workforce[c]				
Average worker dose (mrem/yr)[d]	250	250	258	264
50-year risk of fatal cancer	5.0×10^{-3}	5.0×10^{-3}	5.2×10^{-3}	5.3×10^{-3}
Total dose (person-rem/yr)	46	52	24	25
50-year fatal cancers	0.92	1.0	0.48	0.50
Noninvolved Workforce[e]				
Average worker dose (mrem/yr)[d]	27	27	27	27
50-year risk of fatal cancer	5.5×10^{-4}	5.5×10^{-4}	5.5×10^{-4}	5.5×10^{-4}
Total dose (person-rem/yr)	250	250	250	250
50-year fatal cancers	5.1	5.1	5.1	5.1
Total Site Workforce[f]				
Dose (person-rem/yr)	296	302	274	275
50-year fatal cancers	5.9	6.0	5.5	5.5

[a] It is expected that for the No Action Alternative the number of involved workers and average dose would be the same as for the Upgrade Without RFETS Pu or LANL Pu Subalternative. Additional workers would be required for the Upgrade With RFETS Pu and LANL Pu Subalternative. Therefore, the total worker dose would increase accordingly.

[b] Under the Upgrade Alternative, 225 in-plant workers (of which 185 are badged with dosimeters to monitor radiation exposure) would be required to operate the storage facility, with an estimated additional 27 in-plant workers (22 badged) needed if Pu is transferred from the RFETS and LANL. The impacts given in the upgrade column include those associated with these additional workers. The number of involved badged workers for the Consolidation and Collocation Alternatives would be 92 and 95, respectively.

[c] The involved worker is associated with operations of the proposed action. The maximum dose to an involved worker will be kept below 500 mrem per year. Based on a review of worker doses associated with similar operations (Section M 2.3.2), an average worker dose of 250 mrem per year was conservatively assumed. However, an effective ALARA program will ensure that exposure will be reduced to that level which is as low as reasonably achievable.

[d] 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 site must make reasonable attempts to maintain worker doses below this level.

[e] The noninvolved worker is onsite but not associated with operations of the proposed action. The projected number of noninvolved badged workers in 2005 and beyond is 9,300. The noninvolved workforce is equivalent to the No Action workforce.

[f] 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.

Table 4.2.1.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation at Hanford Site—No Action and Storage Alternatives

	No Action	Upgrade		Consolidation		Collocation	
Receptor	Total Site[a]	Facility[b]	Total Site[a]	Facility[b]	Total Site[a]	Facility[b]	Total Site[a]
Maximally Exposed Individual (Public)							
Hazard Index[c]	$6.2x10^{-5}$	$9.4x10^{-7}$	$6.3x10^{-5}$	$4.0x10^{-6}$	$6.6x10^{-5}$	$1.6x10^{-5}$	$7.8x10^{-5}$
Cancer risk[d]	0	0	0	$2.7x10^{-8}$	$2.7x10^{-8}$	$2.7x10^{-8}$	$2.7x10^{-8}$
Worker Onsite							
Hazard Index[e]	$4.0x10^{-3}$	$1.9x10^{-5}$	$4.0x10^{-3}$	$2.8x10^{-4}$	$4.3x10^{-3}$	$7.1x10^{-4}$	$4.7x10^{-3}$
Cancer risk[f]	0	0	0	$1.2x10^{-5}$	$1.2x10^{-5}$	$1.2x10^{-5}$	$1.2x10^{-5}$

[a] Total=Sum of the No Action plus the contributions of the above activity.
[b] Facility=Contribution from the above activity only (for example, the amount of increase over the existing, No Action level at the site).
[c] Hazard index for MEI=Sum of Individual Hazard Quotients (Noncancerous health effects) for MEI.
[d] Cancer risk for MEI=(Emissions for 8-hr) x (0.286 [Converts concentrations to doses]) x (Slope Factor [SF]).
[e] Hazard index for workers=Sum of Individual Hazard Quotients (Noncancerous 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).
Note: Where there are no known carcinogens among the hazardous chemicals emitted, there are no slope factors, therefore the calculated risk value is 0.
Source: Section M.3, Tables M.3.4–1 through M.3.4–4.

average No Action worker from 50 years of operation would be $5.0x10^{-3}$, and the projected number of latent fatal cancers to the No Action workforce from 50 years of operation would be 0.92.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public resulting from the normal operation under No Action at Hanford are presented in Table 4.2.1.9–3. The hazardous chemical impacts from current site operations represent the baseline site impacts for the various storage alternatives. The noncancerous health effects and the risk of cancer due to the total chemical exposures were estimated. Since the major releases due to normal operation at Hanford are expected to make up nearly all of the exposures to onsite workers and to the public in adjacent communities, contributions to the hazardous chemical concentrations from all other sources (for example, industrial operations) are considered negligible for purposes of risk calculations.

The HI to the MEI of the public at Hanford resulting from normal operation under the No Action Alternative is $6.2x10^{-5}$, and the cancer risk from hazardous chemicals is zero (because no carcinogens are released from the hazardous chemicals used). The HI to the onsite worker is $4.0x10^{-3}$, and the cancer risk is zero (because no carcinogens are released from the hazardous chemicals used).

Facility Accidents. Under the No Action Alternative, Pu would continue to be stored at Hanford in existing facilities. These facilities currently operate in accordance with DOE Orders which ensure that the risk to the public of prompt fatalities due to accidents or cancer fatalities due to operations will be minimized. The safety to workers and the public from accidents at existing facilities is also controlled by Technical Safety Requirements specified in detail in a Safety Analysis Report (SAR) or a Basis for Interim Operations document prepared and maintained specifically for a facility or process within a facility. Under these controls, any change in approved operations or to facilities would cause a halt in operations until it can be established that worker and public safety has not been compromised.

The *Plutonium Finishing Plant Safely Analysis Report* (WHC-SD-CP-SAR-021) analyzes a wide spectrum of accidents that are primarily associated with processing rather than vault storage. This is because a release from a vault would require more severe accident conditions than are normally analyzed in an SAR. The accidents in the SAR consist of potential process accidents such as fires, explosions, and criticality as well as an externally initiated aircraft crash and earthquake. An estimate of the effects of potential accidents in the existing storage vault at Hanford can be derived from similar storage accidents that have been postulated for an upgraded storage facility. A severe consequence, low frequency accident for storage under the No Action Alternative would be a beyond design basis earthquake. If this accident were to occur, there would be an estimated 0.12 latent cancer fatalities in the offsite population within 80 km (50 mi). The estimated frequency of the earthquake with sufficient damage to cause a release is approximately 1.0×10^{-7} per year, which corresponds to a risk of 1.2×10^{-8} latent cancer fatalities per year. For the MEI and noninvolved worker, there would be 1.7×10^{-5} and 2.2×10^{-3} latent cancer fatalities, respectively, if the accident occurred. The risks would be 1.7×10^{-12} and 2.2×10^{-10} latent cancer fatalities per year. A potentially more frequent accident is penetration of the PCV caused by corrosion. If this accident were to occur, the estimated number of cancer fatalities in the offsite population would be 1.3×10^{-3}. The estimated frequency of this accident is 6.4×10^{-3} per year, which corresponds to a risk of 8.3×10^{-5} cancer fatalities per year. For the MEI and noninvolved worker the corresponding impacts are 1.8×10^{-7} and 1.8×10^{-5} latent cancer fatalities, respectively, if the accident occurred. The risks would be 1.2×10^{-9} and 1.2×10^{-7} latent cancer fatalities per year.

Upgrade Alternative

This section describes the radiological and hazardous chemical releases and their associated impacts resulting either from normal operation or from accidents involved with the modified FMEF or a new storage facility at Hanford. The section describes the impacts from normal facility operations at Hanford, followed by a description of impacts from facility accidents.

During normal operation at Hanford, the operation of any of these Pu storage facilities would result in impacts that are within applicable regulatory limits.

[Text deleted.]

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Normal Operation. There would be no radiological releases during the modification of the FMEF at Hanford. 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 (ALARA). Toward this end, construction workers would be monitored as appropriate. Limited hazardous chemical releases are anticipated as a result of the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be radiological and hazardous chemical releases to the environment as well as direct exposures. The resulting doses and potential health effects on the public and workers at Hanford are described below.

Radiological Impacts. Doses to the public from storage would be expected to decrease from No Action for the Upgrade Alternative, as shown in Table 4.2.1.9–1. This is because the storage facility safety and design features would improve. The dose to the MEI of the public due to annual storage facility operation would be 1.8×10^{-6} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 4.5×10^{-11}. The impacts to the average individual would be less. As a result of storage facility operation in the year 2030, the population dose would be 4.7×10^{-5} person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be 1.2×10^{-6}.

The dose to the MEI due to annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be 5.1×10^{-3} mrem. From 50 years of operations, the corresponding risk of fatal cancer to this individual would be 1.3×10^{-7}. These values are presented in Table 4.2.1.9–1. 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 total site operations in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 1.5 person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 0.038.

Doses to onsite workers from normal operations are given in Table 4.2.1.9–2. Included are involved workers directly associated with the modified facility for Pu storage, workers who are not involved with the modified facility, and the entire workforce at Hanford. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. 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. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the upgraded storage facilities at Hanford are presented in Table 4.2.1.9–3. The impacts from all site operations, including the upgraded storage facilities are also included in this table. Total site impacts, which include the No Action impact plus the facility are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI from the facility to the MEI of the public is 9.4×10^{-7}, and the cancer risk from hazardous chemicals from the facility is zero (because no carcinogens are released from the hazardous chemicals used) as a result of operation of the upgraded storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the upgrade facility, would result in an HI of 6.3×10^{-5} and a cancer risk of zero (because no carcinogens are released) for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI from the facility to the onsite worker would be 1.9×10^{-5} and the cancer risk from the facility is zero (because no carcinogens are released from the hazardous chemicals used) as a result of operation of the upgraded storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, provided exposures remain the same. The total site operation including the upgrade facility would result in an HI of 4.0×10^{-3} and a cancer risk of zero (because no carcinogens are released) for the worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. Modification of the existing Pu storage facilities at the Hanford site may change the existing risks of accidents to workers and the public. Under this action, the FMEF would be modified and would be in compliance with applicable DOE Orders and other regulations and standards. This may result in a reduction of risk compared to No Action.

A set of potential accidents have been postulated for upgraded storage at FMEF of existing Pu without LANL or RFETS Pu 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 Table 4.2.1.9–4. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.12 at Hanford for the beyond design basis earthquake accident scenario with an estimated probability of 1.0×10^{-7} per year (for example, probability of severe earthquake occurring is estimated to be about 1.0×10^{-5}, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-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 6.1×10^{-7}, 8.3×10^{-11}, and 1.1×10^{-8}, respectively. The maximum population 50-year facility lifetime risk would be $4.2x10^{-4}$ (for example, one fatality in over 100,000 years) at Hanford for the PCV penetration by corrosion accident scenario with a probability of $6.4x10^{-3}$ per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be $5.7x10^{-8}$ and $5.7x10^{-6}$, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.1.9–4.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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.

Construct New 200 West Area Facility for Plutonium Storage

Normal Operation. There would be no radiological releases during the construction of new storage facilities at Hanford. 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 the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be radiological and hazardous chemical releases to the environment as well as direct exposures. The resulting doses and potential health effects to the public and workers at Hanford are described below.

Radiological Impacts. The doses and associated health risks to the public associated with this new storage facility are expected to be even smaller than those for the modified FMEF. Total site doses and resulting health risks would be virtually the same for both storage facilities. The doses and associated health risks to workers are assumed to be the same as for the modified FMEF (Table 4.2.1.9–2). This is because the operations would be similar and the amount of material handled would be the same.

Hazardous Chemical Impacts. Hazardous chemical emissions from the new Pu storage facility would be less than the emissions from the modified FMEF. The resultant health risks to the public and workers from hazardous chemical emissions associated with this new storage facility would be even smaller than those given in Table 4.2.1.9–3 for the modified FMEF.

Facility Accidents. A new Pu storage facility for continued storage of Pu would incorporate new safety features that should reduce the consequences and risks of accidents compared with No Action. The consequences and risks of accidents for this new facility would be bounded by the consequences and risks presented in Table 4.2.1.9–4 for the upgraded FMEF at Hanford.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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 4.2.1.9–4. Upgrade Without Rocky Flats Environmental Technology Site or Los Alamos National Laboratory Material Alternative—Accident Impacts at Hanford Site

Accident Description	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		Accident Frequency (per yr)
	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	
PCV puncture by forklift	$1.3x10^{-7}$	$4.4x10^{-6}$	$1.3x10^{-9}$	$4.4x10^{-8}$	$9.6x10^{-6}$	$3.2x10^{-4}$	$6.0x10^{-4}$
PCV breach by firearms discharge	$7.7x10^{-9}$	$4.4x10^{-7}$	$7.7x10^{-11}$	$4.4x10^{-9}$	$5.6x10^{-7}$	$3.2x10^{-5}$	$3.5x10^{-4}$
PCV penetration by corrosion	$5.7x10^{-6}$	$1.8x10^{-5}$	$5.7x10^{-8}$	$1.8x10^{-7}$	$4.2x10^{-4}$	$1.3x10^{-3}$	$6.4x10^{-3}$
Vault fire	$5.8x10^{-9}$	$1.2x10^{-3}$	$4.6x10^{-11}$	$9.2x10^{-6}$	$3.4x10^{-7}$	0.067	$1.0x10^{-7}$
Truck bay fire	$3.1x10^{-9}$	$6.1x10^{-4}$	$3.1x10^{-11}$	$6.1x10^{-6}$	$2.2x10^{-7}$	0.045	$1.0x10^{-7}$
Spontaneous combustion	$3.1x10^{-11}$	$8.8x10^{-7}$	$3.1x10^{-13}$	$8.8x10^{-9}$	$2.2x10^{-9}$	$6.4x10^{-5}$	$7.0x10^{-7}$
Explosion in the vault	$7.2x10^{-10}$	$1.4x10^{-4}$	$7.2x10^{-12}$	$1.4x10^{-6}$	$5.3x10^{-8}$	0.011	$1.0x10^{-7}$
Explosion outside of vault	$3.3x10^{-11}$	$6.6x10^{-6}$	$3.3x10^{-13}$	$6.6x10^{-8}$	$2.4x10^{-9}$	$4.8x10^{-4}$	$1.0x10^{-7}$
Nuclear criticality	$2.1x10^{-11}$	$4.2x10^{-6}$	$1.6x10^{-13}$	$3.3x10^{-8}$	$1.8x10^{-10}$	$3.5x10^{-5}$	$1.0x10^{-7}$
Beyond design basis earthquake	$1.1x10^{-8}$	$2.2x10^{-3}$	$8.3x10^{-11}$	$1.7x10^{-5}$	$6.1x10^{-7}$	0.12	$1.0x10^{-7}$
Expected risk[d]	$5.8x10^{-6}$	–	$5.8x10^{-8}$	–	$4.3x10^{-4}$	–	–

[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 in 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 for each accident over the 50-year lifetime of the facility.

Note: All values are mean values

Source: Calculated using Table 4.2 1.9–6 data adjusted for existing inventory of Pu at Hanford.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

Normal Operation. As described for the Upgrade Without RFETS or LANL Pu, there would be no radiological releases during the modification of the FMEF at Hanford. Construction worker exposures to material potentially contaminated with radioactivity 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 the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be radiological and hazardous chemical releases to the environment as well as direct exposures. The resulting doses and potential health effects on the public and workers at Hanford are described below.

Radiological Impacts. During normal operations, there would be only a negligible difference in radiological impacts if Pu from the RFETS and LANL is included in the upgrade storage alternative. Therefore, the impacts are essentially the same as presented in the previous section, which discusses the upgrade without RFETS or LANL Pu.

Hazardous Chemical Impacts. Hazardous chemicals associated with storage of Pu from RFETS and LANL does not measurably contribute to hazardous chemical emissions from the facility for this subalternative. Therefore resultant hazardous chemical impacts to the public and worker are essentially the same as presented in the previous section, which discusses the upgrade without RFETS or LANL Pu.

Facility Accidents. Upgrade of the existing Pu storage facilities at the Hanford site may change the existing risks of accidents to workers and the public. Under upgrade, all Pu storage facilities would be brought into compliance with applicable DOE Orders and other regulations and standards. This may result in a reduction of risk compared to No Action.

A set of potential accidents have been postulated for the RFETS and LANL Pu storage increment 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 Table 4.2.1.9–5. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.12 at Hanford for the beyond design basis earthquake accident scenario with an estimated probability of $1.0x10^{-7}$ per year (for example, probability of severe earthquake occurring is estimated to be about $1.0x10^{-5}$, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-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 $6.2x10^{-7}$, $8.5x10^{-11}$, and $1.1x10^{-8}$, respectively. The maximum population 50-year facility lifetime risk would be $4.3x10^{-4}$ (for example, on fatality in over 100,000 years) at Hanford for the PCV penetration by corrosion accident scenario with a probability of $6.6x10^{-3}$ per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be $5.9x10^{-8}$ and $5.9x10^{-6}$, respectively. Table 4.2.1.9–5 also shows the Combined Expected Risk for the upgraded storage of existing Pu, the RFETS Pu and the LANL Pu increment. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.1.9–5.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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.

Construct New 200 West Area Facility for Plutonium Storage

Normal Operation. As described for the Upgrade Without RFETS or LANL Pu, there would be no radiological releases during the construction of the new 200 West Area Facility. 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 the construction activities. However, concentrations would be within the regulated exposure limits. During normal operation, there would be radiological and hazardous chemical releases to the environment as well as direct exposures. The resulting doses and potential health effects to the public and workers at Hanford are described below.

Radiological Impacts. During normal operations, there would be only a negligible difference in radiological impacts if Pu from the RFETS and LANL is included in the upgrade storage alternative. Therefore, the impacts are essentially the same as presented in the previous section, which discusses the Upgrade Without RFETS or LANL Pu.

Table 4.2.1.9–5. Upgrade With Rocky Flats Environmental Technology Site and Los Alamos National Laboratory Material Alternative—Accident Impacts at Hanford Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	$1.3x10^{-7}$	$4.4x10^{-6}$	$1.3x10^{-9}$	$4.4x10^{-8}$	$9.6x10^{-6}$	$3.2x10^{-4}$	$6.0x10^{-4}$
PCV breach by firearms discharge	$7.7x10^{-9}$	$4.4x10^{-7}$	$7.7x10^{-11}$	$4.4x10^{-9}$	$5.6x10^{-7}$	$3.2x10^{-5}$	$3.5x10^{-4}$
PCV penetration by corrosion	$5.9x10^{-6}$	$1.8x10^{-5}$	$5.9x10^{-8}$	$1.8x10^{-7}$	$4.3x10^{-4}$	$1.3x10^{-3}$	$6.6x10^{-3}$
Vault fire	$5.9x10^{-9}$	$1.2x10^{-3}$	$4.7x10^{-11}$	$9.4x10^{-6}$	$3.5x10^{-7}$	0.069	$1.0x10^{-7}$
Truck bay fire	$3.1x10^{-9}$	$6.1x10^{-4}$	$3.1x10^{-11}$	$6.1x10^{-6}$	$2.2x10^{-7}$	0.045	$1.0x10^{-7}$
Spontaneous combustion	$3.1x10^{-11}$	$8.8x10^{-7}$	$3.1x10^{-13}$	$8.8x10^{-9}$	$2.2x10^{-9}$	$6.4x10^{-5}$	$7.0x10^{-7}$
Explosion in the vault	$7.4x10^{-10}$	$1.4x10^{-4}$	$7.4x10^{-12}$	$1.4x10^{-6}$	$5.4x10^{-8}$	0.011	$1.0x10^{-7}$
Explosion outside of vault	$3.3x10^{-11}$	$6.6x10^{-6}$	$3.3x10^{-13}$	$6.6x10^{-8}$	$2.4x10^{-9}$	$4.8x10^{-4}$	$1.0x10^{-7}$
Nuclear criticality	$2.1x10^{-11}$	$4.2x10^{-6}$	$1.6x10^{-13}$	$3.3x10^{-8}$	$1.8x10^{-10}$	$3.5x10^{-5}$	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$1.1x10^{-8}$	$2.3x10^{-3}$	$8.5x10^{-11}$	$1.7x10^{-5}$	$6.2x10^{-7}$	0.12	$1.0x10^{-7}$
Expected risk[d]	$6.0x10^{-6}$	–	$6.0x10^{-8}$	–	$4.3x10^{-4}$	–	–
Combined expected risk[e]	$1.2x10^{-5}$	–	$1.2x10^{-7}$	–	$8.6x10^{-4}$	–	–

[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 in 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 incremental risk for storing the additional RFETS and LANL material for each accident over the 50-year lifetime of the facility.

[e] Combined expected risk for base case without RFETS or LANL Pu material plus RFETS and LANL Pu material increment.

Note: All values are mean values.

Source: Calculated using in Tables 4.2.1.9–6. Data adjusted for additional RFETS and LANL Pu.

Hazardous Chemical Impacts. Hazardous chemicals associated with storage of Pu from RFETS and LANL associated with building a new Pu facility are essentially the same as presented in the previous section, which discusses the upgrade without RFETS or LANL Pu. The resultant hazardous chemical impacts to the public and worker are essentially the same as presented in the previous section.

Facility Accidents. The new 200 West Area Facility constructed for continued storage of Pu would incorporate new safety features that should reduce the consequences and risks of accidents compared with No Action. The consequences and risks of accidents for this facility would be bounded by the consequences and risks presented in Table 4.2.1.9–5 for the Modify Existing FMEF for Pu Storage Subalternative at Hanford.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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.

Consolidation Alternative

Construct New Plutonium Storage Facility

This section includes a description of radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involving the new consolidated Pu storage facility at Hanford.

[Text deleted.]

Normal Operation. There would be no radiological releases during the construction of a new consolidated Pu storage facility at Hanford. 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 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 Hanford are described below.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the new consolidated Pu storage facility are presented in Table 4.2.1.9–1. The impacts from all site operations, including the new consolidated Pu storage facility, are also given in the table. To put operational doses into perspective, comparisons of operational doses with natural background radiation doses are included in the table.

The dose to the MEI due to annual storage facility operation would be $2.5x10^{-6}$ mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be $6.2x10^{-11}$. As a result of storage plant operation in the year 2030, the population dose would be $1.1x10^{-4}$ person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be $2.8x10^{-6}$.

The dose to the MEI due to annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5 and would be $5.1x10^{-3}$ mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be $1.3x10^{-7}$. 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 total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 1.5 person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be 0.038.

Doses to onsite workers from normal operations are given in Table 4.2.1.9–2. Included are involved workers directly associated with the new consolidated Pu storage facility, workers who are not involved with the new storage facility, and the entire workforce at Hanford. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. 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. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the new consolidated Pu storage facility at Hanford are presented in Table 4.2.1.9–3. The impacts from all site operations, including the consolidated storage facility, are included in this table. Total site impacts, which include the No Action impact plus the added facility impact, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is $4.0x10^{-6}$, and the cancer risk is $2.7x10^{-8}$ as a result of operation of the new consolidated Pu storage facility in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, provided exposures remain the same. The total site operation including the upgrade facility would result in an HI of $6.6x10^{-5}$ and a cancer risk of $2.7x10^{-8}$ for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be $2.8x10^{-4}$, and the cancer risk is $1.2x10^{-5}$ as a result of operation of the new consolidated Pu storage facility in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, provided exposures remain the same. The total site operation including the upgrade facility would result in an HI of $4.3x10^{-3}$ and a cancer risk of $1.2x10^{-5}$ for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents for the consolidation of Pu alternative at Hanford for which there may be releases of Pu that may impact onsite workers and the offsite population has been postulated. The accident consequences and risks to a worker located 1,000 m (3,280 feet) 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 Table 4.2.1.9–6. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 1.2 at Hanford for the beyond design basis earthquake accident scenario with an estimated probability of $1.0x10^{-7}$ per year (that is, probability of severe earthquake occurring is estimated to be about $1.0x10^{-5}$, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-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 $6.1x10^{-6}$, $8.3x10^{-10}$, and $1.1x10^{-7}$, respectively. The maximum population 50-year facility lifetime risk would be $4.2x10^{-3}$ (that is, one fatality in about 12,000 years) at Hanford for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be $5.7x10^{-7}$ and $5.7x10^{-5}$, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.1.9–6.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

This section includes a description of radiological and hazardous chemical releases and the associated impacts resulting from either normal operation or accidents involved with the consolidation of Pu storage and collocation with HEU storage facilities at Hanford. This storage would take place in a new Pu and HEU storage facility.

