DOE/EIS-0549

Final Environmental Impact Statement for the Surplus Plutonium Disposition Program

December 2023

K-Area at Savannah River Site

PF-4 at Los Alamos National Laboratory

National Nuclear Security Administration

U.S. Department of Energy
National Nuclear Security Administration

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APPENDICES

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COVER SHEET

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For further information or for copies of this Final SPDP EIS*, contact:*	*For general information about the NNSA National Environmental Policy Act (NEPA) process, contact:*
Maxcine Maxted, NEPA Document Manager U.S. Department of Energy/National Nuclear Security Administration Office of Material Management and Minimization Savannah River Site Aiken, SC 29802 P.O. Box A, Bldg. 730-2B, Rm. 328 Email: SPDP-EIS@NNSA.DOE.gov Telephone: (803) 952-7434	Lynn Alexander, NEPA Compliance Officer U.S. Department of Energy/National Nuclear Security Administration NNSA Office of Environment, Safety, and Health, NA-ESH-15 1000 Independence Ave, SW Washington, DC 20585 Email: SPDP-EIS@NNSA.DOE.gov Telephone: (803) 952-7434

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- ***Abstract:*** The National Nuclear Security Administration (NNSA), a semi-autonomous agency organized in 2000 within the United States (U.S.) Department of Energy (DOE),[1] works to prevent nuclear weapon proliferation and reduce the threat of nuclear and radiological terrorism around the world. NNSA's Office of Defense Nuclear Nonproliferation works globally to prevent state and non-state actors from developing nuclear weapons or acquiring weapons-usable nuclear or radiological materials, equipment, technology, and expertise. Among other missions, NNSA is engaged in a program to disposition U.S. surplus weapons-grade plutonium (referred to in this Surplus Plutonium Disposition Program Environmental Impact Statement (SPDP EIS) as "surplus plutonium"). NNSA has prepared this document (DOE/EIS-0549) pursuant to the *National Environmental Policy Act* of 1969 (NEPA) (42 United States Code 4321 et seq.), to evaluate the potential environmental impacts of the disposition of plutonium that is surplus to the defense needs of the United States.

  DOE's purpose and need for action is to safely and securely disposition plutonium that is surplus to the Nation's defense needs so that it is not readily usable in nuclear weapons.

[1] In this SPDP EIS, DOE's NNSA is referred to as NNSA for the sake of brevity.

- ***Preferred Alternative***: NNSA's Preferred Alternative to meet the purpose and need is implementation of the dilute and dispose strategy for the full 34 metric tons of surplus plutonium (DOE 2018). The effort would require new, modified, or existing capabilities at the Pantex Plant, Los Alamos National Laboratory, Savannah River Site, Y-12 National Security Complex, and the Waste Isolation Pilot Plant facility. Four sub-alternatives to the Preferred Alternative are considered in this environmental impact statement (EIS). The sub-alternatives differ based on the location (Los Alamos National Laboratory or Savannah River Site) for the processing activities. The sub-alternatives were selected so that the analyses presented in this EIS would bound the impacts (including impacts from transportation) that would occur if either site or a combination of the sites was used (i.e., if some of the 34 metric tons of surplus plutonium is processed at one site and the remainder is processed at the other site).
- ***Public Involvement***: In preparing this Final SPDP EIS, NNSA considered comments received during the scoping period (December 16, 2020 through February 18, 2021), during the public comment period on the Draft SPDP EIS (December 16, 2022 through March 16, 2023), and late comments received after the close of the public comment period but prior to May 2023. NNSA held in-person public hearings in Aiken, South Carolina (January 19, 2023), Carlsbad, New Mexico (January 24, 2023), and Los Alamos, New Mexico (January 26, 2023). In addition, NNSA held an internet-based virtual public hearing (with telephone access) on January 30, 2023. This Final SPDP EIS contains revisions and new information based in part on comments received on the Draft SPDP EIS. Volume 3 contains reproductions of comments, summaries of the comments, and NNSA's responses to the comments. NNSA will use the analysis presented in this SPDP EIS, as well as other information, in preparing a Record of Decision regarding the disposition of 34 metric tons of surplus plutonium.