Normal operation of the new collocated storage facility at Hanford would result in impacts that are within applicable regulatory limits.

[Text deleted.]

Normal Operation. There would be no radiological releases during the construction of a new collocated storage facility at Hanford. Construction worker exposures to materials potentially contaminated with radioactivity (for

Table 4.2.1.9–6. Consolidation Alternative Accident Impacts at Hanford Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	$1.3x10^{-7}$	$4.4x10^{-6}$	$1.3x10^{-9}$	$4.4x10^{-8}$	$9.6x10^{-6}$	$3.2x10^{-4}$	$6.0x10^{-4}$
PCV breach by firearms discharge	$7.7x10^{-9}$	$4.4x10^{-7}$	$7.7x10^{-11}$	$4.4x10^{-9}$	$5.6x10^{-7}$	$3.2x10^{-5}$	$3.5x10^{-4}$
PCV penetration by corrosion	$5.7x10^{-5}$	$1.8x10^{-5}$	$5.7x10^{-7}$	$1.8x10^{-7}$	$4.2x10^{-3}$	$1.3x10^{-3}$	0.064
Vault fire	$5.8x10^{-8}$	0.012	$4.6x10^{-10}$	$9.2x10^{-5}$	$3.4x10^{-6}$	0.67	$1.0x10^{-7}$
Truck bay fire	$3.1x10^{-9}$	$6.1x10^{-4}$	$3.1x10^{-11}$	$6.1x10^{-6}$	$2.2x10^{-7}$	0.045	$1.0x10^{-7}$
Spontaneous combustion	$3.1x10^{-11}$	$8.8x10^{-7}$	$3.1x10^{-13}$	$8.8x10^{-9}$	$2.2x10^{-9}$	$6.4x10^{-5}$	$7.0x10^{-7}$
Explosion in the vault	$7.2x10^{-11}$	$1.4x10^{-3}$	$7.2x10^{-11}$	$1.4x10^{-5}$	$5.3x10^{-7}$	0.11	$1.0x10^{-7}$
Explosion outside of vault	$3.3x10^{-11}$	$6.6x10^{-6}$	$3.3x10^{-13}$	$6.6x10^{-8}$	$2.4x10^{-9}$	$4.8x10^{-4}$	$1.0x10^{-7}$
Nuclear criticality	$2.1x10^{-11}$	$4.2x10^{-6}$	$1.6x10^{-13}$	$3.3x10^{-8}$	$1.8x10^{-10}$	$3.5x10^{-5}$	$1.0x10^{-7}$
Beyond evaluation basis earthquake	$1.1x10^{-7}$	$2.2x10^{-2}$	$8.3x10^{-10}$	$1.7x10^{-4}$	$6.1x10^{-6}$	1.2	$1.0x10^{-7}$
Expected risk[d]	$5.8x10^{-5}$	–	$5.8x10^{-7}$	–	$4.3x10^{-3}$	–	–

[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 for each accident over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.1.1–5 and M.5.2.1.1–6 and the MACCS computer code.

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 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 are described below.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the new collocated storage facility at Hanford are presented in Table 4.2.1.9–1. The impacts from all site operations, including the new storage facility, are also given in the table. To put operational doses into perspective, comparisons of operational doses with natural background radiation doses are included in the table.

The dose to the MEI of the public due to annual storage facility operation would be $2.5x10^{-6}$ mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be $6.2x10^{-11}$. The impacts to the average individual would be less. As a result of storage facility operation in the year 2030, the population dose would be $1.1x10^{-4}$ person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be $2.8x10^{-6}$.

The dose to the MEI of the public due to annual total site operations is within radiological limits and would be $5.1x10^{-3}$ mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be $1.3x10^{-7}$. 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 total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 1.5 person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be 0.038.

Doses to onsite workers due to normal operations are given in Table 4.2.1.9–2. Included are involved workers directly associated with the new storage facility, workers who are not involved with the new storage facility, and the entire workforce at Hanford. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. Dose to individual workers would be kept low by instituting badged monitoring and ALARA programs and also worker 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. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the new consolidation of Pu storage and collocation with HEU storage facilities at Hanford are presented in Table 4.2.1.9–3. The impacts from all site operations, including the consolidation of Pu storage and collocation with HEU storage facilities, are also included in this table. Total site impacts, which include the No Action impact plus the added facility impacts, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is $1.6x10^{-5}$, and the cancer risk is $2.7x10^{-8}$ as a result of operation of the new consolidation of Pu storage and collocation with HEU storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the new facility, would result in an HI of $7.8x10^{-5}$ and a cancer risk of $2.7x10^{-8}$ for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker is $7.1x10^{-4}$, and the cancer risk is $1.2x10^{-5}$ as a result of operation of the new consolidation of Pu storage and collocation with HEU storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation including the new facility would result in an HI of $4.7x10^{-3}$ and a cancer risk of $1.2x10^{-5}$ for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents for collocation of Pu and HEU at Hanford for which there may be releases of Pu or HEU that may impact onsite workers and the offsite population has been postulated. The consequences and risks of potential accidents for Pu and HEU storage would be bounded by the impacts associated with the release of Pu. The accident consequences and risks to a worker located 1,000 m (3,280 feet) 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 Table 4.2.1.9–7. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 1.2 at Hanford for the beyond design basis earthquake accident scenario with an estimated probability of $1.0x10^{-7}$per year (that is, probability of severe earthquake occurring is estimated to be about $1.0x10^{-5}$, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-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 $6.1x10^{-6}$, $8.3x10^{-10}$, and $1.1x10^{-7}$, respectively. The maximum population 50-year facility lifetime risk would be $4.2x10^{-3}$ (that is, one fatality in about 12,000 years) at Hanford for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 5.7×10^{-7} and 5.7×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.1.9–7.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

If the strategic reserve and weapons R&D materials are not included, the incremental impacts to the public and to workers from the accident-free storage activities would be reduced in proportion to the decrease in the amount of material stored. The impacts from total site operations would decrease slightly. This subalternative applies to the Upgrade With All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. The risks due to accidents would also tend to be lower.

Table 4.2.1.9–7. Collocation Alternative Accident Impacts at Hanford Site

	Worker at 1,000 m		Maximum Offsite Individual		Population to 80 km		
Accident Description	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per year)
PCV puncture by forklift	1.3×10^{-7}	4.4×10^{-6}	1.3×10^{-9}	4.4×10^{-8}	9.6×10^{-6}	3.2×10^{-4}	6.0×10^{-4}
PCV breach by firearms discharge	7.7×10^{-9}	4.4×10^{-7}	7.7×10^{-11}	4.4×10^{-9}	5.6×10^{-7}	3.2×10^{-5}	3.5×10^{-4}
PCV penetration by corrosion	5.7×10^{-5}	1.8×10^{-5}	5.7×10^{-7}	1.8×10^{-7}	4.2×10^{-3}	1.3×10^{-3}	0.064
Vault fire	5.8×10^{-8}	0.012	4.6×10^{-10}	9.2×10^{-5}	3.4×10^{-6}	0.67	1.0×10^{-7}
Truck bay fire	3.1×10^{-9}	6.1×10^{-4}	3.1×10^{-11}	6.1×10^{-6}	2.2×10^{-7}	0.045	1.0×10^{-7}
Spontaneous combustion	3.1×10^{-11}	8.8×10^{-7}	3.1×10^{-13}	8.8×10^{-9}	2.2×10^{-9}	6.4×10^{-5}	7.0×10^{-7}
Explosion in the vault	7.2×10^{-9}	1.4×10^{-3}	7.2×10^{-11}	1.4×10^{-5}	5.3×10^{-7}	0.11	1.0×10^{-7}
Explosion outside of vault	3.3×10^{-11}	6.6×10^{-6}	3.3×10^{-13}	6.6×10^{-8}	2.4×10^{-9}	4.8×10^{-4}	1.0×10^{-7}
Nuclear criticality	2.1×10^{-11}	4.2×10^{-6}	1.6×10^{-13}	3.3×10^{-8}	1.8×10^{-10}	3.5×10^{-5}	1.0×10^{-7}
Beyond evaluation basis earthquake	1.1×10^{-7}	0.022	8.3×10^{-10}	1.7×10^{-4}	6.1×10^{-6}	1.2	1.0×10^{-7}
Expected risk[d]	5.8×10^{-5}	–	5.8×10^{-7}	–	4.3×10^{-3}	–	–

[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 for each accident over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.2.1–3 and M.5.2.2.1–4 and the MACCS computer code.

Phaseout

Normal Operation. A phaseout of existing Pu storage facilities at Hanford would reduce the impacts from radiological and chemical releases and exposures to levels slightly less than the No Action exposures. As shown in Table 4.2.1.9–1, the dose to the MEI from annual operation would be reduced by 4.1×10^{-4} mrem; the dose to the population would be reduced by 0.047 person-rem. The associated reductions in fatal cancer are included in the table. All workers involved in the transfer of the Pu would be monitored to assure that their doses remain within regulatory limits and ALARA.

Facility Accidents. The phaseout operation will be conducted in accordance with DOE Orders to ensure that the risk to the public of prompt fatalities due to accidents or of cancer fatalities due to operations will be minimized. For current operations in the facility that would be phased out, the safety of workers and the public from accidents is controlled by Technical Safety Requirements that are specified in SARs or Basis for Interim Operations documents that have been prepared for the facility. Prior to initiating phaseout, the potential for accidents that could affect workers and the public will be assessed and, if necessary, applicable existing safety documentation will be modified to ensure safety for workers and the public.

4.2.1.10 Waste Management

This section summarizes the impacts on waste management at Hanford under No Action, each of the long-term storage alternatives, and the phaseout of Pu storage. There is no spent nuclear fuel or HLW associated with Pu or HEU storage. Table 4.2.1.10–1 lists the projected sitewide waste generation rates and treatment, storage, disposal capacities under No Action for 2005. Projections for No Action were derived from the most recent available environmental data, with the assumption that operational requirements for waste generation in 2005 would be approximately equal to the 1993 generation volume. The projection does not include wastes from future, yet uncharacterized environmental restoration activities, such as content characterization and decommissioning of 149 single shell tanks, treating 28 double shell tanks, and removing over 500 buildings. The projections for No Action could change significantly depending on the decisions resulting from the PEIS on waste management being prepared by DOE. Table 4.2.1.10–2 provides the estimated incremental operational waste volumes projected to be generated at Hanford as a result of the various storage alternatives prior to treatment. Some of the waste values described in this section are different than the waste values in the table. For those values that differ (for example LLW), the table gives waste generated pre-treatment values and the text discusses post-treatment values (indicated as after treatment and volume reduction). The waste volumes generated from the various storage alternatives and the resultant waste effluent used for the waste impacts analysis can be found in Section E.3.1. Facilities that would support the storage of Pu and/or HEU would treat and package all waste generated into forms that would enable staging and/or disposal in accordance with 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 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.

Preferred Alternative: No Action Alternative

Under this alternative, high-level, TRU, low-level, mixed, hazardous, and nonhazardous wastes, and spent nuclear fuel would continue to be managed from the missions outlined in Section 3.2. Hanford no longer has a weapons production mission. Its focus is to decommission the reactors and site facilities, as well as cleanup approximately 1,450 km^2 (560 mi^2) of land. The impacts of the wastes generated as part of environmental restoration and D&D activities are addressed in the *Final Environmental Impact Statement: Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE/EIS–0119F) and the *Draft Hanford Remedial Action Environmental Impact Statement and Comprehensive Land Use Plan* (DOE/EIS–0222D). Under No Action, Hanford would continue to store its inventory of Pu, and treat, store, and dispose of its legacy and newly generated wastes in current and planned facilities.

The Pu addressed in this PEIS is limited to materials currently stored within protected vaults and gloveboxes, and additional materials within process lines and process equipment within the PFP Complex in the 200 West Area. The PFP had been used to conduct Pu processing operations such as Pu purification, Pu recovery, oxide production, metal production, and parts fabrication. The PFP has also been used for receipt and large-scale storage of onsite and offsite Pu scrap and product materials. [Text deleted.] Modifications to the facilities will proceed following the ROD resulting from the PFP EIS (DOE/EIS-0244F) to meet current regulations and provide for interim storage. Maintenance, assay, packaging, and monitoring of the inventory would produce TRU, low-level, hazardous, and nonhazardous wastes. These wastes would be treated, stored, and disposed of in compliance with existing regulations.

Under No Action, the processing of legacy wastes would require new facilities, since the necessary treatment, storage, and disposal facilities either do not exist or are nearing capacity. Spent nuclear fuel would be managed in accordance with the amended ROD (61 FR 9441) from the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste*

Table 4.2.1.10–1. Projected Spent Nuclear Fuel and Waste Management Under No Action (2005) at Hanford Site

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Spent Nuclear Fuel	None[a]	Encapsulation	Planned	Reactor basins Non-Hanford production reactor spent fuel to be sent to INEL	2,133 t	To HLW Program	NA
High-Level							
Liquid	None[a]	Evaporation[b,c]	50,000	Tank farm	146,000[d]	NA	NA
Solid	None	NA	NA	NA	NA	To HLW Program	NA
Transuranic							
Liquid	None[a]	Included in HLW	Included in HLW	Tank farm	Included in HLW	NA	NA
Solid	271	None	NA	Containers on asphalt pads	15,370	WIPP or alternate facility–planned[e]	None
Mixed Transuranic							
Liquid	None[a]	Included in HLW	Included in HLW	Tank farm	Included in HLW	NA	NA
Solid	98	Included in TRU	Included in TRU	Containers on asphalt pads	15,370	WIPP or alternate facility–planned[e]	None
Low-Level							
Liquid	None	Evaporation, separation, solidification (vitrification)	Evaporator in service, new facilities planned	None	NA	NA	NA
Solid	3,390	Compaction	4,000[f]	Not stored	NA	Burial	902,900[g]

Table 4.2.1.10–1. Projected Spent Nuclear Fuel and Waste Management Under No Action (2005) at Hanford Site—Continued

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity (m^3/yr)	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Mixed Low-Level							
Liquid	3,760	Evaporation, ion exchange[c]	50,000	Storage tanks, basins planned	446,500[h]	None	NA
Solid	1,505	None	NA	RCRA facility, retrievable	1,218,700	Landfill, LLW burial grounds 218-E-NN	Included in LLW
Hazardous							
Liquid	Included in solid	None	NA	RCRA building	Included in solid	Commercial[i]	NA
Solid	560	None	NA	RCRA building	127	Commercial[i]	NA
Nonhazardous (Sanitary)							
Liquid	414,000[j]	None	NA	None	NA	Septic tanks, french drains	Expandable
Solid	5,107	None	NA	None	NA	Richland Sanitary Landfill	Expandable
Nonhazardous (Other)							
Liquid	Included in sanitary	None	NA	None	NA	Percolation ponds, leachfields	Expandable
Solid	Included in sanitary	None	NA	None	NA	Landfill	Expandable

[a] No waste in this category is expected to be generated in 2005. Treatment and storage and/or disposal is expected to continue for waste generated from past activities.
[b] Vitrification planned.
[c] Assumes 242-A Evaporator as treatment method for liquid HLW, liquid TRU, and liquid mixed TRU.
[d] Consists of HLW and liquid TRU wastes in Double-Shell Tanks; Pu recovery and extraction aging waste. Includes 241-AN, 241-AP, 241-AW, 241-AY, 241-AZ, and 241-SY Tank Farms.
[e] Disposal at WIPP would depend in part on decisions pursuant to the *Waste Isolation Pilot Plant Disposal Phase Supplemental Environmental Impact Statement*.
[f] Compaction by LLW Compactor (213-W).
[g] Includes the LLW Burial Grounds (unit 218-E-NN) and Low-Level Mixed Waste Disposal Facility (Project-W-025).
[h] Assumes storage of liquid mixed LLW in tanks and planned basins.
[i] Offsite at RCRA facility.
[j] Estimate based on 14,586 employees, 30 gal per day per employee, and 250 days per year of operation.
Note: NA=not applicable.
Source: 61 FR 9441; DOE 1992f; DOE 1993a; DOE 1993h; HF 1993a:1; HF 1995a:1.

Table 4.2.1.10–2. Estimated Annual Generated Waste Volumes at Hanford Site—No Action (2005) and Net Incremental for Storage Alternatives

Category	No Action[a] (m^3)	Upgrade: Without RFETS or LANL Material[b] (m^3)	Upgrade: With RFETS and LANL Material[b] (m^3)	Consolidation[b] (m^3)	Collocation[b] (m^3)	Phaseout (m^3)
Transuranic						
Liquid	None	0	0	0.02[c]	0.02[c]	0
Solid	271	20	21	10	10	0
Mixed Transuranic						
Liquid	None	0	0	0	0	0
Solid	98	0	0	4	4	0
Low-Level						
Liquid	None	0.08[c]	0.08[c]	2[c]	2.1[c]	0
Solid	3,390	85	89	1,260	1,300	0
Mixed Low-Level						
Liquid	3,760	0	0	0.2	0.2	0
Solid	1,505	5	5	65	66	0
Hazardous						
Liquid	Included in solid	0.57	0.57	2	2	0
Solid	560	4	4	2	2	0
Nonhazardous (Sanitary)						
Liquid	414,000	8,330	8,780	110,000	146,000	0
Solid	5,107	917	967	1,140	1,760	0
Nonhazardous (Other)						
Liquid	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	0
Solid	Included in sanitary	0	0	1,400[d]	2,200[d]	0

[a] The No Action waste volumes are from Table 4.2.1.10–1.

[b] Generated waste volumes for storage alternatives shown in this table are found in Section E.3.1 (Tables E 3.1.1–1, E.3.1.1–5, E.3.1.2–1, and E.3.1.3–1). Waste effluents (that is, after treatment and volume reduction) which are used in the narrative description of the impacts are also provided in these tables.

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

[d] Recyclable wastes.

Management Programs Final Environmental Impact Statement (DOE/EIS-0203-F) and the ROD (61 FR 10736) from the follow-on tiered site-specific NEPA analysis, *Final Environmental Impact Statement on the Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington* (DOE/EIS-0245). TRU waste already packaged to current planning-basis WIPP WAC would either be stored or have been shipped. In compliance with the *Federal Facility Compliance Act* of 1992, mixed waste would have been treated and disposed of according to the Hanford Tri-Party Agreement. Solid LLW would continue to be buried at the onsite low-level disposal facility.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

The modification of the FMEF or construction of a new storage facility for the continued storage of Pu would have a small impact on existing Hanford waste management activities. Construction waste volumes as presented in Table E.3.1.1–1 would have minimal impact on Hanford waste management activities. Waste generated during construction would consist of wastewater and solid nonhazardous and hazardous wastes. Nonhazardous waste would be disposed of as part of the construction project by the contractor, and the hazardous waste would be shipped offsite to commercial RCRA-permitted treatment and disposal facilities. Operational waste volumes as shown in Table 4.2.1.10–2 would increase slightly due to increased surveillance activities over No Action.

Approximately 20 m^3 (26 yd^3) of TRU waste from damaged PCVs and contaminated glovebox panels, windows, and gaskets would need to be treated and packaged to meet the current planning-basis WIPP WAC or alternative treatment level. While awaiting shipment 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), the TRU waste would be stored in above-grade storage facilities at the Hanford Central Waste Complex and the Transuranic Waste Storage and Assay Facility. Three additional truck shipments per year or, if applicable, two regular train shipments per year or one dedicated train shipment every 3 years, would be required to transport this waste to WIPP.

After treatment and volume reduction, approximately 42 m^3 (56 yd^3) of LLW from solidified liquid LLW (such as decontamination solutions), protective clothing, HEPA filters, glovebox gloves, and decontamination equipment and materials would require disposal in the 200 Area LLW Burial Grounds. Assuming a land usage of 3,400 m^3/ha (1,800 yd^3/acre), this would require 0.01 ha/yr (0.03 acre/yr) of LLW disposal area.

Contaminated shielding and cleaning materials would be the major contributors to the 5 m^3 (7 yd^3) of mixed LLW. This small amount of mixed LLW could be treated and disposed of in accordance with the Hanford Tri-Party Agreement through the use of existing and planned facilities.

The 0.57 m^3 (150 gal) of liquid hazardous waste such as lubricants, cleaning solvents, paint, and lube oil and 4 m^3 (5 yd^3) of solid hazardous waste such as lead packing, wipes, and solid materials contaminated with oils, lubricants, and cleaning solvents would have minimal impact on waste management activities at Hanford. The hazardous wastes would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment and disposal facilities.

Approximately 8,330 m^3 (2,200,000 gal) of liquid nonhazardous waste to include sanitary, utility and process wastewaters, and cooling system blowdown would be processed using the 200 West Area Treatment Facility or one of the numerous septic tanks/subsurface disposal systems. Existing and planned liquid nonhazardous waste facilities are adequate. After volume reduction, approximately 459 m^3 (600 yd^3) of solid nonhazardous waste such as clean non-Pu metals, packing materials, office trash, defective and damaged equipment, and industrial waste from utility and maintenance operations would be shipped to one of the onsite landfills.

Construct New 200 West Area Facility for Plutonium Storage

The construction and operation of a new storage facility for the continued storage of the current inventory of Pu would have a small impact on existing Hanford waste management activities. The impacts are identical to those identified in the preceding option of modifying the FMEF.

Upgrade With All or Some Rocky Flats Environmental Technology Site and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing Fuels and Materials Examination Facility for Plutonium Storage

As shown in Table E.3.1.1–5 construction waste volumes would increase for the additional required construction. The types of operational waste are identical to those discussed earlier, but there would be a small increase in volume. Approximately 21 m^3 (27 yd^3) of TRU waste would be treated and packaged to meet the current planning-basis WIPP WAC or alternative treatment level. While awaiting shipment to WIPP (depending on decisions resulting from the supplemental PEIS noted earlier), the TRU and mixed TRU waste would be stored in above-grade storage facilities in the Hanford Central Waste Complex and the Transuranic Waste Storage and Assay Facility. Three additional truck shipments per year or, if applicable, two regular train shipments per year or one dedicated train shipment every 3 years, would be required to transport these wastes to WIPP.

After treatment and volume reduction, approximately 45 m^3 (59 yd^3) of LLW would require disposal in the 200 Area LLW Burial Grounds. Assuming a land usage of 3,400 m^3/ha (1,800 yd^3/acre), this would require 0.01 ha/yr (0.03 acre/yr) of LLW disposal area. The 5 m^3 (7 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the Hanford Tri-Party Agreement through the use of existing and planned facilities. The 0.57 m^3 (150 gal) of liquid hazardous wastes and 4 m^3 (5 yd^3) of solid hazardous wastes would have minimal impact on waste management activities at Hanford. The hazardous wastes would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment and disposal facilities. Approximately 8,780 m^3 (2,320,000 gal) of liquid nonhazardous wastes to include sanitary, utility and process wastewaters, and cooling system blowdown would be processed using the 200 West Area Treatment Facility or one of the numerous septic tanks/subsurface disposal systems. Existing and planned liquid nonhazardous waste facilities are adequate. After volume reduction, approximately 483 m^3 (632 yd^3) of solid nonhazardous waste would require disposal at one of the onsite landfills.

Distributing the RFETS and LANL material to more than one site would reduce the operational waste volumes. The decrease would be proportional to the amount of material.

Construct New 200 West Area Facility for Plutonium Storage

The impacts of constructing and operating a new storage facility to include RFETS and LANL Pu would be identical to those identified in the preceding option of modifying the FMEF to include RFETS and LANL Pu.

Consolidation Alternative

Construct New Plutonium Storage Facility

Construction and operation of a consolidated Pu storage facility would have an impact on existing Hanford waste management activities, 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 solid nonhazardous waste would be disposed of as part of the construction project by the contractor, and the hazardous waste 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 was generated it would be managed in accordance with site practice and all applicable Federal and State regulations. The types of operational wastes from the consolidated Pu storage facility would be the same as those from the Upgrade Alternative, but the quantity would change.

After treatment and volume reduction of TRU waste, approximately 5 m^3 (7 yd^3) of TRU waste and 4 m^3 (5 yd^3) of mixed TRU waste from leaded gloves and windows and contaminated lead shielding would be treated and packaged to meet the current planning-basis WIPP WAC or alternative treatment level. While awaiting shipment to WIPP (depending on decisions resulting from the supplemental EIS noted earlier), the TRU and mixed TRU wastes would be stored in above-grade storage facilities in the Hanford Central Waste Complex and the TRU Waste Storage and Assay Facility. One additional truck shipments per year or, if applicable, one regular train shipment every 2 years or one dedicated train shipment every 6 years, would be required to transport these wastes to WIPP.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW would require disposal in the 200 Area LLW Burial Grounds. Assuming a land usage of 3,400 m^3/ha (1,800 yd^3/acre), this would require approximately 0.2 ha/yr (0.5 acre/yr) of LLW disposal area. The 0.2 m^3 (50 gal) of liquid mixed LLW and 65 m^3 (85 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the Hanford Tri-Party Agreement through the use of existing and planned facilities. The 2 m^3 (476 gal) of liquid hazardous waste and 2 m^3 (3 yd^3) of solid hazardous waste would have minimal impact on waste management activities at Hanford. The hazardous wastes would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment and disposal facilities. Approximately 110,000 m^3 (29,000,000 gal) of liquid nonhazardous waste would be treated and recycled by the consolidated facility. After volume reduction, 570 m^3 (746 yd^3) of solid nonhazardous waste would require disposal at one of the onsite landfills.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction and operation of a consolidated Pu storage facility collocated with HEU storage would have an impact on existing Hanford waste management activities, 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 solid nonhazardous waste would be disposed of as part of the construction project by the contractor, and the hazardous waste 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 was generated it would be managed in accordance with site practice and all applicable Federal and State regulations. Since there is no TRU or mixed TRU wastes associated with HEU storage, the impacts from TRU and mixed TRU wastes are identical to those identified in the consolidated Pu storage alternative. The sources of waste are similar to those of the Pu storage facilities except the source of radioactive contamination from HEU storage is uranium.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW contaminated with Pu and 20 m^3 (26 yd^3) of LLW contaminated with uranium would require disposal in the 200 Area LLW Burial Grounds. Assuming a land usage of 3,400 m^3/ha (1,800 yd^3/acre), this would require approximately 0.2 ha/yr (0.5 acre/yr) of LLW disposal area. The 0.2 m^3 (55 gal) of liquid mixed LLW and 66 m^3 (86 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the Hanford Tri-Party Agreement through the use of existing and planned facilities. The 2 m^3 (530 gal) of liquid hazardous waste and 2 m^3 (3 yd^3) of solid hazardous waste would have minimal impact on waste management activities at Hanford. The hazardous wastes would be packaged in DOT-approved containers and shipped offsite to commercial RCRA-permitted treatment and disposal facilities. The 146,000 m^3 (39,000,000 gal) of liquid nonhazardous waste would require construction of sanitary, utility, and process wastewater treatment systems. After volume reduction 880 m^3 (1,150 yd^3) of solid nonhazardous wastes would require disposal at one of the onsite landfills.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The exclusion of strategic reserve and weapons R&D materials would reduce the amount of operational waste volumes shown in Table 4.2.1.10–2 for the Upgrade With All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. The decrease would be proportional to the amount of material excluded. [Text deleted.]

Phaseout

The phaseout of Pu storage would have no impact on Hanford waste management activities. The volume of waste would not decrease until the facilities in which Pu is stored were D&D.

4.2.2 NEVADA TEST SITE

A listing of the proposed long-term storage alternatives, subalternatives, and related actions, including the No Action Alternative, at NTS is provided below. The potential impacts of implementing these alternatives and related actions at NTS are described in the following sections: 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. The specific long-term storage alternatives proposed for NTS are the Consolidation Alternative and the Collocation Alternative.

Preferred Alternative

No Action Alternative:

There is no Pu or HEU storage mission currently at NTS; does not add Pu or HEU storage at NTS.

Proposed Storage Activities at Nevada Test Site

- **No Action Alternative (Preferred Alternative):** There is no Pu or HEU storage mission currently at NTS; does not add Pu or HEU storage at NTS.
- **Upgrade Alternative:** This storage alternative does not apply to NTS.
- **Consolidation Alternative:** Two options to accommodate all Pu material within the scope of this PEIS: Modify the existing network of tunnel drifts and construct a new material handling building at the P-Tunnel; or construct a new facility near DAF.
- **Collocation Alternative:** Two options to accommodate all Pu and HEU material within the scope of this PEIS: Modify the existing network of tunnel drifts and construct a larger new material handling building at the P-Tunnel; or construct a larger new facility near the DAF.
- **Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials:** Facility and other resource requirements would be smaller than the Consolidation Alternative and the Collocation Alternative.
- **Phaseout:** This storage activity does not apply to NTS.

4.2.2.1 Land Resources

Preferred Alternative: No Action Alternative

Neither Pu nor HEU is presently stored at NTS. Under the No Action Alternative, existing and planned missions at NTS would continue. The ongoing (no new action) activities would conform with present and future land-use plans, policies, and controls. No effects to land resources would be anticipated at NTS beyond those of existing and future activities that are independent of this action.

Consolidation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

This option would modify the existing P-Tunnel and construct a new material handling building in Area 12 to accommodate all Pu material within the scope of this PEIS. During construction, 29 ha (72 acres) of land area would be required of which 27 ha (68 acres) would be used during operation. Construction laydown area and the operating facility would be situated entirely on previously disturbed land and would not create any newly disturbed area. As a modification of an existing facility, the 1.6-km (1-mi) buffer zone is established.

Land Use. Utilization of the P-Tunnel in Area 12 would not conform with the master plan of the *Nevada Test Site Development Plan*, which designates the North area of NTS as an underground nuclear weapons test area (NT DOE 1995d:7). However, the P-Tunnel 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 *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (NTS EIS) (NT DOE 1996c:3-8,3-9; NT DOE 1996e:A-18). Should the Consolidation Alternative P-Tunnel option be selected, the Expanded Use Alternative of the NTS EIS could be used to revise the current *Nevada Test Site Development Plan*. With these changes, any required construction would be consistent with the land use plan. As discussed in Section 4.2.2.8, sufficient available labor exists within the region to fill the jobs created during construction and operations. There would be no increased demand for housing. Therefore, no indirect impacts on offsite land use would be anticipated.

Use of the P-Tunnel would not affect special status lands as shown in Figure 3.3.1–1. The buffer zone and security area associated with the long-term storage alternative would preclude development within the immediate area. However, the NTS EIS Expanded Use Alternative indicates that adequate land area is available at NTS for facility siting (NT DOE 1996c:3-14, 3-15). The proposal would not affect offsite grazing allotments. 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. Storage of Pu in the P-Tunnel could impact weapons effects testing ability. It is likely that the P-Tunnel be closed during testing, although it could be kept manned if appropriate safety considerations were met (NT DOE 1995e:1). However, the potential for impacts could be eliminated by test or tunnel design (NT DOE 1996f:1).

Visual Resources. [Text deleted.] Construction and operation of the facility would be compatible with the existing industrialized landscape character of Area 12 and the current VRM Class 5 designation. Although U.S. Route 95 is a heavily traveled public roadway, travelers are unable to view Area 12 facilities because of mountainous terrain and distance.

Construct New Plutonium Storage Facility

All Pu within the scope of this PEIS would be stored at a new storage facility to be constructed at NTS Area 6 near the DAF. The consolidated Pu storage plant at NTS would disturb 58.5 ha (144 acres) of land area during construction of which 56 ha (138 acres) would be used during operation. A buffer zone would be provided between the facility and the NTS site boundary. Pu storage in existing storage facilities at other DOE sites would be phased out.

Land Use. Construction and operation of the Pu facility would convert undeveloped land in Area 6. The proposed action would not conform with the current *Nevada Test Site Development Plan*, which designates the southeast area of NTS as a nonnuclear test area (NT DOE 1995d:7). 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). As discussed in Section 4.2.2.8, no in-migration of workers would be required during construction and operations. No increase in housing demand would be anticipated, with offsite land use not subject to indirect land-use impacts.

Construction and operation would not affect other land uses at NTS or special status lands. The buffer zone and security area associated with the long-term storage alternative would preclude development within the immediate area. However, the Expanded Use Alternative of the NTS EIS indicates that adequate land area is available at NTS for facility siting (NT DOE 1996c:3-14,3-15). The alternative would not affect offsite grazing allotments. 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 alternative would be blocked from sensitive viewpoints accessible to the public by mountainous terrain.

Collocation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Under this action, the existing P-Tunnel located in Area 12 is proposed to be utilized, and a new material handling building would be constructed at the P-Tunnel. Land disturbance would be 29 ha (72 acres) during construction of which 27 ha (68 acres) would be used during operations. Construction laydown area and the operating facility would be situated entirely on previously disturbed land and would not create any newly disturbed area. Effects to land resources during construction and operation would be similar to those of the new and modified P-Tunnel for the Consolidation Alternative. As discussed in Section 4.2.2.8, in-migration would occur only during the operation phase. Projected vacancies within the housing stock would be sufficient to accommodate the slight increase in demand. Therefore, no indirect effects to offsite land use would be anticipated.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The new storage facility would be located on undisturbed land in Area 6 near the DAF and would disturb a land area of 89.5 ha (221 acres) during construction of which 87 ha (215 acres) would be used during operations. A buffer zone would be provided between operations and the NTS site boundary. Direct and indirect land resources effects would be similar to the Consolidation Alternative, new storage facility.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, land effects during construction and operation would be almost the same in extent and magnitude to the Consolidation Alternative and Collocation Alternative because the facility would be almost the same. However, because the smaller quantity of material would require smaller facilities, it is likely that less land area would be disturbed during construction and used during operations. [Text deleted.]

[Text deleted.]

4.2.2.2 Site Infrastructure

Nevada Test Site had an extensive infrastructure to handle the underground test program. With the cessation of nuclear testing, many of the operations around the site have been terminated. However, the facilities remain in place and are considered to be available.

Preferred Alternative: No Action Alternative

The infrastructure currently in place at NTS is capable of handling all anticipated missions and functions associated with the No Action Alternative.

Consolidation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Construction to modify the P-Tunnel and construct a new material handling building to accommodate long-term storage of Pu at NTS would not impact the site infrastructure. Data for construction are presented in Appendix C. Operations impacts to NTS infrastructure under this option are in the areas of electrical energy and fuel requirements for the site. As shown in Table 4.2.2.2–1, additional electrical energy would be required to operate the facility. A small amount of oil would be required to operate the modified P-Tunnel for storage of Pu. Since oil availability is governed by usage and not by storage capacity onsite, the additional oil could be procured through normal contractual means. The preconceptual facility design uses natural gas as a fuel source. The final facility design for NTS would be converted to an energy source already available at NTS. With this conversion from natural gas to oil, site infrastructure requirements are within site capacities.

Construct New Plutonium Storage Facility

Constructing a new storage facility to accommodate long-term storage of Pu at NTS would not affect the site infrastructure. Data for construction are presented in Appendix C. Operations impacts to NTS infrastructure under this option are in the area of fuel requirements. As shown in Table 4.2.2.2–1, a small amount of oil would be required to operate the new facility for storage of Pu. Since oil availability is governed by usage and not by storage capacity on site, the additional oil could be procured through normal contractual means. Adequate electrical energy is available from the regional power grid. The preconceptual facility design uses natural gas as a fuel source. The final facility design for NTS would be converted to an energy source already available at NTS. With this conversion from natural gas to oil, site infrastructure requirements are within site capacities.

Collocation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Construction to modify the P-Tunnel and construct a new material handling building to accommodate long-term storage of Pu and HEU at NTS would not affect site infrastructure. Data for construction are presented in Appendix C. Operations impacts to NTS infrastructure under this option are in the areas of electrical energy and fuel requirements for the site. As shown in Table 4.2.2.2–1, additional electrical energy would be required to operate the facility. A small amount of oil would be required to operate the modified P-Tunnel for storage of Pu and HEU. Since oil availability is governed by usage and not by storage capacity on site, the additional oil could be procured through normal contractual means. Adequate electrical energy is available from the regional power grid. The preconceptual facility design uses natural gas as a fuel source. The final facility design for NTS would be converted to an energy source already available at NTS. With this conversion from natural gas to another energy source, site infrastructure requirements are within site capacities.

Table 4.2.2.2–1. Site Infrastructure Changes Required for Operation at Nevada Test Site (Annual)—No Action (2005) and Storage Alternatives

Alternative	Transportation: Roads (km)	Transportation: Railroads (km)	Electrical: Energy (MWh/yr)	Electrical: Peak Load (MWe)	Fuel: Oil (l/yr)	Fuel: Natural Gas (m^3/yr)	Fuel: Coal (t/yr)
No Action							
Site availability	1100[a]	0	176,844	45	5,716,000	0	0
Projected usage	645	0	124,940	25	5,716,000	0	0
Consolidation							
Modify Existing Tunnel Drifts and Construct New Material Handling Building							
Projected usage with consolidated facility	650	0	196,940	35	5,754,000	3,200,000	0
Amount required in excess to site availability	0	0	20,096	0	38,000	3,200,000	0
New Pu Storage Facility							
Projected usage with consolidated facility	650	0	173,940	33	5,754,000	2,800,000	0
Amount required in excess to site availability	0	0	0	0	38,000	2,800,000	0
Collocation							
Modify Existing Tunnel Drifts and Construct New Material Handling Building							
Projected usage with consolidated and collocated upgrade facilities	650	0	213,940	38	5,754,000	3,600,000	0
Amount required in excess to site availability	0	0	37,096	0	38,000[b]	3,600,000[c]	0
New Pu and HEU Storage Facilities							
Projected usage with and new collocated facilities	650	0	189,940	36	5,754,000	3,200,000	0
Amount required in excess to site availability	0	0	13,096	0	38,000[b]	3,200,000[c]	0

[a] Includes paved and unpaved roads.
[b] Fuel oil requirements in excess to site availability could be procured through normal contractual means.
[c] Facility would be adapted to use fuel oil instead of natural gas.
Note: Modified from NTS 1993a:4.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Constructing a new storage facility to accommodate long-term storage of Pu and HEU at NTS would not affect the site infrastructure. Data for construction are presented in Appendix C. Operations impacts to NTS infrastructure under this option are in the areas of electrical energy and fuel requirements. As shown in Table 4.2.2.2–1, additional electrical energy would be required to operate the facility. A small amount of oil would be required to operate the new facility for storage of Pu and HEU. Since oil availability is governed by usage and not by storage capacity on site, the additional oil could be procured through normal contractual means. Adequate electrical energy is available from the regional power grid. The preconceptual facility design uses natural gas as a fuel source. The final facility design for NTS would be converted to an energy source already available at NTS. With this conversion from natural gas to oil, site infrastructure requirements are within site capacities.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

With a change to the preconceptual facility designs that would allow use of a fuel source already in place at NTS, the existing site infrastructure would be fully capable of supporting construction/modification and operation of facilities for the Consolidation of Pu and Collocation of Pu and HEU Alternatives. With this change, constructing and operating such alternatives, without including provisions for storage of strategic reserve and weapons R&D materials could be accommodated as well. Expected reductions in annual electrical energy requirements from that of the various storage alternatives for all the nonsurplus materials are the only site infrastructure changes expected if this subalternative is chosen because electric usage is dependent on the amount of material. [Text deleted.]

4.2.2.3 Air Quality and Noise

Construction and operation activities associated with the No Action Alternative and the proposed storage alternatives would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts at NTS, criteria and toxic/hazardous concentrations from the No Action Alternative and the proposed storage alternatives are compared with Federal and State standards and guidelines. Impacts from radiological airborne emissions are described in Section 4.2.2.9.

In general, all of the proposed storage facilities would emit the same types of air pollutants during construction. It is expected emissions would not exceed Federal, State, or local air quality regulations. PM_{10} concentrations will be increased especially during peak construction periods.

The principal sources of emissions during construction include the following:

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

During operation, impacts from each of the individual storage facilities with respect to the concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Table 4.2.2.3–1 presents the estimated pollutant concentrations for each of the storage alternatives, indicating little difference between alternatives with respect to impacts to air quality.

Emission rates attributed to operation of the proposed storage facilities are presented in Tables F.1.3–2 and F.1.3–3. [Text deleted.] Air pollutant emission sources associated with operations include the following:

- Operation of boilers for space heating
- Operation of diesel generators and periodic testing of emergency diesel generators
- Exhaust and road dust generated by vehicles delivering supplies and bringing employees to work
- Toxic/hazardous pollutant emissions from facility processes

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

AIR QUALITY

An analysis was conducted of the potential air quality impacts of emissions from each of the storage alternatives as described in Section 4.1.3.

Section 176 (c) of the 1990 CAA Amendments requires that all Federal actions conform with the applicable SIP. EPA has implemented rules that establish the criteria and procedures governing the determination of conformity for all Federal actions in nonattainment and maintenance areas. These are discussed in Section 4.1.3. The attainment status of the area in which NTS is located is discussed in Section 3.3.3. Since the area is considered to be an attainment area for the criteria pollutants, the proposed actions at this site do not require that a conformity analysis be performed.

Table 4.2.2.3–1. Estimated Operational Concentrations of Pollutants at Nevada Test Site and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] (μg/m³)	No Action (μg/m³)	Consolidation: New Storage Facility (μg/m³)	Consolidation: Modify P-Tunnel (μg/m³)	Collocation: New Storage Facilities (μg/m³)	Collocation: Modify P-Tunnel (μg/m³)
Criteria Pollutants							
Carbon monoxide	8-hour	10,000[b]	2,290	2,290.29	2,290.54	2,290.33	2,290.60
	1-hour	40,000[b]	2,748	2,750.02	2,751.77	2,750.30	2,752.22
Lead	Calendar Quarter	1.5[b]	c	c	c	c	c
Nitrogen dioxide	Annual	100[b]	c	<0.01[d]	0.01[d]	<0.01[d]	0.01[d]
Ozone	1-hour	235[b]	e	e	e	e	e
Particulate matter less than or equal to 10 microns in diameter	Annual	50[b]	9.4	9.4	9.4	9.4	9.4
	24-hour	150[b]	106	106	106	106	106
Sulfur dioxide	Annual	80[b]	8.4	8.4	8.4	8.4	8.4
	24-hour	365[b]	94.6	94.6	94.6	94.6	94.6
	3-hour	1,300[b]	725	725	725	725	725
Mandated by Nevada							
Hydrogen sulfide	1-hour	112[f]	c	c	c	c	c

Table 4.2.2.3–1. Estimated Operational Concentrations of Pollutants at Nevada Test Site and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives—Continued

				Consolidation		Collocation	
Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] (μg/m³)	No Action (μg/m³)	New Storage Facility (μg/m³)	Modify P-Tunnel (μg/m³)	New Storage Facilities (μg/m³)	Modify P-Tunnel (μg/m³)
Hazardous and Other Toxic Compounds							
Chlorine	8-hour	35.7[f]	d	<0.01[d]	<0.01[d]	<0.01[d]	<0.01[d]
Hydrogen chloride	8-hour	g	d	<0.01[d]	<0.01[d]	<0.01[d]	<0.01[d]
Hydrazine	8-hour	3.1[f]	d	<0.01[d]	<0.01[d]	<0.01[d]	<0.01[d]
Nitric acid	8-hour	123.8[f]	d	<0.01[d]	<0.01[d]	0.01[d]	<0.01[d]
Phosphoric acid	8-hour	23.8[f]	d	<0.01[d]	<0.01[d]	<0.01[d]	<0.01[d]
Sulfuric acid	8-hour	23.8[f]	d	<0.01[d]	<0.01[d]	<0.01[d]	<0.01[d]

[a] The more stringent of the Federal and State standard is presented if both exist for the averaging time.
[b] Federal and State standard.
[c] No sources of this pollutant have been identified.
[d] The concentration represents the alternative contribution only.
[e] Ozone, as a criteria pollutant is not directly emitted or monitored by the candidate site. See Section 4.1.3 for a discussion of ozone-related issues.
[f] State standard or guideline.
[g] Not Applicable.

Note: Concentrations are based on site contribution, including concentrations from ongoing activities (No Action), and do not include the contribution from non-facility sources (for example, traffic).

Source: 40 CFR 50; DOE 1996e; DOE 1996f; NT DOE 1996a; NV DCNR 1992a; NV DCNR 1995a.

Preferred Alternative: No Action Alternative

This alternative utilizes estimated air emissions data from operations at NTS assuming continuation of site missions as described in Section 3.3. The emission rates for the criteria and toxic/hazardous pollutants for No Action are presented in Table F.1.2.3-1. Table 4.2.2.3–1 presents the No Action concentrations for the total site. Concentrations of all criteria and toxic/hazardous air pollutants at the site boundary are expected to remain within applicable Federal, State, and local ambient air quality standards.

Consolidation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

In addition to the sources of emissions during construction associated with the No Action Alternative, fugitive dust resulting from the operation of a concrete batch plant may be an additional emission source associated with a new facility.

Increases in PM_{10} concentrations may occur during the peak construction period for a new facility and during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations during construction. Concentrations of all pollutants at the site boundary would remain within applicable Federal and State ambient air quality standards during construction.

During operation of the modified P-Tunnel, impacts with respect to the concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.2.3–1.

Construct New Plutonium Storage Facility

The new storage facility option would have air quality impacts similar to those of the modified P-Tunnel, with the following exceptions. During operation, emissions would be slightly lower, as shown in Appendix F. Impacts for the new storage facility option with respect to the concentrations of criteria pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this option for the storage alternative, plus the No Action concentrations, are presented in Table 4.2.2.3–1.

Collocation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

The P-Tunnel option would have slightly higher emissions than for the consolidation of Pu modified P-Tunnel, as shown in Appendix F. Impacts for this alternative are also expected to be in compliance with Federal, State, and local air quality regulations and guidelines. Estimated pollutant concentrations attributable to increased operations associated with this option for the storage alternative, plus the No Action concentrations, are presented in Table 4.2.2.3–1.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The new storage facility option would be located in the same area as the consolidation of Pu new storage facility and would have similar air quality impacts with the following exceptions.

During operation, emissions would be slightly higher than for consolidation of Pu new storage facility option, as shown in Appendix F. Impacts for the new storage facilities option with respect to the concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this option for the storage alternative, plus the No Action concentrations, are presented in Table 4.2.2.3–1.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Air quality impacts for construction and operations for this subalternative are expected to be similar to those previously described for the Consolidation Alternative and the Collocation Alternative. [Text deleted.]

NOISE

The location of the storage facilities relative to the site boundary and sensitive receptors was examined to evaluate 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 local and regional transportation routes used to bring construction material and workers to the site.

Preferred Alternative: No Action Alternative

Nontraffic noise sources associated with continued interim storage and other ongoing missions would be the same as described in Chapter 3. The continuation of operations at NTS would result in no appreciable change in traffic noise and onsite operational noise sources from current levels. Nontraffic noise sources are 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 site, noise emissions from construction equipment and operations activities would not be expected to cause annoyance to the public. Some noise sources may be located close enough to onsite noise sensitive areas to result in impacts, such as disturbance of wildlife.

Consolidation and Collocation Alternatives

Nontraffic, operational noise sources associated with the storage alternatives include existing or additional equipment and machines (cooling systems, vents, motors, and material handling equipment). These noise sources would be located at sufficient distance from offsite areas that the contribution to offsite noise levels would be small. 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.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Noise impacts for construction and operations for this option are expected to be almost the same as those previously described for the Consolidation Alternative and the Collocation Alternative because noise impacts are based on the use of the facility and not the size. [Text deleted.]

4.2.2.4 Water Resources

Construction and operation of the potential long-term storage facilities at NTS could affect water resources. All water required for construction and operation would be supplied from groundwater. The proposed facilities do not lie within areas historically prone to flooding. During construction, treated sanitary wastewater would be discharged to containment and sewage ponds, which would be built in accordance with applicable regulations to avoid impacts on groundwater. While the potential impacts to surface waters during the construction phase would be erosion and sedimentation, the relatively dry climate, along with the implementation of best management practices for stormwater runoff and erosion control, should preclude these potential impacts. No excess wastewater would be discharged to surface waters during the operation of the facilities, so no impacts to surface water quality are expected. Stormwater runoff would be collected and treated, if necessary, before discharge to natural drainage channels. [Text deleted.] Table 4.2.2.4–1 presents No Action water resources uses and discharges and the potential changes to water resources at NTS resulting from the long-term storage alternatives.

Preferred Alternative: No Action Alternative

Surface Water. A description of the activities that would continue at NTS is provided in Section 3.3.4. Under this alternative, no impacts to surface water resources are anticipated because there are no surface water withdrawals, offsite surface drainage system, or publicly owned treatment works. Treated wastewater discharged to evaporation/infiltration ponds is expected to continue at a rate of 82 million l/yr (21.7 million gal/yr). Contamination that has occurred from past practices and is limited to onsite areas would continue to be characterized and remediated.