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Abbreviations and Acronyms

°C	degree(s) Celsius
°F	degree(s) Fahrenheit
ac	acre(s)
ACS	American Community Survey
AEI	Area of Environmental Interest
ALARA	as low as reasonably achievable
APCS	Abandonment of Panel Closures in the South
ARIES	Advanced Recovery and Integrated Extraction System
AROD	Amended Record of Decision
ATSDR	Agency for Toxic Substances and Disease Registry
ATWIR	Annual TRU Waste Inventory Report
BLM	Bureau of Land Management
BMP	best management practice
C&P	characterization and packaging
CAA	Clean Air Act
CBFO	(DOE) Carlsbad Field Office
CCO	criticality control overpack
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH-TRU	contact-handled transuranic
Ci	curie(s)
cm	centimeter(s)
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CRMP	Cultural Resources Management Plan
CSWTF	Central Sanitary Wastewater Treatment Facility
dBA	A-weighted decibel
DD&D	deactivation, decontamination, and decommissioning
DHF	Drum Handling Facility
DOE	U.S. Department of Energy
DSA	documented safety analysis(es)
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FGR	Federal Guidance Report
FR	*Federal Register*
ft	foot (feet)

ft^3	cubic foot (feet)
FY	fiscal year
g	acceleration due to gravity
g	gram(s)
gal	gallon(s)
gal/yr	gallon(s) per year
GHG	greenhouse gas
gpd	gallon(s) per day
gpm	gallon(s) per minute
GWP	global warming potential
HAP	hazardous air pollutant
HEPA	high-efficiency particulate air (filter)
HEU	highly enriched uranium
HLW	high-level (radioactive) waste
hr	hour(s)
HVAC	Heating, ventilation, and air-conditioning
ICRP	International Commission on Radiological Protection
ID	identification
in.	inch(es)
IPCC	Intergovernmental Panel on Climate Change
KAC	K-Area Complex
kg	kilogram(s)
KIS	K-Area Interim Storage
km	kilometer(s)
L	liter(s)
LANL	Los Alamos National Laboratory
lb	pound(s)
LCF	latent cancer fatality
LLW	low-level (radioactive) waste
LOS	level of service
LSC	Logistical Support Center
LWA	Land Withdrawal Act
m	meter(s)
m/s	meter(s) per second
m^3	cubic meter(s)
MACCS	MELCOR Accident Consequence Code System
MAR	material at risk
MEI	maximally exposed individual
MFFF	Mixed Oxide Fuel Fabrication Facility

mi	mile(s)
MLLW	mixed low-level (radioactive) waste
MOX	mixed oxide
mpg	mile(s) per gallon
mph	mile(s) per hour
mrem	millirem
MT	metric ton(s)
MVA	mega volt amp(s)
MW	megawatt(s)
MWh	megawatt-hour(s)
MWh/yr	megawatt-hour(s) per year
NAAQS	National Ambient Air Quality Standard
NASEM	National Academy of Sciences, Engineering and Medicine
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NSHM	National Seismic Hazard Model
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPMP	non-pit metal processing
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
ODS	ozone-depleting substances
OPT	Office of Packaging and Transportation
OST	NNSA's Office of Secure Transportation
PA	Programmatic Agreement
Pantex	Pantex Plant
PCB	polychlorinated biphenyl
pCi	picocurie(s)
PDCF	Pit Disassembly and Conversion Facility
PDP	pit disassembly and processing
PEIS	programmatic environmental impact statement
PF-4	Plutonium Facility-4
PGA	peak ground acceleration
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PMDA	Plutonium Management and Disposition Agreement

psig	pounds per square inch gauge
Pu	plutonium
PuE	plutonium-239 dose equivalent
RCRA	Resource Conservation and Recovery Act
REAC/TS	Radiation Emergency Assistance Center/Training Site
rem	roentgen equivalent man
RH-TRU	remote-handled transuranic
RLUOB	Radiological Laboratory/Utility/Office Building
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
ROI	region of influence
s	second(s)
S&D	storage and disposition
SA	supplement analysis
SCDHEC	South Carolina Department of Health and Environmental Control
SC-GHG	social cost of greenhouse gas
SEIS	supplemental environmental impact statement
SHPO	State Historic Preservation Office(r)
SNL	Sandia National Laboratories
SPD EIS	*Surplus Plutonium Disposition Final Environmental Impact Statement* (1999)
SPD SEIS	*Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (2015)
SPDP	Surplus Plutonium Disposition Program
SRPPF	Savannah River Plutonium Processing Facility
SRS	Savannah River Site
SWEIS	Site-Wide Environmental Impact Statement
SWPPP	stormwater pollution prevention plan
SWSP	Sanitary Wastewater System Plant
SWTP	Sanitary Wastewater Treatment Plant
T	ton(s)
TA	Technical Area
TCEQ	Texas Commission on Environmental Quality
TCP	Traditional Cultural Property
TDEC	Tennessee Department of Environment and Conservation
TRU	transuranic
TRUPACT-II	Transuranic Package Transporter Model-II
TSCA	Toxic Substances Control Act
TWF	Transuranic Waste Facility
U.S.	United States