Groundwater. Under this alternative, no additional impacts to groundwater availability or quality are anticipated. Baseline conditions and operations, described in Section 3.3 would continue at NTS. Current groundwater usage of 2,400 million l/yr (634 million gal/yr) is not anticipated to increase by the year 2005. Groundwater would continue to be withdrawn from local groundwater sources. No additional impacts to groundwater quality are anticipated since there are no direct discharges to groundwater.

Consolidation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Surface Water. No surface water would be withdrawn during construction or operation of the proposed facilities. Consequently, impacts to surface water availability and quality are not expected. Approximately 7.8 million l/yr (2.1 million gal/yr) of nonhazardous wastewater would be generated during construction and subsequently treated, and discharged to evaporation/infiltration ponds that would be designed to minimize seepage. No impacts to surface water from these discharges are expected, because wastewaters are not discharged to natural flowing surface water bodies.

[Text deleted.]

During operation, utility, process, and sanitary wastewater from the proposed facilities would be treated and recycled. Treated effluent would be monitored to comply with discharge permit limits. The extent to which treated effluent or stormwater would be recycled for reuse within the plant would be determined during site-specific studies.

[Text deleted.]

There have been no studies conducted to assess the 500-year floodplain at NTS. However, information on the location of the 500-year floodplain could be developed as part of the siting process. Studies of the 100-year

Table 4.2.2.4–1. No Action and Potential Changes to Water Resources at Nevada Test Site—No Action (2005) and Storage Alternatives

Affected Resource Indicator	No Action	Consolidation		Collocation	
		Modify P-Tunnel	New Storage Facility	Modify P-Tunnel	New Storage Facilities
Water Source	Ground	Ground	Ground	Ground	Ground
Construction					
Water Availability and Use					
Total water requirement (million l/yr)	NA[a]	35	85	35	104.7
Percent increase in projected water use[b]	NA[a]	1.5	3.5	1.5	4.4
Water Quality					
Wastewater discharge (million l/yr)	NA[a]	7.8	7.8	8.7	11.8
Percent change in wastewater discharge[c]	NA[a]	9.5	9.5	10.6	14.4
Operation					
Water Availability and Use					
Total water requirement (million l/yr)	2,400	130	110	190	150
Percent increase in projected water use[d]	0	5.4	4.6	7.9	6.3
Water Quality					
Total wastewater discharge (million l/yr)	82	0	0	0	0
Percent change in wastewater discharge[e]	0	0	0	0	0
Floodplain					
Is action in 100-year floodplain?	NA	No	No	No	No
Is critical action in 500-year floodplain?	NA	Unlikely	Unlikely	Unlikely	Unlikely

[a] See operations section of table for No Action water data.

[b] Percent increases in water requirements during construction at NTS are calculated by dividing No Action water requirements (2,400 million l/yr) with that for each storage option: modified P-Tunnel drift (35 million l/yr), new Pu storage facility (85 million l/yr), modify P-Tunnel drifts (35 million l/yr), and new Pu and HEU storage facility (104.7 million l/yr).

[c] Percent changes in wastewater discharged during construction at NTS are calculated by dividing No Action wastewater discharges (82 million l/yr) with that for each storage option: modified P-Tunnel drift (7.8 million l/yr), new Pu storage facility (7.8 million l/yr), modify P-Tunnel drifts (8.7 million l/yr), and new Pu and HEU storage facility (11.8 million l/yr).

[d] Percent increases in water requirements during operation at NTS are calculated by dividing No Action water requirements (2,400 million l/yr) with that for each storage option: modified P-Tunnel drift (130 million l/yr), New Pu storage facility (110 million l/yr), modify P-Tunnel drifts (190 million l/yr), and new Pu and HEU storage facility (150 million l/yr).

[e] Percent changes in wastewater discharged during operation at NTS are calculated by dividing No Action wastewater discharges (82 million l/yr) with that for each storage option: modified P-Tunnel drift (0 l/yr), new Pu storage facility (0 l/yr), modify P-Tunnel drifts (0 l/yr), and new Pu and HEU storage facility (0 l/yr).

Note: NA=not applicable.

Source: DOE 1996e; DOE 1996f; NT DOE 1996a; NTS 1993a·4.

floodplain showed it to be confined to the Jackass Flats and Frenchman Lake areas. The proposed site for the new Pu storage facilities is outside these areas. However, since NTS is in a region where most flooding occurs by locally intense thunderstorms that 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 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. Groundwater required for construction (35 million l/yr [9 million gal/yr]) and operation (130 million l/yr [34.3 million gal/yr]) would represent a 1.5- and 5.4-percent maximum increase, respectively, over the projected No Action 2005 groundwater withdrawal, and 0.09- and 0.3-percent, respectively, of the minimum estimated annual recharge to the regional aquifer under the entire NTS. This is based on several studies conducted in recent years, which estimated recharge to be 38 to 57 billion l (10 to 15 billion gal). These amounts would also be within NTS's allotment and would not be expected to cause depletion of the aquifer. Groundwater required for both construction and operation and the percent increase in projected water use is shown in Table 4.2.2.4–1.

Construction and operation of the potential modified P-Tunnel drifts would not result in direct discharges to groundwater. Recycling of all treated wastewater is expected. However, if treated wastewater generated during construction was discharged to disposal ponds it could percolate downward into the groundwater of the Valley-Fill Aquifer. This water would be monitored and would not be discharged until contaminant levels are within the limits specified. 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. Similarly, some stormwater runoff and other discharges routed to storm drains could percolate into the subsurface These discharges would be monitored and no impacts to groundwater quality are expected.

Construct New Plutonium Storage Facility

Surface Water. There are no unique construction characteristics associated with water requirements and discharges from a new Pu storage facility. No surface water would be withdrawn for any construction or operation activities associated with any of the proposed facilities. Therefore, there would be no impacts to surface water availability. During the construction phase, approximately 7.8 million l/yr (2.1 million gal/yr) of nonhazardous wastewater would be generated. This treated wastewater would be discharged to evaporation/infiltration ponds. No impacts to surface water from these discharges are expected, because wastewaters are not discharged to natural flowing surface waterbodies.

[Text deleted.]

During operation, utility, process, and sanitary wastewater from the proposed facilities would be treated and recycled to the cooling tower and/or boiler. Cooling system blowdown is directed to the utility wastewater treatment facility and is also recycled for use as cooling tower makeup. Treated effluent would be monitored to comply with discharge permit limits. Floodplain issues are the same as described for the previous alternative.

[Text deleted.]

Groundwater. All water required for construction and operation would be supplied from groundwater via the existing supply system. Groundwater required for both construction and operation and the percent increase in projected water use are shown in Table 4.2.2.4–1 for operations at NTS.

Construction and operation water requirements for the proposed facilities (85 million l/yr [22.5 million gal/yr], and 110 million l/yr [30 million gal/yr]) represent approximately 0.2 and 0.3 percent of the minimum estimated annual recharge (38 billion l [10 billion gal]) to the regional aquifer under the entire NTS. As shown in Table 4.2.2.4–1, the quantities of water required for construction and operation of the proposed facilities represent approximately 3.5- and 4.6-percent increases over the projected No Action groundwater usage. These small increases boost the total projected groundwater withdrawal to less than 7 percent of the estimated annual recharge; there should be no impact on groundwater availability.

Construction and operation of the proposed consolidated Pu storage facilities would not result in direct discharges to groundwater. Recycling of all treated wastewater is expected. However, if treated wastewater generated during construction was discharged to disposal ponds it could percolate downward into the groundwater of the Valley-Fill Aquifer. This water would be monitored and would not be discharged until contaminant levels are within the limits specified. 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. Impacts to groundwater quality are therefore not expected.

Similarly, some stormwater runoff and other discharges routed to storm drains could percolate into the subsurface. These discharges would be monitored under the State of Nevada stormwater regulations and therefore no impacts to groundwater quality are expected.

Collocation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Surface Water. Under this alternative, modifying the P-Tunnel would increase water discharges by 10.6 percent over the projected No Action discharge during construction. During operations, wastewater would be recycled. All other wastewater requirements of the option would be similar to modifying P-Tunnel under the Consolidation Alternative.

Groundwater. During construction, the Pu and HEU storage upgrade using the P-Tunnel would require 35 million l/yr (9.2 million gal/yr) of groundwater, or a 1.5-percent increase over projected No Action water use. During operations, 190 million l/yr (50.2 million gal/yr) of water would be required, a 7.9-percent increase over the projected No Action water use, representing 0.5 percent of the minimum estimated recharge. All other water requirements of the option are identical to those discussed previously for modifying the P-Tunnel.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Since the new Pu and HEU collocated storage facilities would be located in the same area as the new Pu storage facility, the impacts associated with them are similar to those previously discussed for the Consolidation New Storage Facility Alternative, with the following exceptions. Sanitary wastewater quantities generated during construction would be greater than for the new storage facility option and are approximately 11.8 million l/yr (3.1 million gal/yr). These effluents would be discharged to evaporation/infiltration ponds under a State of Nevada permit. No impacts are expected. During operations, wastewater would be recycled. The groundwater requirements for construction of this option are greater than those for the previous option. This option would require approximately 104.7 million l/yr (27.7 million gal/yr) and 150 million l/yr (39.6 million gal/yr) for construction and operation, respectively. These additional requirements represent 4.4- and 6.3-percent increases, respectively, in the projected No Action groundwater withdrawals. These amounts increase the total projected site groundwater withdrawal to less than 7 percent of the estimated annual recharge; there should be no impact on groundwater availability.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Water resource impacts for construction and operation of this option are expected to be slightly less than those described for the Consolidation Alternative and the Collocation Alternative because of the reduction in the amount of material. [Text deleted.]

4.2.2.5 Geology and Soils

Construction and operation of the alternatives at NTS would have no effect on the geologic resources. A moderate seismic risk exists, but would be considered in the design of the proposed alternatives. The existing seismic risk does not preclude the safe construction and operation of the proposed alternative facilities. The facilities would be designed for earthquake-generated ground accelerations, in accordance with DOE O 420.1, *Facility Safety.* The Yucca and Carpet Bag faults are considered to be capable faults and represent a potential for ground rupture as a result of an earthquake. However, ground shaking is more likely in the areas of the proposed alternatives. Intensities of approximately VII on the MMI scale are possible at NTS. A peak ground acceleration of 0.67 g with a Richter magnitude of 6.7, has been estimated for the Cane Spring fault, with a recurrence interval of 10,000 to 30,000 years. This could affect the integrity of inadequately designed or nonreinforced structures but should not affect newly designed facilities. Human health effects form accidents initiated by natural phenomenon (for example, earthquakes) are discussed in Section 4.2.2.9. Volcanic activity is improbable during the life of the alternatives and is not anticipated to affect the construction and operation of the alternatives. The most likely risk to NTS is possible ash fall from the Long Valley, California area located approximately 214 km (150 mi) to the west-northwest. Lava extrusions from sources at NTS could recur but are unlikely. Precursors, such as shallow earthquakes, gas venting activity, and an increase in groundwater temperatures provide advance warning of most eruptions of this type; no such activity is currently indicated at NTS. It is unlikely that landslides, sinkhole development, or other nontectonic events would affect project activities. Slopes and underlying foundation materials are generally considered stable. Properties and conditions of the soils typical of NTS have no limitation on construction. Soils would be affected by construction and operations of a proposed alternative.

None of the sites has known economically viable geologic resources that would be affected by the construction and operations of an alternative. Except for the potential existence of gold, tungsten, and molybdenum at NTS, geologic resources consist of surficial sand, gravel, or clay deposits that have low economic value. New construction may increase the use of the materials, but because large volumes of these materials are present, consequently the impact is anticipated to be negligible.

Construction of the proposed alternative facilities may involve ground-disturbing activities that could affect the soil resource. The amount of land disturbed is specified below for each alternative. Impacts would depend on the specific soil units in the disturbed area, the extent of the land disturbing activities, and the amount of soil disturbed. Within NTS, the soil erosion potential is directly related to the amount of land disturbed because soil and climatic conditions are similar throughout the site. Control measures would be employed during construction to minimize soil erosion.

Preferred Alternative: No Action Alternative

[Text deleted.]

Impacts to geologic and soil resources occur during, or as a result of, ground-disturbing construction activities. Under the No Action Alternative, DOE would continue current and ongoing activities at NTS. There would be no ground-disturbing activities beyond those associated with existing and future site improvements. Because new construction and the associated ground disturbance for potential soil erosion would not occur, the No Action Alternative would have no effect on the geologic or soil resources at the site.

Consolidation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

No apparent direct or indirect effects on the geologic resource are anticipated, because neither facility construction and operational activities nor site infrastructure improvements will restrict access to potential geologic resources. Design of the facilities would ensure that they would not be affected by potentially hazardous geological conditions.

[Text deleted.] Construction activities will occur completely on previously disturbed land, as described in Section 4.2.2.1 and involve land disturbance of approximately 29 ha (72 acres) that will affect the soil profile and potentially cause a temporary increase in soil erosion. Soil disturbance would occur primarily from ground-disturbing construction activities (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 rainstorm wind velocities (increased velocities and durations increase potential erosion); the frequency and severity of storms; and the size, location, and duration of ground-disturbing activities.

Net soil disturbance during operations would be considerably less than during construction because areas temporarily used for construction laydown would be restored. Although stormwater runoff and wind action could occur during operation, it is anticipated to be minimal. [Text deleted.]

Construct New Plutonium Storage Facility

Construction and operation effects on geologic resources for the storage facility are the same as those described for the modified P-Tunnel. However, additional soil impacts would be expected from the construction of the storage facility which will occur completely on previously disturbed land as described in Section 4.2.2.1. Approximately 58.5 ha (144 acres) would be disturbed for construction of the new facility, affecting the soil profile and leading to a possible temporary increase in soil erosion as a result of stormwater runoff and wind action. Soil losses would depend on frequency of storms, wind velocity, and location of the facility with respect to drainage and wind patterns; slope, shape, and area of the tracts of ground disturbed; and the duration of time the soil is bare. Soil impacts during operation are expected to be minimal.

Collocation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Construction and operation effects on geological and soil resources for this alternative are the same as those discussed previously for the Consolidation Alternative using the modified P-Tunnel. Construction will occur completely on previously disturbed land, as described in Section 4.2.2.1, and involve land disturbance of approximately 29 ha (72 acres).

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

[Text deleted.] Additional soil impacts would be anticipated from the construction of the storage facilities which will occur completely on previously undisturbed land, as described in Section 4.2.2.1. Approximately 89.5 ha (221 acres) would be disturbed for construction of the Collocation Alternative, affecting the soil profile and leading to a possible temporary increase in soil erosion as a result of storm water runoff and wind action. Soil losses would depend on frequency of storms, wind velocity, and location of the facility with respect to drainage and wind patterns; slope, shape, and area of the tracts of ground disturbed; and the duration of time the soil is exposed. Soil impacts during operation are expected to be minimal.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Exclusion of strategic reserve and weapons R&D materials would give almost the same effects to the geologic and soil resources for the Consolidation Alternative and Collocation Alternative. By excluding these materials, the size of a facility would be similar, thus not changing the amount of land disturbed by construction activities. No effect to the geologic resource is anticipated as a result of this option. [Text deleted.]

[Text deleted.]

4.2.2.6 Biological Resources

Preferred Alternative: No Action Alternative

The missions described in Section 2.2.2 would continue at NTS. This would result in no changes to current conditions of biological resources at NTS as described in Section 3.3.6.

Consolidation Alternative

Consolidated storage facilities would be located in modified P-Tunnel drifts or in new facilities in the Frenchman Flat area.

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Terrestrial Resources. If consolidated storage facilities were located within the modified P-Tunnel area, existing and new facilities would be required at both the modified P-Tunnel site itself and the Area 12 Camp. Modification of existing structures would have minimal impact on terrestrial resources. New construction would also have minimal impact, because construction would take place within presently developed areas. The material handling facility, which is the principal structure to be built, would be located in an area on which excavated material from the modified P-Tunnel was deposited. Foundation preparation would require some additional soil, which would be imported from other as-yet-unspecified areas of NTS. If this material was excavated from a new borrow pit, terrestrial resources at the location could be affected. Construction and operation could result in disturbance to wildlife by noise and human activity, but impacts to wildlife would be minimal because animals would have already adjusted to ongoing activities.

Wetlands. Construction and operation of consolidated storage facilities would not affect wetlands since there are no wetlands in the vicinity of the modified P-Tunnel.

Aquatic Resources. Construction and operation of consolidated storage facilities would not affect aquatic resources since there are no permanent surface water bodies in the vicinity of the modified P-Tunnel.

Threatened and Endangered Species. Construction and operation of consolidated storage facilities would have minimal effect on threatened and endangered species in the modified P-Tunnel area since the habitat is already disturbed. The range of the federally listed threatened desert tortoise does not extend to the modified P-Tunnel area. Site surveys would be performed as necessary to determine the presence of special status species. Consultation with USFWS and State agencies would be conducted at the sit-specific levels, as appropriate.

Construct New Plutonium Storage Facility

Under this alternative, Pu would be consolidated in a new storage facility 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 of the consolidated Pu storage facility at NTS would result in the disturbance of 58.5 ha (144 acres) of terrestrial resources, or less than 0.02 percent of NTS. This includes areas on which facilities would be constructed, as well as areas used for construction laydown. Vegetative cover within the proposed 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 Pu storage 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 proposed site may not survive. The site would be surveyed as necessary for the nests of migrating 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. Impacts to vegetation from salt drift would not occur since dry cooling systems would be used.

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

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

Threatened and Endangered Species. The desert tortoise is a federally listed threatened species that could be affected by construction of the Pu storage 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 from previous projects at NTS designed to avoid impacts to the desert tortoise 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 present when heavy equipment is in use. The USFWS would be consulted, and similar USFWS recommendations would be implemented should NTS be selected as the location for the Pu storage facility.

[Text deleted.] Any listed plant species located within the construction area could be lost or affected during land-clearing activities. Preactivity surveys would be conducted as appropriate prior to construction to determine the presence of these species in the area to be disturbed. Consultation with USFWS and State agencies would be conducted at the site-specific levels, as appropriate.

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 are not expected to change due to operation of the Pu storage facility (Section 4.2.2.4), so 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.

Collocation Alternative

Under this alternative, consolidated Pu would be stored with HEU inventories in existing and new facilities in the modified P-Tunnel area or in a new collocated Pu storage facility sited at the same location as the consolidated storage facility.

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Impacts to biological resources from placing collocated storage facilities in modified P-Tunnel drifts would be similar to those described previously for consolidated storage facilities. This is because both facilities are of a similar size and both would be placed within developed portions of the P-Tunnel site and Area 12 Camp.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction and operation of a collocated storage facility at the Frenchman Flat area of NTS would have similar, but somewhat greater effects on biological resources as those described for the consolidated storage facility. Construction of the collocated storage alternative would disturb 89.5 ha (221 acres) of habitat.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The exclusion of strategic reserve and weapons R&D materials would have almost the same effects to the Consolidation Alternative and the Collocation Alternative. The size of facility would be similar and would not result in the reduction of disturbed habitat and/or fewer facility modifications and thus lessen the potential impacts to biological resources would be similar. [Text deleted.]

4.2.2.7 Cultural and Paleontological Resources

Preferred Alternative: No Action Alternative

Under this alternative, DOE would continue the existing and planned missions at NTS. Management of NTS's cultural resources follows the Programmatic Agreement between DOE, the Nevada SHPO, and the Advisory Council on Historic Preservation. Any impacts to cultural or paleontological resources from these missions would be independent of the proposed action and would be addressed through separate NHPA, *American Indian Religious Freedom Act*, and *Native American Graves Protection and Repatriation Act* regulatory compliance procedures.

Consolidation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

The existing P-Tunnel is located in Area 12. Modification would result in ground disturbance of 29 ha (72 acres) on previously disturbed land. No new, undisturbed land would be used. The P-Tunnel is on Rainier Mesa, in Area 12. In 1990, DOE entered into a Programmatic Agreement with the Nevada SHPO and the Advisory Council on Historic Preservation that has resulted in an in-depth cultural resources study of 11 percent of Pahute and Rainier Mesas. Additional surveys would be completed prior to construction on any currently unexamined tracts. This area is rich in cultural resources, including many archaeological sites. Construction of the proposed facility may affect some potentially NRHP-eligible resources. Recorded prehistoric sites in the area include quarries, lithic workshops, campsites, and rock shelters. Historic site types include remains of ranches and mines. Operation would not have an additional impact on prehistoric or historic resources. Some paleontological resources may also be affected by land disturbance during construction. Operation would not result in additional impacts to those resources.

The CGTO is an alliance of Native American groups that have ties to the land at NTS. This alliance has in the past requested and been denied access to Rainier Mesa. Consequently, no important Native American resources have been identified there to date. Oral histories indicate that some resources, such as ancestral campsites, are located within Rainier Mesa (NT DOE 1996c:4-169). Additional Native American resources such as archaeological sites, traditionally used plant and animal species, and rock art may be affected by both the construction and operation of the proposed facility. Consultation with interested parties during the *American Indian Religious Freedom Act*, *Native American Graves Protection and Repatriation Act*, and NHPA compliance process may identify some of these resources.

Construct New Plutonium Storage Facility

The new Pu storage facility would be situated in the northern portion of Frenchman Flat in Area 6, near the DAF. The operational land requirement for the proposed facility is 56 ha (138 acres). Some new construction would be necessary. Land to be disturbed during construction totals 58.5 ha (144 acres). A 1.6-km (1-mi) reduced-access buffer zone would be created around the facility.

[Text deleted.] In 1984, a Class III cultural resources survey was conducted across the 660-ha (1,610-acres) DAF site and no NRHP-eligible sites were identified. Although no resources were identified within the DAF project area, Frenchman Flat contains 49 sites that 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 could occur during construction of the proposed facility. Operation would not result in additional impact as it does not involve ground disturbance or increased activity. In addition, construction (but not operation) may have some impact on Late Pleistocene paleontological resources, should any exist within the acreage to be disturbed.

The CGTO has conducted surveys over portions of Frenchman Flat. The area is known to contain 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 proposed facility. Potential impacts include reduced access to traditional use areas and visual or auditory intrusions to sacred space.

Collocation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handing Building at the P-Tunnel

Potential impacts under this option would be the same as the P-Tunnel discussion under the Consolidation Alternative.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction of the proposed Pu and HEU storage facility would disturb 89.5 ha (221 acres) of land; operation would require 87 ha (215 acres). A 1.6-km (1-mi) reduced-access buffer zone would be created around the facility. The proposed location is contained within Area 6 near the DAF. Impacts to cultural and paleontological resources would be similar to those discussed under the new storage facility option of the Consolidation Alternative.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, facility and other resource requirements will be almost the same as the Consolidation and Collocation Alternative. Therefore, impacts to cultural and paleontological resources would equal those previously discussed. [Text deleted.]

4.2.2.8 Socioeconomics

Preferred Alternative: No Action Alternative

Under this alternative, the existing storage facility would remain operational. No new employment or in-migration of workers would be required.

Regional Economy Characteristics. Total employment in the REA is projected to grow 3.4 percent annually between 1995 and 2000, reaching 686,800 in the latter year. Slower growth is projected after the year 2000, when employment will increase 2 percent annually and reach approximately 1,236,600 in 2040. Unemployment in the REA was 6.1 percent in 1994 and is expected to remain at this level into the near future. Per capita income is projected to increase from approximately $21,900 in 1995 to $46,134 in 2040. No Action projections are presented in Table L.1–19.

Population and Housing. Population in the ROI is projected to total 990,700 in 1995 and reach 2,087,000 by 2040. Over the same period, the total number of housing units in the ROI is projected to increase from 403,700 to 850,500. No Action projections for population and housing are presented in Tables L.1–20 and L.1–21, respectively.

Community Services. Education, public safety, and health care characteristics are used to assess the level of community services in the NTS ROI. School enrollments are projected to increase from approximately 165,630 students in 1995 to 348,920 students by 2040. In 1994, the student-to-teacher ratio was 19.6:1. To maintain this level of service, the number of teachers in the ROI would need to increase from 8,466 in 1995 to 17,833 in 2040. No Action projections are presented in Tables L.1–22 and L.1–23.

The projected number of sworn police officers and firefighters serving ROI communities during the period 1995 to 2040 is shown in Tables L.1–24 and L.1–25, respectively. Under No Action, the number of sworn police officers is projected to increase from 1,946 in 1995 to 4,101 in 2040 to maintain the current service level of 2.0 officers per 1,000 persons. The number of firefighters in the ROI is estimated to increase from 1,553 in 1995 to 3,271 in 2040 to maintain the current service level of 1.6 firefighters per 1,000 persons.

Hospital occupancy rates are based on current capacity. Projections of hospital occupancy rates and the number of practicing physicians serving the ROI population between 1995 and 2040 are presented in Tables L.1–26 and L.1–27, respectively. Without expansion of existing capacity, hospital occupancy rates for the ROI would increase from 62 percent in 1995 to over 100 percent in 2040. If the 1994 physician-to-population ratio of 1.3 physicians per 1,000 persons is to be maintained, the total number of physicians would need to increase from 1,276 in 1995 to 2,704 in 2040.

Local Transportation. The worker population at NTS would not increase and could decrease. Any increases in traffic would be due to the projected growth in the area unrelated to DOE activities. [Text deleted.]

Consolidation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Modification of the existing P-Tunnel at NTS to consolidate the storage of Pu would require 1,103 workers during the peak construction year and would generate over 2,100 jobs (direct and indirect) in the region. Operation of the facility would generate over 1,400 jobs (direct and indirect) in the region. Projections indicate that there would be sufficient labor available within the region to fill all direct and indirect jobs during both construction and operations.

Regional Economy Characteristics. A total of 2,139 (1,103 direct and 1,036 indirect) jobs would be created in the region during the construction of the facility. Employment in the region would increase by less than 1 percent, and the unemployment rate would fall from the No Action projection of 6.1 percent to 5.8 percent. Per capita income would increase by less than 1 percent (Socio 1996a).

Operation of the facility would generate a total of 1,406 jobs (527 direct and 879 indirect) in the region, increasing regional employment by less than 1 percent. Operation workers would begin phasing in as construction nears completion. Unemployment would rise from 5.8 percent during peak construction to 5.9 percent during operation but remain below the No Action level of 6.1 percent (Socio 1996a).

Population, Housing, and Community Services. All newly created jobs would be filled by the resident labor force. Therefore, there would be no change to the region's population from the No Action projections. Accordingly, there would be minimal impacts to the demand for housing or community services in the region as a result of the construction and operation of this facility (Socio 1996a).

Local Transportation. During the peak construction year, workers would generate 2,118 vehicle trips per day. During operations, workers would generate 1,012 vehicle trips per day. These increases would not affect the level of service on the local road segments analyzed (Socio 1996a).

Construct New Plutonium Storage Facility

Construction of a new facility for the consolidated storage of Pu at NTS would generate over 2,100 jobs (direct and indirect) within the REA. Operation would generate over 1,300 jobs (direct and indirect) in the region. Projections indicate that there would be sufficient available labor in the region to fill all of the direct and indirect jobs. [Text deleted.]

[Text deleted.]

Regional Economy Characteristics. During the construction period, the project would add a total of 2,122 (1,094 direct and 1,028 indirect) jobs to the regional economy that would be filled by the labor available within the region. The regional unemployment rate would decrease from 6.1 percent to 5.8 percent, while per capita income would increase minimally (much less than 1 percent) (Socio 1996a).

The consolidated storage facility at NTS would create 1,313 jobs (492 direct and 821 indirect) during full operation, increasing total employment in the REA by much less than 1 percent over the No Action projection. Available labor would fill all of the indirect positions. However, some workers would need to in-migrate to fill specialized direct employment requirements. Operation workers would begin phasing in as construction nears completion. Unemployment would rise from 5.8 percent during peak construction to 6.0 percent during operation but would remain below the No Action level of 6.1 percent. Per capita income would increase minimally (much less than 1 percent) (Socio 1996a).

Population, Housing, and Community Services. All newly created jobs would be filled by the resident labor force. Therefore, there would be no change to the region's population from the No Action projections. Accordingly, there would be minimal impact to the demand for housing or community services in the region as a result of the construction and operation of this facility. [Text deleted.]

[Text deleted.]

Local Transportation. Construction workers would generate a projected 2,100 vehicle trips per day during peak construction activity. During operations, workers would generate 945 vehicle trips per day. These increases would not affect the level of service on the local road segments analyzed (Socio 1996a).

Collocation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Modification of the existing P-Tunnel at NTS to consolidate the storage of all Pu and HEU would generate a total of over 2,500 jobs (direct and indirect) during the construction phase. Projections indicate that there would be sufficient labor available within the region to fill these positions. However, operations of the upgraded facility, which would generate over 1,700 total jobs (direct and indirect), would require some workers to relocate to the area to fill specialized employment requirements. Available labor within the REA would fill all of the indirect jobs created during the operation phase. The impacts on the region's economy, population, housing, community services, and local transportation are discussed below.

Regional Economy Characteristics. Modification of the existing P-Tunnel would require 1,297 workers during the peak construction year and would generate an additional 1,218 jobs in other industries within the REA. The available labor force within the region would be sufficient to fill all the direct and indirect jobs created. Employment in the REA would increase by less than 1 percent over No Action, and the unemployment rate would fall from the No Action projection of 6.1 percent to 5.8 percent. Per capita income would increase by less than 1 percent (Socio 1996a).

Operation of the facility would require 641 new employees and would generate an additional 1,069 indirect jobs within the REA. Available labor within the REA would fill all of the indirect positions, however, some workers would have to in-migrate to fill specialized direct employment requirements. Total employment and per capita income in the region would both increase by much less than 1 percent over No Action projections. Operation workers would begin phasing in as construction nears completion. Unemployment would rise from 5.8 percent during peak construction to 5.9 percent during operation but would remain below the No Action level of 6.1 percent (Socio 1996a).

Population and Housing. During full operation of the upgraded facility, in-migration is projected to increase population in the ROI by 73 over the No Action Alternative, a change of much less than 1 percent of total population. Projected vacancies in the housing stock would be sufficient to accommodate the slight increase in demand (Socio 1996a).

Community Services. Because there would be no in-migration associated with construction of the upgraded facility, and the population change resulting from operations is so small, the demand for community services would remain unchanged from No Action projections (Socio 1996a). [Text deleted.]

[Text deleted.]

Local Transportation. Construction workers would generate a projected 2,490 vehicle trips per day in the year 2001 (the peak construction year) under this alternative. Operation workers would generate 1,231 vehicle trips per day. These increases would not affect the level of service on the local road segments analyzed (Socio 1996a).

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction of a new facility to store all Pu and HEU would generate almost 2,200 jobs (direct and indirect) in the region. Operation of the facility would generate over 1,600 jobs. Projections indicate that workers would in-migrate to the REA to fill some of the direct jobs created during the operation of a new consolidated Pu and HEU storage facility at NTS. However, there would be sufficient available labor in the REA to fill both the indirect jobs created during operation and all employment generated by the construction of the facility. The effects on the region's economy, population, housing, community services, and local transportation are discussed below.

Regional Economy Characteristics. Construction of the new consolidated Pu and HEU storage facility would generate 1,123 direct and 1,055 indirect jobs during peak construction at NTS. Total employment in the region would increase by less than 1 percent, and the unemployment rate would decrease from the No Action projection of 6.1 percent to 5.8 percent. Per capita income would increase by much less than 1 percent (Socio 1996a).

Operation of the proposed storage facilities would generate a total of 1,659 new jobs (622 direct and 1,037 indirect) in the REA, with some direct jobs filled by in-migrant workers. All of the indirect positions would be filled by available labor in the REA. Total employment in the region would increase by less than 1 percent over the No Action projection. Operation workers would begin phasing in as construction nears completion. Unemployment would rise from 5.8 percent during peak construction to 5.9 percent during operation but remain below the No Action level of 6.1 percent. Per capita income would increase much less than 1 percent (Socio 1996a).

Population and Housing. Although 22 workers would in-migrate to the REA during the operation phase of the proposed storage facilities, the resulting change to population would be less than a 1 percent increase over No Action. Projected housing vacancies would be sufficient to accommodate demand from the in-migrating population (Socio 1996a).

Community Services. Because there would be no in-migration associated with construction of the facility, and the population change from operations is so small, the demand for community services would remain unchanged from No Action projections (Socio 1996a).

[Text deleted.]

Local Transportation. Construction employees would generate 2,156 vehicle trips per day. Operation employees would generate an estimated 1,194 vehicle trips per day. These increases would not affect the level of service on the local road segments analyzed (Socio 1996a).

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

If strategic reserve and weapons R&D materials are not included in the storage requirements at NTS, there would be a small reduction in worker requirements for construction and operation of the facility. Therefore, the socioeconomic effects would be less than those options including strategic reserve and weapons R&D for the Consolidation Alternative and the Collocation Alternative. [Text deleted.]

4.2.2.9 Public and Occupational Health and Safety

The assessments of potential radiological and chemical impacts associated with the storage alternatives at NTS are presented in this section. Summaries of radiological impacts from normal operations are presented in Tables 4.2.2.9–1 and 4.2.2.9–2 for the public and workers, respectively. Impacts from hazardous chemicals are presented in Table 4.2.2.9–3. Summaries of impacts associated with postulated accidents are given in Tables 4.2.2.9–4 through 4.2.2.9–7. Detailed results are presented in Appendix M.

Preferred Alternative: No Action Alternative

This section describes the radiological and hazardous chemical releases and their associated impacts resulting from normal operations involved with the sitewide NTS missions. The radiological and chemical source terms (releases) under the No Action Alternative are taken to be the same as for the existing baseline condition; the resulting impacts would be within applicable regulatory limits. For facility accidents, the risks and consequences are described in site safety documentation.

Normal Operation. The doses and potential health effects on the public and workers during normal operations are described below.

Radiological Impacts. The calculated annual dose to the average and maximally exposed members of the public from total site operation; the associated fatal cancer risks to these individuals from 50 years of operation; the dose to the population within 80 km (50 mi) from total site operation in the year 2030; and the projected number of fatal cancers in this population from 50 years of operation are presented in Table 4.2.2.9–1 under this alternative at NTS. The annual dose of 4.2×10^{-3} mrem to the MEI is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.0×10^{-7}. This activity would be included in a program to ensure that doses to the public are ALARA. The annual dose of 3.7×10^{-3} person-rem to the population would be within the limit in proposed 10 CFR 834. The corresponding number of fatal cancers in this population from 50 years of operation would be 9.3×10^{-5}. To put operational doses into perspective, comparisons with doses from natural background radiation are included in the table.

Under the No Action Alternative, as shown in Table 4.2.2.9–2, the annual average dose to a noninvolved (No Action) site worker and the annual dose to the noninvolved (No Action) total site workforce would be 5.0 mrem and 3.0 person-rem, respectively. The associated risk of fatal cancer to the average worker from 50 years of total site operations would be 1.0×10^{-4} and the projected number of fatal cancers among all workers from 50 years of total site operations would be 0.060.

Hazardous Chemical Impacts. There would be no hazardous chemical impacts shown in Table 4.2.2.9–3 on the public or to workers resulting from the normal operation under No Action at NTS because no hazardous or other carcinogens are released.

Facility Accidents. Under the No Action Alternative, facilities would continue to operate in accordance with DOE safety orders, which ensure that the risk to the public of prompt fatalities due to accidents or cancer fatalities due to operations will be minimized. The safety to workers and the public from accidents at existing facilities is also controlled by Technical Safety Requirements specified in detail in SARs or a Basis for Interim Operations document prepared and maintained specifically for a facility or process within a facility. Under these controls, any change in approved operations or to facilities would cause a halt in operations until it can be established that worker and public safety has not been compromised.

Table 4.2.2.9–1. Potential Radiological Impacts to the Public During Normal Operation at Nevada Test Site—No Action and Storage Alternatives

	No Action	Consolidation				Collocation
		Modify P-Tunnel		New Storage Facility		
Receptor	**Total Site**	**Facilities**	**Total Site[a]**	**Facility**	**Total Site[a]**	
Annual Dose to the Maximally Exposed Individual Member of the Public[b]						
Atmospheric release pathway (mrem)	4.2×10^{-3}	5.6×10^{-6}	4.2×10^{-3}	1.3×10^{-6}	4.2×10^{-3}	c
Drinking water pathway (mrem)	0	0	0	0	0	c
Total liquid release pathway (mrem)	0	0	0	0	0	c
Atmospheric and liquid release pathways combined (mrem)	4.2×10^{-3}	5.6×10^{-6}	4.2×10^{-3}	1.3×10^{-6}	4.2×10^{-3}	c
Percent of natural background[d]	1.3×10^{-3}	1.8×10^{-6}	1.3×10^{-3}	4.2×10^{-7}	1.3×10^{-3}	c
50-year fatal cancer risk	1.0×10^{-7}	1.4×10^{-10}	1.0×10^{-7}	3.2×10^{-11}	1.0×10^{-7}	c
Population Dose Within 80 Kilometers for Year 2030[e]						
Atmospheric release pathway (person-rem)	3.7×10^{-3}	1.7×10^{-6}	3.7×10^{-3}	2.6×10^{-6}	3.7×10^{-3}	c
Total Liquid Release Pathway (person-rem)	0	0	0	0	0	c
Atmospheric and liquid release pathways combined (person-rem)	3.7×10^{-3}	1.7×10^{-6}	3.7×10^{-3}	2.6×10^{-6}	3.7×10^{-3}	c
Percent of natural background[d]	4.0×10^{-5}	1.8×10^{-8}	4.0×10^{-5}	2.8×10^{-8}	4.0×10^{-5}	c
50-year fatal cancers	9.3×10^{-5}	4.3×10^{-8}	9.3×10^{-5}	6.5×10^{-8}	9.3×10^{-5}	c
Annual Dose to the Average Individual Within 80 Kilometers[f]						
Atmospheric and liquid release pathways combined (mrem)	1.3×10^{-4}	5.8×10^{-8}	1.3×10^{-4}	8.8×10^{-8}	1.3×10^{-4}	c
50-year fatal cancer risk	3.1×10^{-9}	1.4×10^{-12}	3.1×10^{-9}	2.2×10^{-12}	3.1×10^{-9}	c

[a] Includes impacts from No Action (Baseline) facilities. The location of the MEI may be different under No Action than for the other alternatives. 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 impacts for both the new storage facility and the new and modified P-Tunnel Drifts under the Collocation of Pu Storage would be virtually the same as for these two options under the Consolidation of Pu Storage. This is because the HEU contributes a negligible dose to the public.

[d] The annual natural background radiation level at NTS is 313 mrem for the average individual; the population within 80 km in the year 2030 receives 9,190 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 by the number of people projected to live within 80 km of NTS in 2030 (29,400).

Source: Section M.2.

Table 4.2.2.9–2. ***Potential Radiological Impacts to Workers During Normal Operation at Nevada Test Site—Storage Alternatives***

Receptor	Consolidation		Collocation	
	Modify P-Tunnel	New Storage Facility	Modify P-Tunnel	New Storage Facility
Involved Workforce[a]				
Average worker dose (mrem/yr)[b]	262	258	262	264
50-year risk of fatal cancer	5.2×10^{-3}	5.2×10^{-3}	5.2×10^{-3}	5.3×10^{-3}
Total dose (person-rem/yr)	30	24	40	25
50-year fatal cancers	0.60	0.48	0.80	0.50
Noninvolved Workforce[c]				
Average worker dose (mrem/yr)[b]	5.0	5.0	5.0	5.0
50-year risk of fatal cancer	1.0×10^{-4}	1.0×10^{-4}	1.0×10^{-4}	1.0×10^{-4}
Total dose (person-rem/yr)	3.0	3.0	3.0	3.0
50-year fatal cancers	0.060	0.060	0.060	0.060
Total Site Workforce[d]				
Dose (person-rem/yr)	33	27	43	28
50-year fatal cancers	0.66	0.54	0.86	0.56

[a] The involved worker is a worker associated with operations of the proposed action. The number of involved badged workers for the consolidation and collocation alternatives using the New Storage Facility would be 92 and 95, respectively. For storage in P-Tunnel, the number of involved badged workers would be 113 for the consolidation alternative and 152 for the collocation alternative. The maximum dose to an involved worker would be kept below 500 mrem per year. An effective ALARA program will ensure that exposure will be reduced to that level which is as low as reasonably achievable.

[b] The radiological limit for an individual worker is 5000 mrem/year (10 CFR 835). However, DOE has also established an administrative control level of 2,000 mrem per year (DOE 1992t); the site 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 projected number of noninvolved badged workers in 2005, and beyond, is 619. 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: NT DOE 1996a and Section M.2.

Table 4.2.2.9–3. Potential Hazardous Chemical Impacts to the Public and Workers During Normal Operation at Nevada Test Site—No Action and Storage Alternatives

		Consolidation				Collocation			
	No Action	Modify P-Tunnel		New Facility		Modify P-Tunnel		New Facilities	
Receptor	Total Site[a]	Facilities[b]	Total Site[a]	Facility[b]	Total Site[a]	Facility[b]	Total Site[a]	Facility[b]	Total Site[a]
Maximally Exposed Individual (Public)									
Hazard Index[c]	0	2.5×10^{-6}	2.5×10^{-6}	2.3×10^{-6}	2.3×10^{-6}	2.8×10^{-6}	2.8×10^{-6}	4.2×10^{-6}	4.2×10^{-6}
Cancer Risk[d]	0	4.1×10^{-9}	4.1×10^{-9}	4.1×10^{-9}	4.1×10^{-9}	4.1×10^{-9}	4.1×10^{-9}	4.1×10^{-9}	4.1×10^{-9}
Worker Onsite									
Hazard Index[e]	0	5.1×10^{-4}	5.1×10^{-4}	4.7×10^{-4}	4.7×10^{-4}	5.6×10^{-4}	5.6×10^{-4}	7.2×10^{-4}	7.2×10^{-4}
Cancer risk[f]	0	6.4×10^{-6}	6.4×10^{-6}	6.4×10^{-6}	6.4×10^{-6}	6.4×10^{-6}	6.4×10^{-6}	6.4×10^{-6}	6.4×10^{-6}

[a] Total=Sum of the No Action plus the contributions of the above activity.
[b] Contribution from the above activity only (for example, the amount of increase over the existing, No Action level at the site).
[c] Hazard Index for MEI=Sum of Individual Hazard Quotients (Noncancerous health effects) for MEI.
[d] Cancer Risk for MEI=(Emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (Slope Factor [SF]).
[e] Hazard Index for workers=Sum of Individual Hazard Quotients (Noncancerous health effects) for workers.
[f] Cancer risk for worker=(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).
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.3.4–5 through M.3.4–9.

Earthquakes offer the greatest threat from natural phenomena. Available seismology studies indicate that active faults such as the Mine Mountain Fault, the Carpetbag Fault, the Yucca Flat Fault, and the Cane Spring Fault in the NTS vicinity are capable of generating earthquakes of up to 0.85 g (PX DOE 1996b:5-16). NTS has a natural background seismicity. The Cane Springs Fault, located 5 to 8 km (3 to 5 mi) south-southeast of the DAF area, has been identified as the most significant feature from the standpoint of seismic risk. However, a large portion of seismic events occurring near NTS may have been aftershocks from past nuclear explosions. The proposed storage area in P-Tunnel is only a few hundred feet away from the site of some past nuclear explosions. Since the P-Tunnel has survived these explosions without noticeable degradation, it is not reasonably foreseeable that the proposed storage area would be damaged by an earthquake. However, if the P-Tunnel collapses, the impact forces could breach some containers. The collapse would also seal the containers inside the tunnel, resulting in no or minimal short-term releases to the environment. Thus, the consequences to the public and workers are considered negligible.

Consolidation Alternative

This section includes a description of radiological and hazardous chemical releases and their associated impacts resulting from either normal operation or accidents involved with the new material handling building and modified P-Tunnel drifts and with the new consolidated Pu storage facility at NTS.

Normal operation under either consolidated storage option would result in impacts that are within applicable regulatory limits.

[Text deleted.]

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Normal Operation. There would be no radiological releases during the construction of a new material handling building or from modifying P-Tunnel drifts at NTS. 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 NTS are described below.

Radiological Impacts. The radiological impacts to the public resulting from the normal operation of the modified P-Tunnel and the associated handling building are given in Table 4.2.2.9–1. The dose to the MEI due to annual storage operation in the P-Tunnel drifts and handling building would be 5.6×10^{-6} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.4×10^{-10}. The impacts to the average individual would be less. As a result of storage operations in the year 2030, the population dose would be 1.7×10^{-6} person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be 4.3×10^{-8}.

The dose to the MEI 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, and would be 4.2×10^{-3} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.0×10^{-7}. 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 total site operation in the year 2030, the population doses would all be within the limit in proposed 10 CFR 834 and would be 3.7×10^{-3} person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be 9.3×10^{-5}.

Doses to onsite workers due to normal operations are given in Table 4.2.2.9–2. Included are involved workers directly associated with the new handling building and modified P-Tunnel drifts, workers who are not involved with the new building and modified P-Tunnel drifts, and the entire workforce at NTS. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. For the purposes of analyses only, this PEIS assumes that TRU and TRU mixed waste would be treated onsite to the current planning-basis WIPP WAC, and shipped to WIPP for disposal. This PEIS also assumes that LLW and mixed LLW would be treated and disposed of in accordance with current site practice. Also, this analysis assumes that hazardous waste would be treated and disposed of in accordance with current site practice.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of consolidated storage in the P-Tunnel facility and the new handling building at NTS are presented in Table 4.2.2.9–3. The impacts from all site operations, including the upgraded storage facilities, are also included in this table. Total site impacts, which include the No Action impact plus the facility impact, are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is 2.5×10^{-6}, and the cancer risk is 4.1×10^{-9} as a result of operation of consolidated storage in the P-Tunnel facility and handling building in the year 2030. The total HI and cancer risk from hazardous chemicals would remain constant over 50 years of operation, provided exposures remain the same. The total site operation, including the consolidated facility, would result in an HI of 2.5×10^{-6} and a cancer risk of 4.1×10^{-9} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker at P-Tunnel is 5.1×10^{-4}, and the cancer risk is 6.4×10^{-6} as a result of operation of consolidated storage in the year 2030. The total HI and cancer risk would remain constant over 50 years of operation, provided exposures remain the same. The total operation, including the consolidated facility, would result in an HI of 5.1×10^{-4} and a cancer risk of 6.4×10^{-6} for the onsite worker. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents for modified P-Tunnel drifts for which there may be releases of Pu that may impact onsite workers and the offsite population has been postulated for the P-Tunnel. 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 Table 4.2.2.9–4. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 5.3×10^{-4} at NTS for the truck bay fire accident scenario with a probability of 1.0×10^{-7} per year. The corresponding 50-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 2.7×10^{-9}, 3.6×10^{-10}, and 2.1×10^{-9}, respectively. The maximum population 50-year facility lifetime risk would be 5.1×10^{-5} (that is, one fatality in about 1,000,000 years) at NTS for the PCV Penetration by Corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 6.9×10^{-6} and 4.0×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.2.9–4.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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 4.2.2.9–4. Consolidation Alternative (P-Tunnel) 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 50 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatality (per 50 yr)[a]**	**Probability of Cancer Fatality[b]**	**Risk of Cancer Fatalities (per 50 yr)[a]**	**Number of Cancer Fatalities[c]**	**Accident Frequency (per yr)**
PCV puncture by forklift impact	8.8×10^{-8}	2.9×10^{-6}	1.5×10^{-8}	5.0×10^{-7}	1.1×10^{-7}	3.7×10^{-6}	6.0×10^{-4}
PCV breach by firearms discharge	5.2×10^{-9}	2.9×10^{-7}	8.8×10^{-10}	5.0×10^{-8}	6.5×10^{-9}	3.7×10^{-7}	3.5×10^{-4}
PCV penetration by corrosion	4.0×10^{-5}	1.3×10^{-5}	6.9×10^{-6}	2.2×10^{-6}	5.1×10^{-5}	1.6×10^{-5}	0.064
Truck bay fire	2.1×10^{-9}	4.2×10^{-4}	3.6×10^{-10}	7.2×10^{-5}	2.7×10^{-9}	5.3×10^{-4}	1.0×10^{-7}
Spontaneous combustion	2.1×10^{-11}	5.9×10^{-7}	3.5×10^{-12}	1.0×10^{-7}	2.6×10^{-11}	7.5×10^{-7}	1.0×10^{-7}
Explosion outside of vault	2.1×10^{-11}	4.2×10^{-6}	3.6×10^{-12}	7.1×10^{-7}	2.6×10^{-11}	5.3×10^{-6}	1.0×10^{-7}
Nuclear criticality	1.5×10^{-11}	3.1×10^{-6}	3.1×10^{-12}	6.1×10^{-7}	3.2×10^{-12}	6.4×10^{-7}	1.0×10^{-7}
Expected risk[d]	4.0×10^{-5}	–	6.9×10^{-6}	–	5.1×10^{-5}	–	–

[a] The risk values are calculated by multiplying the probability of cancer fatality (for the worker at 1,000 m or the MEI) 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 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 incident 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 for each accident over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.8.1–3 and M.5.2 8.1–4 and the MACCS computer code

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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.