U.S.C.	United States Code
USGS	United States Geological Survey
VTR	Versatile Test Reactor
WAC	Waste Acceptance Criteria
WebTRAGIS	Web Transportation Routing Analysis Geographic Information System
WG	weapons-grade
WIPP SEIS	*Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement*
WIPP	Waste Isolation Pilot Plant
WSB	Waste Solidification Building
Y-12	Y-12 National Security Complex
yd^3	cubic yard(s)
yr	year(s)
ZPPR	Zero Power Physics Reactor

Conversion Table

Metric to English			English to Metric		
Multiply	**by**	**to get**	**Multiply**	**by**	**to get**
Area					
Square meters	10.764	square feet	square feet	0.092903	square meters
Square kilometers	247.1	acres	acres	0.0040469	square kilometers
Square kilometers	0.3861	square miles	square miles	2.59	square kilometers
Hectares	2.471	acres	acres	0.40469	hectares
Concentration					
Kilograms/square meter	0.16667	tons/acre	tons/acre	0.5999	kilograms/square meter
Milligrams/liter	1[(a)]	parts/million	parts/million	1[(a)]	milligrams/liter
Micrograms/liter	1[(a)]	parts/billion	parts/billion	1[(a)]	micrograms/liter
Micrograms/cubic meter	1[(a)]	parts/trillion	parts/trillion	1[(a)]	micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	pounds/cubic feet	pounds/cubic feet	0.016018	grams/cubic centimeter
Grams/cubic meter	0.0000624	pounds/cubic feet	pounds/cubic feet	16,018.5	grams/cubic meter
Length					
Centimeters	0.3937	inches	inches	2.54	centimeters
Meters	3.2808	feet	feet	0.3048	meters
Kilometers	0.62137	miles	miles	1.6093	kilometers
Radiation					
Sieverts	100	rem	rem	0.01	sieverts
Temperature					
Degrees Celsius (C)	Multiply by 1.8 and then add 32	degrees Fahrenheit (F)	degrees Fahrenheit (F)	Subtract 32 and then multiply by 0.55556	degrees Celsius (C)
Velocity/Rate					
Cubic meters/second	2,118.9	cubic feet/minute	cubic feet/minute	0.00047195	cubic meters/second
Grams/second	7.9366	pounds/hour	pounds/hour	0.126	grams/second
Meters/second	2.237	miles/hour	miles/hour	0.44704	meters/second
Volume					
Liters	0.26417	gallons	gallons	3.7854	liters
Liters	0.035316	cubic feet	cubic feet	28.316	liters
Liters	0.001308	cubic yards	cubic yards	764.54	liters
Cubic meters	264.17	gallons	gallons	0.0037854	cubic meters
Cubic meters	35.315	cubic feet	cubic feet	0.028317	cubic meters
Cubic meters	1.3079	cubic yards	cubic yards	0.76456	cubic meters
Cubic meters	0.0008107	acre-feet	acre-feet	1,233.49	cubic meters

Conversion Table

Metric to English			English to Metric		
Multiply	**by**	**to get**	**Multiply**	**by**	**to get**
Weight/Mass					
Grams	0.035274	ounces	ounces	28.35	grams
Kilograms	2.2046	pounds	pounds	0.45359	kilograms
Kilograms	0.0011023	tons (short)	tons (short)	907.18	kilograms
Metric tons	1.1023	tons (short)	tons (short)	0.90718	metric tons
English to English					
Acre-feet	325,850.7	gallons	gallons	0.000003046	acre-feet
Acres	43,560	square feet	square feet	0.000022957	acres
Square miles	640	acres	acres	0.0015625	square miles

(a) This conversion is only valid for concentrations of contaminants (or other materials) in water.
Note: Conversion factors have been rounded to an appropriate number of significant digits for each conversion given the order of magnitude of the conversion.

APPENDIX A

RELATED NATIONAL ENVIRONMENTAL POLICY ACT REVIEWS AND DECISION DOCUMENTS

This appendix includes a summary of National Environmental Policy Act (NEPA; 42 U.S.C. § 4321 et seq.) reviews related to this *Surplus Plutonium Disposition Program Environmental Impact Statement* (SPDP EIS). Section A.1 covers NEPA reviews and decision documents specific to the Surplus Plutonium Disposition Program (SPDP); Section A.2 covers other related U.S. Department of Energy (DOE) NEPA reviews for activities that support the SPDP; and Section A.3 provides the references cited in this appendix.