Construct New Plutonium Storage Facility

Normal Operation. There would be no radiological releases during the construction of a new consolidated Pu storage facility at NTS. 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 on the public and workers at NTS are described below.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the new consolidated Pu storage facility are presented in Table 4.2.2.9–1. The impacts from all site operations, including the new consolidated storage facility, are also given in the table. To put operational doses into perspective, comparisons with natural background radiation doses are included in the table.

The dose to the MEI due to annual storage facility operation would be $1.3x10^{-6}$ mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be $3.2x10^{-11}$. The impacts to the average individual would be less. As a result of storage facility operation in the year 2030, the population dose would be $2.6x10^{-6}$ person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be $6.5x10^{-8}$.

The dose to the MEI due to annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be $4.2x10^{-3}$ mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be $1.0x10^{-7}$. 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 total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be $3.7x10^{-3}$ person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be $9.3x10^{-5}$.

Doses to onsite workers from normal operations are given in Table 4.2.2.9–2. Included are involved workers directly associated with the new consolidated Pu storage facility, workers who are not involved with the storage facility, and the entire workforce at NTS. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operations are included in the table.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the consolidated storage facilities at NTS are presented in Table 4.2.2.9–3. The impacts from all site operations, including the new consolidated storage facilities are also included in this table. Total site impacts, which include the No Action impact plus the facility are provided. All analyses to support the values presented in this table are provided in Section M.3.

The HI to the MEI of the public is $2.3x10^{-6}$, and the cancer risk is $4.1x10^{-9}$ as a result of operation of the consolidated storage facilities in the year 2030. The HI and cancer risk from hazardous chemicals would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the consolidated facility, would result in an HI of 2.3x10^{-6} and a cancer risk of 4.1x10^{-9} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 4.7x10^{-4}, and the cancer risk is 6.4x10^{-6} as a result of operation of the consolidated storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the consolidated facility, would result in an HI of 4.7x10^{-4} and a cancer risk of 6.4x10^{-6} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents for consolidation of Pu in a new storage facility for which there may be releases of Pu that may impact onsite workers and the offsite population has been postulated. 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 Table 4.2.2.9–5. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.027 at NTS for the beyond design basis earthquake accident scenario with an estimated probability of 1.0x10^{-7} per year (that is, probability of severe earthquake occurring is estimated to be about 1.0x10^{-5}, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-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 1.4x10^{-7}, 1.3x10^{-9}, and 7.3x10^{-8}, respectively. The maximum population 50-year facility lifetime risk would be 9.4x10^{-5} (that is, one fatality in about 540,000 years) at NTS for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 9.1x10^{-7} and 3.9x10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.2.9–5.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. The locations 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 of a new or modification of an existing 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.

Collocation Alternative

This section includes a description of radiological and hazardous chemical releases and the associated impacts resulting from either normal operation or accidents involved with the consolidation of Pu storage and collocation with HEU storage facilities at NTS. This storage would take place in either the modified P-Tunnel drifts or in a new collocated Pu and HEU storage facility.

Normal operation under either the modified P-Tunnel option or the new collocated storage facility option at NTS would result in impacts that are within applicable regulatory limits.

Involved workers, those that would work in the facilities associated with the proposed action, may be subject to injury and, in some cases, fatality as a result of potential accidents. [Text deleted.] The locations 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 of a new or modification of an existing 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 4.2.2.9–5. Consolidation Alternative (New Storage 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 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	9.0×10^{-8}	3.0×10^{-6}	2.1×10^{-9}	7.0×10^{-8}	2.2×10^{-7}	7.2×10^{-6}	6.0×10^{-4}
PCV breach by firearms discharge	5.3×10^{-9}	3.0×10^{-7}	1.2×10^{-10}	7.0×10^{-9}	1.3×10^{-8}	7.2×10^{-7}	3.5×10^{-4}
PCV penetration by corrosion	3.9×10^{-5}	1.2×10^{-5}	9.1×10^{-7}	2.9×10^{-7}	9.4×10^{-5}	3.0×10^{-5}	0.064
Vault fire	3.8×10^{-8}	7.6×10^{-3}	7.3×10^{-10}	1.5×10^{-4}	7.6×10^{-8}	0.015	1.0×10^{-7}
Truck bay fire	2.1×10^{-9}	4.2×10^{-4}	4.9×10^{-11}	9.7×10^{-6}	5.1×10^{-9}	1.0×10^{-3}	1.0×10^{-7}
Spontaneous combustion	2.1×10^{-11}	6.0×10^{-7}	4.9×10^{-13}	1.4×10^{-8}	5.1×10^{-11}	1.5×10^{-6}	7.0×10^{-7}
Explosion in the vault	4.9×10^{-9}	9.9×10^{-4}	1.1×10^{-10}	2.3×10^{-5}	1.2×10^{-8}	2.4×10^{-3}	1.0×10^{-7}
Explosion outside of vault	2.3×10^{-11}	4.5×10^{-6}	5.2×10^{-13}	1.0×10^{-7}	5.4×10^{-11}	1.1×10^{-5}	1.0×10^{-7}
Nuclear criticality	1.5×10^{-11}	3.1×10^{-6}	3.3×10^{-13}	6.5×10^{-8}	3.5×10^{-12}	6.9×10^{-7}	1.0×10^{-7}
Beyond design basis earthquake	7.3×10^{-8}	0.015	1.3×10^{-9}	2.6×10^{-4}	1.4×10^{-7}	0.027	1.0×10^{-7}
Expected risk[d]	4.0×10^{-5}	–	9.2×10^{-7}	–	9.5×10^{-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 for each accident over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.1.1–5 and M.5.2.1.1–6 and the MACCS computer code.

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Normal Operation. There would be no radiological releases during the construction of a new, but larger (than for consolidation) material handling building or from modifying P-Tunnel drifts at NTS. 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 are described below.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the modified P-Tunnel drifts and the associated handling building at NTS are included in the information presented in Table 4.2.2.9–1. The impacts from all site operations are also given in the table. To put operational doses into perspective, comparisons with natural background radiation doses are also included in the table. Similar information regarding radiological impacts to workers is given in Table 4.2.2.9–2. [Text deleted.]

The dose to the MEI due to annual storage operation in the P-Tunnel and handling building would be 5.6×10^{-6} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.4×10^{-10}.

The impacts to the average individual would be less. As a result of storage operations in the year 2030, the population dose would be 1.7×10^{-6} person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be 4.3×10^{-8}.

The dose to the MEI due to annual total site operations is within the radiological limits specified in NESHAPS (40 CFR 61, Subpart H) and DOE Order 5400.5, and would be 4.2×10^{-3} mrem. From 50 years of operation, the corresponding risk of fatal cancer to this individual would be 1.0×10^{-7}. 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 total site operation in the year 2030, the population dose would be within the limit in proposed 10 CFR 834 and would be 3.7×10^{-3} person-rem. The corresponding number of fatal cancers in this population due to 50 years of operation would be 9.3×10^{-5}.

Doses to onsite workers due to normal operations are given in Table 4.2.2.9–2. Included are involved workers directly associated with the modified P-Tunnel drifts and handling building, workers who are not involved with the modified P-Tunnel drifts and handling building, and the entire workforce at NTS. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table.

Hazardous Chemical Impacts. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the collocated storage facility in the P-Tunnel at NTS are presented in Table 4.2.2.9–3.

The HI to the MEI of the public is 2.8×10^{-6}, and the cancer risk is 4.1×10^{-9} as a result of operation of the collocated storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation in P-Tunnel would result in an HI of 2.8×10^{-6} and a cancer risk of 4.1×10^{-9} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker at P-Tunnel would be 5.6×10^{-4}, and the cancer risk is 6.4×10^{-6} as a result of operation of the collocated storage facility in the P-Tunnel at NTS in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation including the consolidated facility would result in an HI of 5.6×10^{-4} and a cancer risk of 6.4×10^{-6} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents for modified P-Tunnel and collocated Pu and HEU storage facilities for which there may be releases of Pu or uranium that may impact onsite workers and the offsite population has been postulated. The consequences and risks of potential accidents that release both Pu and HEU would be bounded by the impacts associated with Pu. 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 Table 4.2.2.9–6 For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 5.3×10^{-4} at NTS for the truckbay fire accident scenario with a probability of 1.0×10^{-7} per year. The corresponding 50-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 2.7×10^{-9}, 3.6×10^{-10}, and 2.1×10^{-9}, respectively. The maximum population 50-year facility lifetime risk would be 5.1×10^{-5} (that is, one fatality in about 1,000,000 years) at NTS for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be 6.9×10^{-6} and 4.0×10^{-5}, respectively. Section M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.2.9–6.

Table 4.2.2.9–6. Collocation Alternative (P-Tunnel) 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 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift impact	$8.8x10^{-8}$	$2.9x10^{-6}$	$1.5x10^{-8}$	$5.0x10^{-7}$	$1.1x10^{-7}$	$3.7x10^{-6}$	$6.0x10^{-4}$
PCV breach by firearms discharge	$5.2x10^{-9}$	$2.9x10^{-7}$	$8.8x10^{-10}$	$5.0x10^{-8}$	$6.5x10^{-9}$	$3.7x10^{-7}$	$3.5x10^{-4}$
PCV penetration by corrosion	$4.0x10^{-5}$	$1.3x10^{-5}$	$6.9x10^{-6}$	$2.2x10^{-6}$	$5.1x10^{-5}$	$1.6x10^{-5}$	0.064
Truck bay fire	$2.1x10^{-9}$	$4.2x10^{-4}$	$3.6x10^{-10}$	$7.2x10^{-5}$	$2.7x10^{-9}$	$5.3x10^{-4}$	$1.0x10^{-7}$
Spontaneous combustion	$2.1x10^{-11}$	$5.9x10^{-7}$	$3.5x10^{-12}$	$1.0x10^{-7}$	$2.6x10^{-11}$	$7.5x10^{-7}$	$1.0x10^{-7}$
Explosion outside of vault	$2.1x10^{-11}$	$4.2x10^{-6}$	$3.6x10^{-12}$	$7.1x10^{-7}$	$2.6x10^{-11}$	$5.3x10^{-6}$	$1.0x10^{-7}$
Nuclear criticality	$1.5x10^{-11}$	$3.1x10^{-6}$	$3.1x10^{-12}$	$6.1x10^{-7}$	$3.2x10^{-12}$	$6.4x10^{-7}$	$1.0x10^{-7}$
Expected risk[d]	$4.0x10^{-5}$	–	$6.9x10^{-6}$	–	$5.1x10^{-5}$	–	–

[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 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 incident 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 for each accident over the 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.8.1–3 and M.5.2 8.1–4 and the MACCS computer code.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Normal Operation. There would be no radiological releases during the construction of a new collocated storage facility at NTS. Worker exposures to material potentially contaminated with radioactivity 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 are described below.

Radiological Impacts. Radiological impacts to the public resulting from the normal operation of the new collocated storage facility at NTS are included in the information presented in Table 4.2.2.9–1. The impacts from all site operations are also given in the table. To put operational doses into perspective, comparisons with natural background radiation doses are also included in the table. Similar information regarding radiological impacts to workers is given in Table 4.2.2.9–2. [Text deleted.]

The dose to the MEI from the annual storage operations in the new storage facility would be 1.3×10^{-6} mrem. For 50 years of operation, the corresponding risk of fatal cancer to this individual would be 3.2×10^{-11}. The impacts to the average individual would be less. As a result of storage operation in the year 2030, the population dose would be 2.6×10^{-6} person-rem. The corresponding number of fatal cancers in this population from 50 years of operation would be 6.5×10^{-8}.

Doses and associated health risks to the public from total site operations are virtually the same whether storage is in the new storage facility or in the modified P-Tunnel drifts (Table 4.2.2.9–1). This is because the storage operations contribute negligibly to the total offsite doses.

Doses to onsite workers due to normal operations are given in Table 4.2.2.9–2. All doses fall within regulatory limits and administrative control levels. The associated risks and numbers of fatal cancers among the different workers from 50 years of operation are included in the table. 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. Hazardous chemical impacts to the public and to the onsite worker resulting from the normal operations of the new consolidation of Pu storage and collocation with HEU storage facilities at NTS are presented in Table 4.2.2.9–3. The impacts from all site operations, including the consolidation of Pu storage and collocation with HEU storage facilities, are also included in this table. Total site impacts, which include the No Action impact plus the facility impacts, are provided. All analyses to support the values presented in this table are provided in Section M.3

The HI to the MEI of the public is 4.2×10^{-6}, and the cancer risk is 4.1×10^{-9} as a result of operation of the new consolidation of Pu storage and collocation with HEU storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the new facility, would result in an HI of 4.2×10^{-6} and a cancer risk of 4.1×10^{-9} for the MEI in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

The HI to the onsite worker would be 7.2×10^{-4}, and the cancer risk is 6.4×10^{-6} as a result of operation of the new consolidation of Pu storage and collocation with HEU storage facilities in the year 2030. The HI and cancer risk would remain constant over 50 years of operation, because exposures would be expected to remain the same. The total site operation, including the new facility, would result in an HI of 7.2×10^{-4} and a cancer risk of 6.4×10^{-6} for the onsite worker in the year 2030. This would be expected to remain constant as a result of 50 years of operation.

Facility Accidents. A set of potential accidents for a new storage facility for collocated Pu and HEU for which there may be releases of Pu or HEU that may impact onsite workers and the offsite population has been postulated. The consequences and risks of potential accidents that release both Pu and HEU would be bounded by the impacts associated with Pu. 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 Table 4.2.2.9–7. For the set of accidents analyzed, the maximum number of cancer fatalities in the population within 80 km (50 mi) would be 0.027 at NTS for the beyond design basis earthquake accident scenario with an estimated probability of $1.0x10^{-7}$ per year (that is, probability of severe earthquake occurring is estimated to be about $1.0x10^{-5}$, once in 100,000 years, multiplied by a damage and release probability of 0.01). The corresponding 50-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 $1.4x10^{-7}$, $1.3x10^{-9}$, and $7.3x10^{-8}$, respectively. The maximum population 50-year facility lifetime risk would be $9.4x10^{-5}$ (that is, one fatality in about 530,000 years) at NTS for the PCV penetration by corrosion accident scenario with a probability of 0.064 per year. The corresponding maximum offsite individual and worker 50-year facility lifetime risks would be $9.1x10^{-7}$ and $3.9x10^{-5}$, respectively. Appendix M.5 presents additional facility accident data and summary descriptions of the accident scenarios identified in Table 4.2.2.9–7.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

If the strategic reserve and weapons R&D materials are not included, the impacts to the public and to workers from the accident-free storage activities would be reduced in proportion to the decrease in the amount of material stored. The impacts from total site operations would decrease slightly. The risks due to accidents would also tend to be lower.

Table 4.2.2.9–7. Collocation Alternative (New Plutonium and Highly Enriched Uranium Facilities) 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 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatality (per 50 yr)[a]	Probability of Cancer Fatality[b]	Risk of Cancer Fatalities (per 50 yr)[a]	Number of Cancer Fatalities[c]	Accident Frequency (per yr)
PCV puncture by forklift	9.0x10-8	$3.0x10^{-6}$	$2.1x10^{-9}$	$7.0x10^{-8}$	$2.2x10^{-7}$	$7.2x10^{-6}$	$6.0x10^{-4}$
PCV breach by firearms discharge	5.3x10-9	$3.0x10^{-7}$	$1.2x10^{-10}$	$7.0x10^{-9}$	$1.3x10^{-8}$	$7.2x10^{-7}$	$3.5x10^{-4}$
PCV penetration by corrosion	3.9x10-5	$1.2x10^{-5}$	$9.1x10^{-7}$	$2.9x10^{-7}$	$9.4x10^{-5}$	$3.0x10^{-5}$	0.064
Vault fire	3.8x10-8	$7.6x10^{-3}$	$7.3x10^{-10}$	$1.5x10^{-4}$	$7.6x10^{-8}$	0.015	$1.0x10^{-7}$
Truck bay fire	2.1x10-9	$4.2x10^{-4}$	$4.9x10^{-11}$	$9.7x10^{-6}$	$5.1x10^{-9}$	$1.0x10^{-3}$	$1.0x10^{-7}$
Spontaneous combustion	2.1x10-11	$6.0x10^{-7}$	$4.9x10^{-13}$	$1.4x10^{-8}$	$5.1x10^{-11}$	$1.5x10^{-6}$	$7.0x10^{-7}$
Explosion in the vault	4.9x10-9	$9.9x10^{-4}$	$1.1x10^{-10}$	$2.3x10^{-5}$	$1.2x10^{-8}$	$2.4x10^{-3}$	$1.0x10^{-7}$
Explosion outside the vault	2.3x10-11	$4.5x10^{-6}$	$5.2x10^{-13}$	$1.0x10^{-7}$	$5.4x10^{-11}$	$1.1x10^{-5}$	$1.0x10^{-7}$
Nuclear criticality	1.5x10-11	$3.1x10^{-6}$	$3.3x10^{-13}$	$6.5x10^{-8}$	$3.5x10^{-12}$	$6.9x10^{-7}$	$1.0x10^{-7}$
Beyond evaluation basis earthquake	7.3x10-8	0.014	$1.3x10^{-9}$	$2.6x10^{-4}$	$1.4x10^{-7}$	0.027	$1.0x10^{-7}$
Expected risk[d]	4.0x10-5	–	$9.2x10^{-7}$	–	$9.5x10^{-5}$	–	–

[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 50-year lifetime of the facility.

Note: All values are mean values.

Source: Calculated using the source terms in Tables M.5.2.2.1–3 and M.5.2 2.1–4 and the MACCS computer code.

4.2.2.10 Waste Management

This section summarizes the impacts on waste management at NTS under No Action and for each of the long-term storage alternatives. There is no spent nuclear fuel or HLW associated with Pu or HEU storage. Table 4.2.2.10–1 lists the projected sitewide waste generation rates and treatment, storage, and disposal capacities under No Action for 2005. Projections for No Action were derived from the most recent applicable environmental data, with the appropriate adjustments made for those changing operational requirements where the volumes of wastes generated are identifiable. The projections do not include waste from future, yet uncharacterized, environmental restoration activities. The projections for No Action could change significantly depending on the decisions resulting from the Waste Management PEIS or the NTS Site-Wide EIS. Table 4.2.2.10–2 provides the estimated incremental operational waste volumes projected to be generated at NTS as a result of the various storage alternatives prior to treatment. Some of the waste values described in this section are different than the waste values in the table. For those values that differ (for example LLW), the table gives waste generated pre-treatment values and the text discusses post-treatment values (indicated as after treatment and volume reduction). The waste volumes generated from the various storage alternatives that were added to the No Action projection and the resultant waste effluent used for the waste impact analysis are shown in Section E.3.1. Facilities that would support the storage of Pu and/or HEU would treat and package all generated waste into forms that would enable staging and/or disposal in accordance with RCRA and other applicable statutes as outlined in Section E.1.2. Depending in part on decisions in waste-type-specific RODs for the Waste Management PEIS and in subsequent RODs and NEPA documents, wastes could be treated and disposed of onsite or at regionalized or centralized DOE sites. For 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.

Preferred Alternative: No Action Alternative

Under this alternative, TRU, low-level, mixed, hazardous, and nonhazardous wastes would continue to be managed from the missions outlined in Section 3.3. The disposal of waste received from offsite would not involve treatment at NTS, since this waste must be treated, packaged, and certified to NTS WAC before being shipped to NTS for disposal. NTS has retrievable storage of TRU waste awaiting shipment to a Federal repository. Although there would be no generation of TRU waste onsite, mixed TRU waste from LLNL would continue to be stored at NTS. Solid mixed LLW would be stored and treated in accordance with the NTS Site Treatment Plan. Hazardous waste would be accumulated, then shipped offsite for treatment and disposal at commercial RCRA-permitted facilities. Nonhazardous and sanitary wastes would be treated and disposed of locally in facilities located within the separate activity areas onsite.

Consolidation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Construction and operation of a consolidated Pu storage facility using P-Tunnel would have an impact on existing NTS waste management activities, 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 waste would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous material or radioactive constituents is expected to be generated during construction. However, if any was generated it would be managed in accordance with site practice and all applicable Federal and State regulations.

After treatment and volume reduction, approximately 5 m^3 (7 yd^3) of TRU waste and 4 m^3 (5 yd^3) of mixed TRU waste from leaded gloves, windows, and contaminated lead shielding would be treated and packaged to

Table 4.2.2.10–1. *Projected Waste Management Under No Action (2005) at Nevada Test Site*

Category	Annual Generation (m^3)	Treatment Method	Treatment Capacity	Storage Method	Storage Capacity (m^3)	Disposal Method	Disposal Capacity (m^3)
Mixed Transuranic	None	None	None	Containers on asphalt pads	1,208[a]	To WIPP or alternate facility	NA
Low-Level							
Liquid	Dependent on restoration activities	Not determined	None	None	NA	NA	NA
Solid	15,000[b]	None	None	None	NA	Shallow burial	650,000[c]
Mixed Low-Level							
Liquid	None	None	NA	None	NA	NA	NA
Solid	50[d]	None	NA	Containers on asphalt pads	Included in mixed TRU	Shallow land burial[e]	90,626[f]
Hazardous							
Liquid	Included in solid	Contracted offsite	None	RCRA-permitted pad	Included in solid	Contracted offsite	NA
Solid	212	Contracted offsite	None	RCRA-permitted pad	61.6[g]	Contracted offsite	NA
Nonhazardous (Sanitary)							
Liquid	Included in solid	Septic fields	As required	None	NA	Septic fields	As required
Solid	2,120	None	None	NA	NA	Landfill onsite	As required
Nonhazardous (Other)							
Liquid	Included in sanitary	Septic fields	As required	None	NA	Septic fields	As required
Solid	76,500	None	None	NA	NA	NA	As required

[a] TRU waste pad and cover building, Area 5. Storage area is 1,765 m^2. Volume estimate made assuming 50 percent of area is available due to aisle space and drums are stacked two high.
[b] Depending on ROD from the sitewide EIS, additional solid LLW could be received.
[c] Area 3 and 5. Additional acreage available for expansion
[d] Depending on ROD from the sitewide EIS, additional mixed LLW could be generated from onsite environmental restoration activities and receipts from offsite for disposal.
[e] As required to meet RCRA requirements.
[f] Remaining capacity Pit 3, Area 5 RWMS.
[g] Total capacity for solid and liquid hazardous wastes stored at the Hazardous Waste Storage Unit in Area 5.
Source: NTS 1996a:1.

Table 4.2.2.10–2. Estimated Annual Generated Waste Volumes at Nevada Test Site—No Action (2005) and Net Incremental for Storage Alternatives

		Consolidation		Collocation	
Category	**No Action[a] (m^3)**	**Modify P-Tunnel[b] (m^3)**	**New Facility[b] (m^3)**	**Modify P-Tunnel[b] (m^3)**	**New Facility[b] (m^3)**
Transuranic					
Liquid	None	0.02[c]	0.02[c]	0.02[c]	0.02[c]
Solid	None	10	10	10	10
Mixed Transuranic					
Liquid	None	0	0	0	0
Solid	None	4	4	4	4
Low-Level					
Liquid	Dependent on restoration activities	2[c]	2[c]	2.1[c]	2.1[c]
Solid	15,000	1,260	1,260	1,300	1,300
Mixed Low-level					
Liquid	Included in solid	0.2	0.2	0.2	0.2
Solid	50	65	65	66	66
Hazardous					
Liquid	Included in solid	2	2	2	2
Solid	212	2	2	2	2
Nonhazardous (Sanitary)					
Liquid	Included in solid	135,000	114,000	189,000	153,000
Solid	2,120	1,620	1,500	1,960	1,900
Nonhazardous (Other)					
Liquid	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary	Included in sanitary
Solid	76,500	2,000[d]	1,900[d]	2,500[d]	2,400[d]

[a] The No Action waste volumes are from Table 4.2.2.10–1.