A.1 Surplus Plutonium Disposition NEPA Reviews

Table A-1 describes NEPA reviews and decision documents that have been developed in support of decisions related to long-term storage and disposition of surplus plutonium.

Table A-1. NEPA Reviews Developed in Support of Decisions Related to Long-Term Storage and Disposition of Surplus Plutonium

NEPA Review	Overview	Decision Document(s)
[1996] DOE/EIS-0229: *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE 1996b)	Evaluated the environmental consequences of alternative strategies for the long-term storage and disposition of surplus plutonium and HEU. The following four SAs were issued: **[1998] DOE/EIS-0229-SA-1**: *Supplement Analysis for Storing Plutonium in the Actinide Packaging and Storage Facility and Building 105-K at the Savannah River Site* (DOE 1998c) **[2002] DOE/EIS-0229-SA-2**: *Supplement Analysis for Storage of Surplus Plutonium Materials in the K-Area Material Storage Facility at the Savannah River Site* (DOE 2002) **[2003] DOE/EIS-0229-SA-3**: *Supplement Analysis – Fabrication of Mixed Oxide Fuel Lead Assemblies in Europe* (DOE 2003b) **[2007] DOE/EIS-0229-SA-4**: *Supplement Analysis – Storage of Surplus Plutonium Materials at the Savannah River Site* (DOE 2007b)	**[1997] 62 FR 3014** ROD: DOE decided to pursue a dual-path strategy for plutonium disposition; immobilization and MOX fuel. Both waste forms would be emplaced in a geologic repository. Plutonium would be immobilized in glass or ceramic material along with high-level radioactive waste. Other surplus plutonium would be fabricated into MOX fuel, irradiated in domestic commercial reactors, and the spent MOX fuel would be disposed of in a deep geologic repository. DOE also decided to implement the Preferred Alternative to provide storage for weapons-usable fissile materials, including plutonium and HEU. **[1998] 63 FR 43386** AROD: DOE decided to proceed with accelerated shipment of non-pit surplus plutonium from the Rocky Flats Environmental Technology Site and the Hanford Site to SRS before completion of the Actinide Packaging and Storage Facility. **[2001] 66 FR 7888** AROD: DOE decided to cancel the Actinide Packaging and Storage Facility. **[2002] 67 FR 19432** AROD: DOE decided to (1) cancel the immobilization portion due to budgetary constraints, (2) select the alternative of immediate implementation of consolidated long-term non-pit surplus plutonium storage at SRS, and (3) adjust the manner in which surplus plutonium pits will be stored at the Pantex Plant. **[2007] 72 FR 51807** AROD: DOE decided to consolidate long-term storage of non-pit surplus plutonium from the Hanford Site, LANL, and Lawrence Livermore National Laboratory at SRS.