[b] Incremental generated waste volumes for storage alternatives are found in Section E.3.1 (Tables E.3.1.2–2, E.3.1.2–3, E.3.1.3–2, and E.3.1.3–3). Waste effluents (that is, after treatment and volume reduction) which are used in the narrative description of the impacts are also provided in these tables.

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

[d] Recyclable wastes.

meet the current planning-basis WIPP WAC or alternative treatment level. While awaiting shipment 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), the TRU and mixed TRU waste would be stored at the TRU Pad Waste Storage in Area 5. One additional truck shipment per year would be required to transport these wastes to WIPP.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW from solidified liquid LLW (such as decontamination solutions), protective clothing, HEPA filters, glovebox gloves, and decontamination equipment and materials would require disposal in the Area 5 or Area 3 RWMS. Assuming a land usage of 6,000 m^3/ha (3,200 yd^3/acre), this would require approximately 0.1 ha/year (0.3 acres/year) of LLW disposal area. The 0.2 m^3 (50 gal) of liquid and 65 m^3 (85 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the NTS Site Treatment Plan through the use of existing and planned facilities. The 2 m^3 (476 gal) of liquid and 2 m^3 (3 yd^3) of solid hazardous wastes would have a minimal impact on waste management activities at NTS. Existing facilities at the Area 5 Hazardous Waste Storage Unit are adequate to stage the increase in hazardous waste while awaiting shipment to an offsite commercial RCRA-permitted treatment and disposal facility. New sanitary lagoons would be required to treat the 135,000 m^3 (35,600,000 gal) of nonhazardous liquid wastes. After volume reduction, 810 m^3 (1,060 yd^3) of solid nonhazardous waste would require disposal at one of the onsite landfills.

Construct New Plutonium Storage Facility

Construction and operation of a consolidated Pu storage facility would have an impact on existing waste management activities identical to that described above for the P-Tunnel facility, with the following exceptions. Construction of sanitary, utility, and process wastewater treatment systems would be required to treat approximately 114,000 m^3 (30,100,000 gal) of liquid nonhazardous waste. After volume reduction, 750 m^3 (981 yd^3) of solid nonhazardous waste would require disposal at one of the onsite facilities.

Collocation Alternative

Modify Existing Tunnel Drifts and Construct New Material Handling Building at the P-Tunnel

Construction and operation of a consolidated Pu storage facility collocated with HEU storage using the P-Tunnel would have an impact on existing NTS waste management activities, 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 waste would be shipped to commercial RCRA-permitted treatment and disposal facilities. No soil contaminated with hazardous material or radioactive constituents is expected to be generated during construction. However, if any was generated it would be managed in accordance with site practice and all applicable Federal and State regulations.

Since there is no TRU or mixed TRU wastes associated with HEU storage, the impacts from TRU and mixed TRU wastes are identical to those identified in the consolidated Pu storage alternative. The sources of waste are similar to those of the consolidated Pu storage facility, except the source of radioactive contamination from the HEU storage is uranium.

Following treatment and volume reduction, approximately 630 m^3 (824 yd^3) of LLW contaminated with Pu and 20 m^3 (26 yd^3) contaminated with uranium would require disposal in the Area 5 or Area 3 RWMS. Assuming a land usage of 6,000 m^3/ha (3,200 yd^3/acre), this would require approximately 0.1 ha/yr (0.3 acre/yr) of LLW disposal area. The 0.2 m^3 (55 gal) of liquid mixed LLW and 66 m^3 (86 yd^3) of solid mixed LLW would be treated and disposed of in accordance with the NTS Site Treatment Plan through the use of existing and planned facilities. The 2 m^3 (528 gal) of liquid and 2 m^3 (3 yd^3) of solid hazardous wastes would have a minimal impact on waste management activities at NTS. Existing facilities at the Area 5 Hazardous Waste Accumulation Site are adequate to stage the increase in hazardous waste while awaiting shipment to an offsite commercial RCRA-permitted treatment and disposal facility. New sanitary lagoons would be required to treat the 189,000 m^3 (49,900,000 gal) of liquid nonhazardous waste. After volume reduction, 980 m^3 (1,280 yd^3) of solid nonhazardous waste would require disposal at one of the onsite landfills.

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Construction and operation of a consolidated Pu storage facility collocated with HEU storage would have an impact on existing NTS waste management activities identical to that described above for the modified P-Tunnel facility, with the following exceptions. Construction of sanitary, utility, and process wastewater treatment systems would be required to treat approximately 153,000 m^3 (40,500,000 gal) of nonhazardous waste. After volume reduction, 950 m^3 (1,240 yd^3) of solid nonhazardous waste would require disposal at one of the onsite landfills.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The exclusion of strategic reserve or weapons R&D materials would reduce the amount of operational waste volumes shown in Table 4.2.2.10–2 for the Consolidation Alternative and the Collocation Alternative. The decrease would be proportional to the amount of material excluded. [Text deleted.]

4.2.3 IDAHO NATIONAL ENGINEERING LABORATORY

A listing of the proposed long-term storage alternatives, subalternatives, and related actions, including the No Action Alternative at INEL, is provided below. The potential impacts of implementing these alternatives and related actions at INEL are described for: 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. The specific long-term storage alternatives proposed for INEL are the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative.

Preferred Alternative

No Action Alternative:

Continue to store INEL Pu material within the scope of this PEIS at ANL-W in the ZPPR and FMF vaults and the ICPP in stabilized form pursuant to DNFSB Recommendation 94-1.

Proposed Storage Activities at Idaho National Engineering Laboratory

- **No Action Alternative (Preferred Alternative):** Continue to store INEL Pu material within the scope of this PEIS at ANL-W in the ZPPR and FMF vaults and the ICPP in stabilized form pursuant to DNFSB Recommendation 94-1.

- **Upgrade Alternative:** There are two subalternatives under this storage alternative.

  – *Upgrade Without RFETS Pu or LANL Pu Subalternative*: Modify the FMF and construct a new material handling building at ANL-W to accommodate INEL Pu material.

  – *Upgrade With All or Some RFETS Pu and LANL Pu Subalternative*: Modify the FMF and construct a larger new material handling building at ANL-W to accommodate INEL, RFETS, and LANL Pu material.

- **Consolidation Alternative:** Construct a new facility near the ICPP to accommodate all Pu material within the scope of this PEIS.

- **Collocation Alternative:** Construct a new facility near the ICPP to accommodate all Pu and HEU material within the scope of this PEIS.

- **Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials:** Facility and other resource requirements would be smaller than the Upgrade With All or Some RFETS Pu and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative.

- **Phaseout:** INEL Pu material within the scope of this PEIS would be moved out of ANL-W to the Consolidation or Collocation site (located at another DOE site) or to disposition (for surplus Pu).

4.2.3.1 Land Resources

Preferred Alternative: No Action Alternative

Under this alternative, Pu storage would continue at the current interim storage locations at the ICPP and at ANL-W in the ZPPR and FMF vaults in stabilized form pursuant to DNFSB Recommendation 94-1. The ongoing (no new action) activities conform with present and future land-use plans, policies, and controls. Therefore, no effects to land use or visual resources would be anticipated at INEL beyond those of existing and future activities that are independent of the proposed action.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Long-term storage of the existing inventory of INEL Pu material would be accommodated at ANL-W on the INEL site. The proposed facility would be a modification of the FMF on the ANL-W and construction of a new material handling building. Construction laydown area and the operating facility would be situated on previously disturbed land entirely within an upgraded protected area of ANL-W totalling approximately 9 ha (22 acres) and would not create any newly disturbed area. A buffer zone exists between ANL-W operations and the INEL site boundary. [Text deleted.]

Land Use. Upgrading existing storage facilities and constructing a new material handling building at ANL-W would have no direct land-use effect during construction or operations. Existing land use would not change and would conform with site development and facility utilization plans. As discussed in Section 4.2.3.8, no in-migration of workers would be required during the construction and operation phases. No indirect effects to offsite land use would be anticipated.

Construction and operation would not affect other land uses at INEL or special status lands. 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 facilities would be compatible with the industrial landscape character of ANL-W. The current VRM Class 5 designation of ANL-W would not change.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

The FMF would be modified, and a material handling building would be constructed at ANL-W to accommodate INEL, RFETS, and LANL Pu material. Land area requirements during construction and operations would be equal to the Upgrade Without RFETS Pu or LANL Pu Subalternative (that is, protected area). Direct and indirect effects on land resources during construction and operations would be similar to the Upgrade Alternative, Upgrade Without RFETS Pu or LANL Pu Subalternative.

Consolidation Alternative

Construct New Plutonium Storage Facility

All the Pu within the scope of the PEIS would be stored at a new storage facility to be constructed at INEL within the Prime Development Zone of the Sitewide Area near the ICPP. Land disturbance would be 58.5 ha (144 acres) during construction of which 56 ha (138 acres) would be used during operations. A buffer zone would be provided between operations and the INEL site boundary. Pu storage in existing DOE storage facilities would be phased out.

Land Use. Consolidating the storage of Pu at INEL would be situated on undisturbed land. However, the proposed site is within designated prime development land pursuant to the current *Idaho National Engineering Laboratory Site Development Plan* (IN DOE 1994d:8-4) although existing land use would change. As discussed in Section 4.2.3.8, expected vacancies and historic housing construction rates indicate that sufficient housing would be available to accommodate the estimated in-migration of workers during the construction and operational phases. Therefore, indirect effects to offsite land use would not be anticipated.

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. Construction and operation would not affect other land uses at INEL or special status lands. No onsite grazing permits would be affected. No prime farmlands exist onsite.

Visual Resources. [Text deleted.] Construction and operation would be compatible with the industrial character of INEL's developed areas, which consist of large industrial facilities and stack plumes. The current VRM Class 5 designation of the proposed site would not change.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

All the Pu and HEU within the scope of this PEIS would be collocated at a primary new storage plant at INEL, on undisturbed land in the Prime Development Zone of the Sitewide Area near the ICPP. Land disturbance would be 89.5 ha (221 acres) during construction of which 87 ha (215 acres) would be used during operation. A buffer zone would be provided between operations and the INEL site boundary. Pu and HEU storage in existing DOE storage facilities would be phased out. Direct and indirect effects on land resources would be similar to those described under the Consolidation Alternative.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Under this subalternative, land effects during construction and operation would be almost the same in extent and magnitude to the Upgrade with All or Some RFETS Pu and LANL Pu Subalternative, Consolidation Alternative, and Collocation Alternative because the facility would be almost the same. However, because the smaller quantity of material would require smaller facilities, it is likely that less land area would be disturbed during construction and used during operations. [Text deleted.]

Phaseout

No new construction or upgrade of existing facilities would occur under phaseout of the Pu mission. INEL Pu material would be moved out of ANL-W to the Consolidation or Collocation site or to disposition. Potential impacts on visual resources could occur if facilities are not maintained.

[Text deleted.]

4.2.3.2 Site Infrastructure

The INEL infrastructure would be capable of supporting any of the storage alternatives without major modifications to the existing infrastructure. A comparison of site infrastructure and facilities resource needs for the various storage alternatives is shown in Table 4.2.3.2–1.

Preferred Alternative: No Action Alternative

INEL would continue Pu storage at ANL-W. No change to the baseline infrastructure is anticipated, and no additional environmental impacts would be expected.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Modifying the existing storage facility plus building a new facility to accommodate long-term storage of existing quantities of Pu at INEL would have minimal impact on site infrastructure. Data for construction are presented in Appendix C. [Text deleted.] As shown in Table 4.2.3.2–1, the INEL infrastructure would be capable of supporting the modification of the existing storage facility without major improvements. Adequate electrical energy is available from the regional power grid. [Text deleted.] All infrastructure requirements are within site capacities.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

To accommodate material currently at the site, plus the relocation of material from RFETS and LANL, the ANL-W storage capacity would be upgraded by constructing a new 2,550 m^2 (27,400 ft^2) Material Handling Building to augment modified existing support buildings and by using balance of plant facilities. Building 704 would be modified for an additional 4,100 storage positions above that of the baseline upgrade, while Buildings 774 and 775 would be modified for storage support. The buildings would be interconnected by a new material transfer access corridor.

Construction for upgrading the existing storage facility, plus building a new facility to accommodate long-term storage of existing quantities of Pu, plus material relocated from RFETS and LANL would have minimal impact on site infrastructure. Data for construction are presented in Appendix C. As shown in Table 4.2.3.2–1, additional electrical energy, and peak load would be required to operate the facility. The INEL infrastructure would be capable of supporting the modification of the existing storage facility, plus building a new facility to accommodate long-term storage of existing quantities of Pu, plus material relocated from RFETS and LANL without major improvements. Adequate electrical energy is available from the regional power grid. [Text deleted.] All infrastructure requirements are within site capacities.

Since impacts associated with relocating all of the RFETS Pu and LANL Pu material to INEL for long-term storage are minimal for construction and can be managed for operations, relocating only a portion of this material to INEL would result in minimal impacts on the site infrastructure as well. Additional annual electrical energy requirements would be proportionately less than the 700 MWh/yr required for storage of the full amount of RFETS Pu and LANL Pu material, depending on the amount of material relocated to the site.

Table 4.2.3.2–1. Site Infrastructure Changes Required for Operation at Idaho National Engineering Laboratory (Annual)— No Action (2005) and Storage Alternatives

Alternative	Transportation: Roads (km)	Transportation: Railroads (km)	Electrical: Energy (MWh/yr)	Electrical: Peak Load (MWe)	Fuel: Oil (l/yr)	Fuel: Natural Gas (m^3/yr)	Fuel: Coal (t/yr)
No Action							
Site availability	445	48	394,200	124	16,000,000	0	11,340
Projected usage	445	48	232,500	42	5,820,000	0	11,340
Upgrade (without RFETS Pu or LANL Pu material)							
Projected usage with upgraded facility	445	48	236,300	43	6,460,000	0	0
Amount required in excess to site availability	0	0	0	0	0	0	0
Upgrade (with RFETS Pu and LANL Pu material)							
Projected usage with upgraded facility	445	48	237,000	43	6,550,000	0	0
Amount required in excess to site availability	0	0	0	0	0	0	0
Consolidation							
Projected usage with consolidated facility	450	53	277,500	50	5,940,000	0	22,340
Amount required in excess to site availability	<5	<5	0	0	0	0	11,000
Collocation							
Projected usage with consolidated and new collocated facilities	450	53	290,500	52	5,960,000	0	25,340
Amount required in excess to site availability	<5	<5	0	0	0	0	14,000
Phaseout							
Projected usage without storage facility	445	48	228,700	41	5,820,000	0	11,340
Amount required in excess to site availability	0	0	0	0	0	0	0

Source: Modified from DOE 1995j; INEL 1993a:5.

Consolidation Alternative

Construct New Plutonium Storage Facility

Under this alternative, all the Pu within the scope of this PEIS would be stored at a new storage facility located at INEL. Construction requirements would constitute a small change in resource requirements at INEL. Since coal availability is governed by usage and not by site storage capacity, the additional coal required could be procured through contractual means. Impacts on the site infrastructure would be negligible. The INEL infrastructure would be capable of supporting operation of the consolidated Pu storage facility without major modifications to the existing infrastructure. As shown in Table 4.2.3.2–1, less than 5 km (3 mi) of roads and less than 5 km (3 mi) of railroad lines would need to be added to the site. Adequate electrical energy is available from the regional power grid.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Under this alternative, all the HEU within the scope of this PEIS would be stored at INEL in a new storage facility, collocated with the consolidated Pu storage facility. Construction requirements would constitute a small change in resource requirements for INEL. Since coal availability is governed by usage and not by site storage capacity, the additional coal required could be procured through contractual means. As shown in Table 4.2.3.2–1, less than 5 km (3 mi) of roads and less than 5 km (3 mi) of railroad lines would need to be added to the site. The INEL infrastructure would be capable of supporting operation of the consolidated and collocated facilities without major modifications to the existing infrastructure. Adequate electrical energy is available from the regional power grid.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Since the existing INEL site infrastructure would be fully capable of supporting construction/modification and operation of facilities for the Upgrade With All or Some RFETS Pu and LANL Pu, Consolidation of Pu, and Collocation of Pu and HEU Alternatives, constructing and operating such facilities without including provisions for storage of strategic reserve and weapons R&D materials could be accommodated as well. Expected reductions in amounts of annual electrical energy requirements for the various storage facilities are the only site infrastructure changes expected if this subalternative is chosen because electric usage is dependant on the amount of material. [Text deleted.]

Phaseout

Because of the relatively small amounts of Pu located on the site, INEL storage operations at ANL-W would be phased out with minimal impact on the site infrastructure.

4.2.3.3 Air Quality and Noise

Construction and operation activities associated with the No Action Alternative and the proposed storage alternatives would generate criteria and toxic/hazardous pollutants. To evaluate the air quality impacts at INEL, criteria and toxic/hazardous concentrations from the No Action Alternative and the proposed storage alternatives are compared with Federal and State standards and guidelines. Impacts from radiological airborne emissions are described in Section 4.2.3.9.

In general, all of the proposed storage facilities would emit the same types of air pollutants during construction. It is expected emissions would not exceed Federal, State, or local air quality regulations. PM_{10} and TSP concentrations will be increased, especially during peak construction periods.

The principal sources of emissions during construction include the following:

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

During operation, impacts from each of the individual storage facilities with respect to the concentrations of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Table 4.2.3.3–1 presents the estimated pollutant concentrations for each of the fissile materials storage alternatives, indicating little difference between alternatives with respect to impacts on air quality.

Emission rates attributed to operation of the proposed storage facilities are presented in Tables F.1.3–1 to F.1.3–3. [Text deleted.] Air pollutant emission sources associated with operations include the following:

- Operation of boilers for space heating
- Operation of diesel generators and periodic testing of emergency diesel generators
- Exhaust and road dust generated by vehicles delivering supplies and bringing employees to work
- Toxic/hazardous pollutant emissions from facility processes

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

AIR QUALITY

An analysis was conducted of the potential air quality impacts of emissions from each of the storage alternatives as described in Section 4.1.3.

Section 176 (c) of the 1990 CAA amendments requires that all Federal actions conform with the applicable state implementation plan. EPA has implemented rules that establish the criteria and procedures governing the determination of conformity for all Federal actions in nonattainment and maintenance areas. These are discussed in Section 4.1.3. The attainment status of the area in which INEL is located is discussed in Section 3.4.3. Since

Table 4.2.3.3–1. Estimated Operational Concentrations of Pollutants at Idaho National Engineering Laboratory and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] (μg/m³)	No Action (μg/m³)	Upgrade (μg/m³)	Consolidation (μg/m³)	Collocation (μg/m³)
Criteria Pollutants						
Carbon monoxide	8-hour	10,000[b]	284	284.36	285.4	285.6
	1-hour	40,000[b]	614	614.91	617.4	618.1
Lead	Calendar Quarter	1.5[b]	0.001	0.001	0.001	0.001
Nitrogen dioxide	Annual	100[b]	4	4.02	4.73	4.91
Ozone	1-hour	235[b]	c	c	c	c
Particulate matter less than or equal to10 microns in diameter	Annual	50[b]	5	5.01	5.05	5.06
	24-hour	150[b]	80	80.14	80.98	81.17
Sulfur dioxide	Annual	80[b]	6	6.04	7.25	7.53
	24-hour	365[b]	135	135.71	158.5	163.7
	3-hour	1,300[b]	579	582.07	681.3	704.2
Mandated by Idaho						
Total suspended particulate	Annual	60[d]	5	5.1	5.05	5.06
	24-hour	150[d]	80	80.4	80.98	81.17
Hazardous and Other Toxic Compounds						
Acetaldehyde	Annual	0.45[e]	0.011	0.011	0.011	0.011
Ammonia	Annual	180[e]	6.0	6.0	6.0	6.0
Arsenic	Annual	0.00023[e]	0.00009	0.00009	0.00009	0.00009
Benzene	Annual	0.12[e]	0.029	0.029	0.029	0.029
1,3-Butadiene	Annual	0.0036[e]	0.001	0.001	0.001	0.001
Carbon tetrachloride	Annual	0.067[e]	0.0060	0.0060	0.0060	0.0060
Chlorine	Annual	30[e]	f	<0.01[g]	<0.01[g]	<0.01[g]
Chloroform	Annual	0.043[e]	0.00040	0.00040	0.00040	0.00040
Cyclopentane	Annual	17,000[e]	2.7	2.7	2.7	2.7
Formaldehyde	Annual	0.077[e]	0.012	0.012	0.012	0.012
Hexavalent chromium	Annual	0.000083[e]	0.00006	0.00006	0.00006	0.00006

Table 4.2.3.3–1. Estimated Operational Concentrations of Pollutants at Idaho National Engineering Laboratory and Comparison With Most Stringent Regulations or Guidelines—No Action (2005) and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] (μg/m³)	No Action (μg/m³)	Upgrade (μg/m³)	Consolidation (μg/m³)	Collocation (μg/m³)
Hazardous and Other Toxic Compounds (Continued)						
Hydrogen chloride	Annual	7.5[e]	0.98	0.98	0.98	0.98
Hydrazine	Annual	0.00034[e]	0.000001	0.000001	0.000004	0.000004
Mercury	Annual	1[e]	0.042	0.042	0.042	0.042
Methylene chloride	Annual	0.24[e]	0.006	0.006	0.006	0.006
Naphthalene	Annual	500[e]	18	18	18	18
Nickel	Annual	0.0042[e]	0.0027	0.0027	0.0027	0.0027
Nitric acid	Annual	50[e]	0.64	0.64	0.64	0.64
Perchloroethylene	Annual	2.1[e]	0.11	0.11	0.11	0.11
Phosphorus	Annual	1[e]	0.30	0.30	0.30	0.30
Phosphoric acid	Annual	10[e]	[f]	<0.01[g]	<0.01[g]	<0.01[g]
Potassium hydroxide	Annual	20[e]	0.20	0.20	0.20	0.20
Proprionaldehyde	Annual	4.3[e]	0.30	0.30	0.30	0.30
Styrene	Annual	1,000[e]	1.3	1.3	1.3	1.3
Sulfuric acid	Annual	10[e]	[f]	<0.01[g]	<0.01[g]	<0.01[g]
Toluene	Annual	3,750[e]	370	370	370	370
Trichloroethylene	Annual	0.077[e]	0.00097	0.00097	0.00097	0.00097
Trimethylbenzene	Annual	1,230[e]	100	100	100	100
Trivalent chromium	Annual	5[e]	0.036	0.036	0.036	0.036

[a] The more stringent of the Federal and State standard is presented if both exist for the averaging time.
[b] Federal and State standard.
[c] Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate site. See Section 4.1.3 for a discussion of ozone-related issues.
[d] State standard or guideline.
[e] Acceptable air concentrations listed in Rules for the Control of Air Pollution in Idaho apply only to new (not existing) sources and are used here only as reference levels.
[f] No sources of this pollutant have been identified.
[g] The concentration represents the alternative contribution only.

Note: Concentrations are based on site contribution, including concentrations from ongoing activities (No Action), and do not include the contribution from non-facility sources (for example, traffic).

Source: 40 CFR 50; DOE 1995v; DOE 1996e; DOE 1996f; FDI 1996a:1; ID DHW 1995a; ID DHW 1995b; IN DOE 1996a.

the area is considered to be an attainment area for criteria pollutants, the proposed actions at this site do not require that a conformity analysis be performed.

Preferred Alternative: No Action Alternative

This alternative utilizes estimated air emissions data from total site operations at INEL assuming continuation of site missions as described in Section 3.4. These data reflect conservative estimates of criteria and toxic/hazardous emissions at INEL. The emission rates for the criteria and toxic/hazardous pollutants for No Action are presented in Table F.1.2.4–1. Table 4.2.3.3–1 presents the No Action concentrations. During dry and windy conditions, increased PM_{10} and TSP concentrations may occur due to ongoing construction associated with other activities (that are outside of the scope of this PEIS) under the No Action Alternative. Concentrations of all other criteria and toxic/hazardous air pollutants at the site boundary or public access highways are expected to remain within applicable Federal, State, and local ambient air quality standards.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Particulate matter and TSP concentrations are expected to increase during the peak construction period, particularly during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations during construction. It is expected that concentrations of all pollutants at the site boundary or public access highways would remain within applicable Federal and State ambient air quality standards during construction of new and modified facilities.

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. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.3.3–1. Concentrations of air pollutants are expected to be the same with or without the RFETS and LANL material.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Air quality impacts for construction and operation for this subalternative are expected to be similar to those previously described for the Upgrade Alternative for INEL.

Consolidation Alternative

Construct New Plutonium Storage Facility

In addition to the types of sources of emissions during construction associated with the No Action and upgrade of storage facilities, fugitive dust resulting from the operation of a concrete batch plant would be an additional emission source associated with a new facility. PM_{10} and TSP concentrations may increase during the peak construction period for a new facility, particularly during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations during construction. It is expected that construction period for a new facility, particularly during dry and windy conditions. Appropriate control measures would be followed to minimize pollutant concentrations during construction. It is expected that concentrations of all pollutants at the site boundary or public access highways would remain within applicable Federal and State ambient air quality standards during construction.

During operation, impacts of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.3.3–1.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The Pu and HEU Collocation Alternative would be located in the same area as the consolidation Pu facility and would have similar air quality impacts, with the following exceptions. During operation, emissions would be higher, as shown in Appendix F. Impacts of criteria and toxic/hazardous air pollutants are predicted to be in compliance with Federal, State, and local air quality regulations or guidelines. Estimated pollutant concentrations attributable to increased operations associated with this storage alternative, plus the No Action concentrations, are presented in Table 4.2.3.3–1.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Air quality impacts for construction and operation for this subalternative are expected to be similar to those previously described for the Upgrade With All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the Collocation Alternative. [Text deleted.]

Phaseout

Phaseout of existing Pu inventories as a result of consolidating Pu at another site is expected to result in a small reduction in air pollutant concentrations from the No Action concentrations and would be in compliance with Federal and State standards.

NOISE

The location of the proposed storage facilities relative to the site boundary and sensitive receptors was examined to evaluate 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 local and regional transportation routes used to bring construction materials and workers to the site.

Preferred Alternative: No Action Alternative

Nontraffic noise sources associated with continued storage and other ongoing missions are the same as described in Chapter 3. The continuation of operations at INEL would result in no appreciable change in traffic noise and onsite operational noise sources from current levels. Nontraffic noise sources are located at a sufficient distance from offsite areas that the contribution to offsite noise levels would continue to be small. 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 be located close enough to onsite noise sensitive areas to result in impacts, such as disturbance of wildlife.

Upgrade, Consolidation, and Collocation Alternatives

Nontraffic noise sources associated with the storage Upgrade Alternative would be similar to those for existing facilities as discussed in Chapter 3. Nontraffic, operational noise sources associated with the storage alternatives include existing or additional equipment and machines (cooling systems, vents, motors, and material handling equipment). These noise sources would be located at a sufficient distance from offsite areas that the contribution to offsite noise levels would be small. 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.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Noise impacts for construction and operations for this option are expected to be almost the same as those previously described for the Consolidation Alternative and the Collocation Alternative because noise impacts are based on the use of the facility and not the size. [Text deleted.]

Phaseout

A reduction in noise levels associated with facility operations may result from the phaseout of storage facilities.

4.2.3.4 Water Resources

Construction and operation of the proposed long-term storage facilities at INEL would affect water resources. No surface water would be withdrawn for construction or for normal operations. Instead, groundwater from the Snake River Plain Aquifer would be used, which is a sufficient source. Water requirements for normal operation for all storage options would fall within INEL's current allotment (43,000 million l/yr [11,360 million gal/yr]). The site proposed for the upgraded storage facilities would be outside the floodplain that could result from failure of MacKay Dam during a probable maximum flood. The site proposed for the Consolidation or Collocation Alternative, however, falls within that floodplain. During construction, treated sanitary wastewater would be discharged to lined evaporation ponds. While the potential impacts on surface water during the construction phase would result from erosion and sedimentation of drainage channels, the relatively dry climate and application of appropriate controls should preclude these potential impacts. No wastewater would be discharged on surface waters during operation of the facilities, nor would there be impacts on surface water quality from these activities. All wastewater would be treated and recycled for cooling system makeup. Stormwater runoff would be collected and treated, if necessary, before discharge to natural drainage channels. [Text deleted.] Table 4.2.3.4–1 presents No Action water resources uses and discharges and the potential changes to water resources at INEL resulting from the long-term storage alternatives.

Preferred Alternative: No Action Alternative

Surface Water. A description of the activities that would continue at INEL is provided in Section 3.4. Treated wastewater discharged to evaporation/infiltration ponds is expected to continue at a rate of 540 million l/yr (142.7 million gal/yr).

Groundwater. Under this alternative, no additional impacts on groundwater resources are anticipated. Current groundwater usage of 7,949 million l/yr (2,100 million gal/yr) is anticipated to decrease to 7,570 million l/yr (2,000 million gal/yr) by 2005. Existing tritium plumes in groundwater and in perched groundwater are expected to continue to migrate southwest slowly. Studies show that water withdrawals could change the existing plumes' southwesterly direction to the east.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory-West Facilities for Continued Plutonium Storage

Surface Water. There are no unique construction characteristics associated with water requirements and discharges from this alternative. No surface water would be withdrawn for any construction or operation activities associated with any of the proposed upgraded Pu storage facilities. Therefore, there would be no impacts on surface water availability. Nonhazardous wastewater generated during construction and operation of the upgraded Pu storage facilities would be diverted to either the sanitary or industrial waste treatment ponds, where it would be allowed to evaporate into the atmosphere and percolate into the subsurface. It is expected that a total of approximately 4.0 million l/yr (1.1 million gal/yr) of nonhazardous wastewater would be generated during the construction phase. This water would be discharged to the sanitary wastewater treatment ponds, where it would undergo aerobic and anaerobic treatment and then be allowed to evaporate to the atmosphere and percolate into the subsurface under NPDES permit requirements.

Table 4.2.3.4–1. No Action and Potential Changes to Water Resources at Idaho National Engineering Laboratory—No Action (2005) and Storage Alternatives

Affected Resource Indicator	No Action	Upgrade: Without RFETS or LANL Material	Upgrade: With RFETS and LANL Material	Consolidation	Collocation	Phaseout
Water Source	Ground	Ground	Ground	Ground	Ground	Ground
Construction						
Water Availability and Use						
Total water requirement (million l/yr)	NA[a]	9.7	12.5	85	104.7	0
Percent increase in projected water use[b]	NA[a]	0.1	0.2	1.1	1.4	0
Water Quality						
Total wastewater discharge (million l/yr)	NA[a]	4.0	6.1	7.8	12.8	0
Percent change in wastewater discharge[c]	NA[a]	0.7	1.1	1.4	2.4	0
Operation						
Water Availability and Use						
Total water requirement (million l/yr)	7,570	17	22	66	87	0
Percent increase in projected water use[d]	0	0.2	0.3	0.9	1.2	0
Water Quality						
Total wastewater discharge (million l/yr)	540	0	0	0	0	0
Percent change in wastewater discharge[c]	0	0	0	0	0	0

Table 4.2.3.4–1. No Action and Potential Changes to Water Resources at Idaho National Engineering Laboratory—No Action (2005) and Storage Alternatives—Continued

Affected Resource Indicator	No Action	Upgrade: Without RFETS or LANL Material	Upgrade: With RFETS and LANL Material	Consolidation	Collocation	Phaseout
Floodplain						
Is action in 100-year floodplain?	NA	No	No	No	No	No
Is critical action in 500-year floodplain?	NA	No	No	Uncertain	Uncertain	No

[a] See operations section of table for No Action water data.

[b] Percent increases in projected water use during construction at INEL are calculated by dividing No Action water requirements (7,570 million l/yr with that for each storage option: upgrade existing storage facility without RFETS or LANL material (9.7 million l/yr), Pu upgrade with all RFETS and LANL material (12.5 million l/yr), consolidate Pu storage facility (85 million l/yr), collocate Pu and HEU storage facility (104.7 million l/yr), and storage phaseout (0 l/yr).

[c] Percent changes in wastewater discharge during construction at INEL are calculated by dividing No Action wastewater discharges (540 million l/yr) with that for each storage option: upgrade existing storage facility without RFETS or LANL material (4.0 million l/yr), Pu upgrade with all RFETS and LANL material (6.1 million l/yr), consolidate Pu storage facility (7.8 million l/yr), collocate Pu and HEU storage facility (12.8 million l/yr), and storage phaseout (0 l/yr).

[d] Percent increases in projected water use during operation at INEL are calculated by dividing No Action water requirements (7,570 million l/yr) with that for each storage option: upgrade existing storage facility without RFETS or LANL material (17 million l/yr), Pu storage upgrade with all RFETS and LANL material (22 million l/yr), consolidate Pu storage facility (66 million l/yr), collocate Pu and HEU storage facility (87 million l/yr), and storage phaseout (0 l/yr).

[e] Present changes in wastewater discharged during operation at INEL are calculated by dividing No Action wastewater discharges (540 million l/yr) with that for each storage option: upgrade existing storage facility without RFETS or LANL material (0 l/yr), Pu storage upgrade with all RFETS and LANL material (0 l/yr), consolidate Pu storage facility (0 l/yr), collocate Pu and HEU storage facility (0 l/yr), and storage phaseout (0 l/yr).

Note: NA=not applicable. Construction impacts are considered to be temporary, lasting only throughout the construction period. Impacts from operations would occur continuously. During operations wastewater will be recycled.

Source: DOE 1996e; DOE 1996f; IN DOE 1996a; INEL 1995a:1.

[Text deleted.]

During operation, utility, process, and sanitary wastewater for the upgraded Pu storage facilities would be diverted to the sanitary waste treatment ponds, where it would undergo aerobic and anaerobic treatment and then be allowed to evaporate into the atmosphere and percolate into the subsurface. Similarly, cooling system blowdown and stormwater runoff would be diverted to the industrial waste treatment ponds and ANL-W sewage lagoons, where it would be allowed to evaporate or percolate. Industrial and sanitary wastewater treatment pond water is monitored for the parameters specified in the site-specific NPDES permit. If evaporation pond capacity is limited, uncontaminated effluents would be discharged to natural drainage channels. Contaminated effluents would be diverted to, and treated in, the liquid radioactive waste treatment system before disposal.

No construction would occur in areas delineated as 100-year floodplains. The proposed site is also located above the maximum probable flood elevation, which is higher than the 500-year flood elevation. The closest large surface water body, the Big Lost River, is located approximately 16 km (10 mi) west of the proposed site. 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. Construction water requirements for the upgraded Pu storage upgrade are small relative to INEL's total usage. As shown in Table 4.2.3.4–1, upgrading the ANL-W facilities would require approximately 9.7 million l/yr (2.6 million gal/yr) of water, which represents a 0.1-percent increase over the projected annual groundwater usage. Annual groundwater requirements for operation of the proposed facilities are estimated to be approximately 17 million l (4.5 million gal), which represents a 0.2-percent increase over the projected No Action groundwater usage. This small increase in overall demand should cause minimal impacts. This would increase the total projected amount to be pumped at INEL to under 18 percent of the total allotment.

Construction and operation of the proposed upgraded Pu storage facilities would not result in direct discharges to groundwater. Treated wastewater discharged to evaporation/infiltration ponds, however, would percolate downward into the groundwater. The water would be monitored and would not be discharged into the ponds until contaminant levels are within the limits specified. Impacts on groundwater quality are therefore not expected. In addition, other factors contributing to a lessening of potential impacts on groundwater are the combined effects of a deep water table, low discharge volumes, and high evaporation rates. Therefore, the tritium contamination problem in the Snake River Plain Aquifer, as identified in Section 3.4.4, would not be exacerbated by any of the long-term storage alternatives.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory-West Facilities for Continued Plutonium Storage

The Pu storage upgrade using all or some RFETS Pu and LANL Pu material at INEL would increase water discharges during construction by 6.1 million l/yr (1.6 million gal/yr), or 1.1 percent over the projected No Action discharge during construction. During operations, wastewater would be recycled. All other wastewater requirements and floodplain issues of the Pu storage upgrade with RFETS Pu and LANL Pu material are similar to those of the Pu consolidated option. During construction, Pu storage upgrade using RFETS Pu and LANL Pu material would require 12.5 million l/yr (3.3 million gal/yr), or a 0.2-percent increase over projected No Action water use. During operations, 22 million l/yr (5.8 million gal/yr) of water would be required, or a 0.3-percent increase over projected No Action water use.

Water resources impacts for construction and operation upgrading with some RFETS Pu and LANL Pu material are expected to be similar to, but less than, those previously described for the other storage options at INEL.

Consolidation Alternative

Construct New Plutonium Storage Facility

The new consolidated Pu storage facility would be located just outside the ICPP area of INEL. The impacts associated with it are the same as those discussed above for the upgrade of the existing Pu storage area, with the following exceptions.

Sanitary wastewater quantities generated during construction of this alternative would be approximately 7.8 million l/yr (2.1 million gal/yr). These effluents would be discharged to evaporation/infiltration ponds. No impacts are expected. Surface water would not be used for this option, so no impacts on surface water availability would be expected. The groundwater requirements of this option are slightly greater than those for the previous option. This option would require approximately 85 million l/yr (22.5 million gal/yr) and 66 million l/yr (17.4 million gal/yr) of water for construction and operation, respectively. These additional requirements represent 1.1- and 0.9-percent increases, respectively, in the projected No Action annual withdrawals from the Snake River Plain Aquifer and should not cause any impacts on groundwater availability.

The proposed site for this facility falls within the estimated floodplain that could result from failure of the MacKay Dam during a maximum flood, which would be greater than the 500-year flood.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

The new consolidated and collocated storage facilities would be located in the same area as the new storage facility, just outside the ICPP area of INEL. The impacts associated with it are the same as those discussed above, with the following exceptions.

Sanitary wastewater quantities generated during construction and operation of this option would be greater than for the previous option and are approximately 12.8 million l/yr (3.4 million gal/yr). These effluents would be discharged to evaporation/infiltration ponds. During operations, wastewater will be recycled. No impacts are expected. Groundwater requirements during construction and operation of this option would be slightly greater than those for the new Pu storage facility. This option would require approximately 104.7 million l/yr (27.7 million gal/yr) and 87 million l/yr (23 million gal/yr) for construction and operation, respectively. These additional requirements represent 1.4- and 1.2-percent increases, respectively, in the projected No Action annual groundwater withdrawals. These small increases boost the total projected groundwater withdrawal to a maximum of 17.8 percent of the groundwater allotment; there should be no impact on groundwater availability.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Water resource impacts for construction and operation for this option are expected to be slightly less than those previously described for the Pu consolidated and Pu and HEU collocated storage alternatives at INEL because of the reduction in the amount of material. [Text deleted.]

Phaseout

If the current Pu storage mission at INEL was phased out, groundwater withdrawals from the Snake River Plain Aquifer and nonhazardous wastewater discharge to evaporation/percolation ponds would decrease by negligible quantities. No noticeable impacts would occur or be alleviated due to these decreases.

[Text deleted.]

4.2.3.5 Geology and Soils

Construction and operation of the alternatives at INEL would have no impact on the geologic resources. A moderate seismic risk exists, but would be considered in the design of the proposed alternatives. The existing seismic risk does not preclude the safe construction and operation of the proposed alternative facilities. The facilities would be designed for earthquake-generated ground accelerations, in accordance with DOE O 420.1, *Facility Safety*. Because there are no known capable faults at INEL, the potential for ground rupture as a result of an earthquake during the life of a proposed alternative is minimal; ground shaking is more likely. Intensities of approximately VII on the MMI scale are possible but would not affect newly designed facilities. Human health effects from accidents initiated by natural phenomena (for example, earthquakes) are discussed in Section 4.2.3.9. Volcanic activity is improbable during the life of the alternatives and is not anticipated to affect the construction and operation of the alternatives. Lava extrusions could recur with a recurrence probability at approximately once in every 3,000 years. Precursors, such as shallow earthquakes, gas venting activity, and an increase in groundwater temperatures can provide advance warning of most eruption of this type; no such activity is currently indicated at INEL. It is highly unlikely that landslides, sinkhole development, or other nontectonic events would affect project activities. Slopes and underlying foundation materials are generally considered stable. Geologic resources at INEL consist of surficial sand, gravel, or clay deposits that have low economic value. New construction may increase the use of these materials, but because large volumes of these materials are present, the effect to the geologic resource is anticipated to be negligible.

Impacts to the geologic and soil resources occur during, or as a result of, ground-disturbing construction activities. Construction of the alternatives may involve ground-disturbing activities that could affect the soil resources. The amount of land disturbed is specified below for each alternative. Impacts to the soil resource depend on the specific soil units in the disturbed area, the extent of land-disturbing activities, and the amount of soil disturbed. Control measures would be employed to minimize soil erosion. Within INEL, the soil erosion potential is directly related to the amount of land disturbed because soil and climatic conditions are similar throughout the site.

[Text deleted.]

Preferred Alternative: No Action Alternative

Under the No Action Alternative, DOE would continue current and ongoing activities at INEL. There would be no ground-disturbing activities beyond those associated with existing and future site improvements. Because no new construction and the associated ground disturbance for potential soil erosion would occur, the No Action Alternative would have no effect on the soil resources at the site.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory-West Facilities for Continued Plutonium Storage

No apparent direct or indirect effects on the geologic resource are anticipated because neither facility construction and operation activity nor site infrastructure improvements will restrict access to potential geologic resources. Design of the facilities would ensure that they would not be affected by potentially hazardous geologic conditions.

Construction activities will occur completely on previously disturbed land, as described in Section 4.2.3.1, and involve land disturbance of approximately 9 ha (22 acres). Soil disturbance would occur primarily from ground-disturbing construction activities (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 (increases in wind velocity and duration increase potential soil erosion), and the size, location, and duration of ground-disturbing activities.

Net soil disturbance during operations would be considerably less than during construction because areas temporarily used for construction laydown would be restored. Although stormwater runoff and wind action could occur during operation, they are anticipated to be minimal. [Text deleted.]

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative.

Modify Existing and Construct New Argonne National Laboratory-West Facilities for Continued Plutonium Storage

Construction and operation effects on geological and soil resources would be the same as those discussed previously for the upgrade without RFETS or LANL Pu Subalternative, because the inclusion or exclusion of RFETS and LANL Pu material would not change the amount of land disturbed during construction.

Consolidation Alternative

Construct New Plutonium Storage Facility

No apparent direct or indirect effects on the geologic resources are anticipated, because neither facility construction and operational activities nor site infrastructure improvements will limit access to potential geologic resources.

[Text deleted.] Additional soil impacts would be expected from the construction of the storage facility, which will occur completely on undisturbed land, as described in Section 4.2.3.1. Approximately 58.5 ha (144 acres) would be disturbed for the Consolidation Alternative, affecting the soil profile and leading to a possible increase in erosion. Analysis in this section is the same as that provided for the Upgrade Alternative.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

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

[Text deleted.] Construction of the storage facilities would occur on undisturbed land as described in Section 4.2.3.1. However, additional soil impacts would be anticipated because this alternative has the largest construction and land use requirements. During construction, approximately 89.5 ha (221 acres) would be disturbed for the new facilities, affecting the soil profile and leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil impacts during operation are expected to be minimal. Analysis in this section is the same as that provided for the Upgrade Alternative.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

Exclusion of strategic reserve and weapons R&D materials would give almost the same effects to the soil resources for the No Action Alternative, the Upgrade Alternative, the Consolidation Alternative, and the Collocation Alternative. By excluding these materials the size of a facility would be similar, thus not changing the amount of land disturbed by construction activities. No effect to the geologic resource is anticipated as a result of this subalternative.

Phaseout

The phaseout of storage capacity would have no apparent effects on the geologic resources. However, phaseout could result in beneficial effects on the soils of the area. Hazardous, radioactive, and mixed waste sources would be eliminated from the area, thus decreasing the potential for future soil contamination.

[Text deleted.]

4.2.3.6 Biological Resources

Preferred Alternative: No Action Alternative

Under this alternative, the Pu storage mission described in Section 2.2.3 would continue at INEL. These activities would result in no appreciable change to current conditions of biological resources at INEL, as described in Section 3.4.6.

Upgrade Alternative

Upgrade Without Rocky Flats Environmental Technology Site Plutonium or Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Upgrading existing Pu storage facilities at the ANL-W area of INEL would cause minimal disturbance to biological resources. This is because all activities, including some new construction, would take place within an area that is currently disturbed. Noise associated with construction could cause some temporary disturbance to wildlife, but this impact would be minimal since animals living adjacent to the current facility would have already adapted to its presence. Impacts on wetlands and aquatic resources would not occur since these resources are not found in the upgrade area, and all discharges would be to existing evaporation ponds. Since the upgrade would take place within a developed area, impacts on threatened and endangered species would not be expected.

Upgrade With All or Some Rocky Flats Environmental Technology Site Plutonium and Los Alamos National Laboratory Plutonium Subalternative

Modify Existing and Construct New Argonne National Laboratory–West Facilities for Continued Plutonium Storage

Upgrading with all or some of the RFETS and LANL materials stored at INEL would not be expected to change impacts on biological resources from those described for the Upgrade without RFETS Pu or LANL Pu Subalternative.

Consolidation Alternative

Construct New Plutonium Storage Facility

Under this alternative, Pu reserves would be consolidated in a new storage facility at INEL. Impacts on terrestrial resources, wetlands, aquatic resources, and threatened and endangered species are discussed below.

Terrestrial Resources. Construction of the Consolidated Pu storage facility would result in the disturbance of 58.5 ha (144 acres) of terrestrial resources, or less than 0.03 percent of INEL. This includes areas on which plant facilities would be constructed, as well as areas revegetated following construction. Vegetation within the proposed site would be destroyed during land-clearing operations. Big sagebrush is the dominant plant within the proposed site. Plant communities in which big sagebrush is the dominant overstory species are well represented on INEL, but they are relatively uncommon regionally because of widespread conversion of shrub-steppe habitats to agriculture.

Construction of the Pu storage 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. Because pronghorn use of the proposed site is relatively low, the facility should not have a lasting impact on these species. Nests and young animals living within the proposed site may not survive. The site would be surveyed as necessary for the nests of migrating 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 activity, could affect wildlife living immediately adjacent to the Pu storage 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. Impacts on vegetation from salt drift would not occur since dry cooling systems would be used.

Wetlands. Construction and operation of the Pu storage facility would not affect wetlands since there are no wetlands on the proposed site. Wetlands associated with the Big Lost River are located 2.4 km (1.5 mi) from the site, so impacts on these wetlands are not expected.

Aquatic Resources. Construction and operation of the Pu storage facility would not affect aquatic resources since there are no surface water bodies on the proposed site. The nearest surface water body is in the Big Lost River, which is located 2.4 km (1.5 mi) from the site. Temporary aquatic habitat may develop in evaporation and retention ponds, as well as in natural channels in the immediate vicinity of NPDES-permitted outfalls.

Threatened and Endangered Species. It is unlikely that federally listed threatened or endangered species would be affected by construction of the Pu storage facility on INEL, but several State-status species may be affected. Up to 58.5 ha (144 acres) of habitat would be lost. Burrows and foraging habitat for the pygmy rabbit would be lost. Bat species such as the Townsend's western big-eared bat may roost in caves and forage throughout the proposed site. One State-listed sensitive plant species could potentially be affected by construction of the facility. The plant species, treelike oxytheca, has been collected at eight sites on INEL and at only two other sites in Idaho (IN DOE 1984a:34,36). If present, individual plants of this species could be destroyed during land-clearing activities. Preactivity surveys would be conducted as appropriate prior to construction to determine the presence of these species in the area to be disturbed. Consultation with USFWS and State agencies would be conducted at the site-specific level, as appropriate.

During operation of the new facilities, several bat species could forage at evaporation and stormwater retention ponds. No impacts on threatened and endangered species are expected due to facility operation.

Collocation Alternative

Construct New Plutonium and Highly Enriched Uranium Storage Facilities

Under this alternative, consolidated Pu reserves would be stored with HEU inventories in a new collocated storage facility(s) at INEL. Construction and operation of collocated storage facilities at INEL would have effects on biological resources similar to, but somewhat greater than, those described for the consolidated storage facility. Construction of the collocated storage alternative would disturb 89.5 ha (221 acres) of habitat.

Subalternative Not Including Strategic Reserve and Weapons Research and Development Materials

The exclusion of strategic reserve and weapons R&D materials would have almost the same effects to the Upgrade With All or Some RFETS and LANL Pu Subalternative, the Consolidation Alternative, and the

Collocation Alternative. The size of the facility would be similar and would not reduce the amount of habitat disturbance, and the potential impacts on biological resources would be similar. [Text deleted.]

Phaseout

The phaseout of Pu storage facilities at INEL would not be expected to affect biological resources, although increased human activity could temporarily disturb some wildlife species in the vicinity of the site.