NEPA Review	Overview	Decision Document(s)
[1998] DOE/EA-1207: *Pit Disassembly and Conversion Demonstration Environmental Assessment and Research and Development Activities* (DOE 1998a)	Evaluated the environmental consequences of the ARIES, a pit disassembly and conversion demonstration project at LANL. Plutonium oxide produced from the ARIES system was designated for disposition via MOX fuel.	**[1998] 63 FR 44851** FONSI: DOE concluded that no significant environmental consequences would result from implementation of the proposed action.
[1999] DOE/EIS-0283: *Surplus Plutonium Disposition Final Environmental Impact Statement* (SPD EIS; DOE 1999d)	Tiered from **[1996] DOE/EIS-0229** (DOE 1996b); evaluated the environmental consequences from several plutonium disposition pathways, including fabrication of MOX fuel for use in existing domestic commercial nuclear power reactors. The following SAs were issued: **[2003] DOE/EIS-0283-SA1**: *Changes Needed to the Surplus Plutonium Disposition Program, Supplement Analysis and Amended Record of Decision* (DOE 2003a). Evaluated disposal of 34 MT of plutonium by fabricating it into MOX fuel. **[2008] DOE/EIS-0283-SA-2***: Supplement Analysis for Construction and Operation of a Waste Solidification Building at the Savannah River Site* (DOE 2008d). Evaluated construction and operation of the Waste Solidification Building at SRS to treat liquid waste generated from the MFFF and Pit Disassembly and Conversion Facility. **[2012] DOE/EIS-0283-SA-03***: Supplement Analysis: Transportation of Depleted Uranium Hexafluoride for Conversion to Depleted Uranium Oxide* (DOE 2012c). Evaluated transportation of depleted uranium hexafluoride from Piketon, Ohio, to Richland, Washington, for conversion to depleted	**[2000] 65 FR 1608** ROD: DOE decided to disposition up to 50 MT of plutonium at SRS using a hybrid approach that involves both the ceramic can-in-canister immobilization approach and the MOX fuel approach. DOE decided to construct and operate a MFFF, a Pit Disassembly and Conversion Facility, and an Immobilization Facility at SRS. **[2002] 67 FR 19432** AROD: DOE decided to cancel the immobilization portion of the disposition strategy, select the alternative of immediate implementation of consolidated long-term storage of surplus plutonium at SRS, and adjust the manner of surplus plutonium storage at Pantex. **[2003] 68 FR 20134** AROD: DOE decided to fabricate 6.5 MT of surplus weapons-grade plutonium, originally intended for immobilization, into MOX fuel, including the material transferred from the Rocky Flats Environmental Technology Site to SRS for storage. DOE also changed the amount of surplus plutonium to be fabricated into MOX fuel from 33 MT to 34 MT. **[2003] 68 FR 64611, [2008] 73 FR 75088** AROD: DOE decided to construct and operate the Waste Solidification Building in close proximity to the MFFF and Pit Disassembly and Conversion Facility in F-Area at SRS. **[2020] 85 FR 53350** AROD: DOE decided to prepare and dispose of up to an additional 7.1 MT of non-pit surplus plutonium as CH-TRU waste at the WIPP facility using the dilute and dispose strategy. DOE also decided that non-pit metal processing may be performed at either LANL or SRS.

NEPA Review	Overview	Decision Document(s)
	uranium oxide, followed by shipment of the depleted uranium oxide to SRS. **[2020] DOE/EIS-0283-SA-4**: *Supplement Analysis for Disposition of Additional Non-Pit Surplus Plutonium* (DOE 2020c). Evaluated preparation of up to 7.1 MT of non-pit surplus plutonium for disposal at the WIPP facility.	
[1999] DOE/EIS-0283-S1: *Supplement to the Surplus Plutonium Disposition Draft Environmental Impact Statement* (SPD Draft EIS; DOE 1999c)	Evaluated the environmental consequences of using MOX fuel in six specific reactors as well as other program changes made since the issuance of the SPD Draft EIS (DOE/EIS-0283 [DOE 1999d]).	**[2000] 65 FR 1608** ROD: DOE decided to immobilize approximately 17 metric tons of surplus plutonium and use up to 33 metric tons of surplus plutonium as MOX fuel.
[2005] DOE/EA-1538: *Environmental Assessment for the Safeguards and Security Upgrades for Storage of Plutonium Materials at the Savannah River Site* (DOE 2005a)	Evaluated the environmental consequences of installation and operation of the K-Area Container Surveillance and Storage Capability for non-pit surplus plutonium surveillance and stabilization, and packaging of plutonium from F-Area in DOE-STD-3013 containers for storage in K-Area, and installation of safeguards and security upgrades in K-Area and the Advanced Tactical Training Area at SRS.	**[2005] FONSI** (DOE 2005b): DOE concluded that safety and security enhancements for storage of plutonium-bearing materials at SRS did not constitute a major Federal action significantly affecting the quality of the human environment. **[2008] Revised FONSI** (DOE 2008c): DOE determined that expansion of the Surface Danger Zone associated with the Advanced Tactical Training Area was prudent, and these actions did not constitute a major Federal action significantly affecting the quality of the human environment.
[2005] NRC NUREG-1767: *Environmental Impact Statement on the Construction and Operation of a Proposed Mixed Oxide Fuel Fabrication Facility at the Savannah River Site, South Carolina* (NRC 2005a)	Evaluated the environmental consequences of the construction and operation of the MFFF. Supports the analysis of construction of the PDP capability in F-Area for the **All SRS Sub-Alternative** capability.	**[2005] Construction Authorization** (NRC 2005b): Authorization to construct a MFFF at SRS.

NEPA Review	Overview	Decision Document(s)
[2015] DOE/EIS-0283-S2: *Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (SPD Supplemental EIS; DOE 2015)	Evaluated the environmental consequences of dispositioning 13.1 MT of surplus plutonium for which a disposition path was not assigned. DOE also updated the analyses for the 34 MT of surplus plutonium analyzed in the SPD EIS and analyzed options for pit disassembly and conversion and the use of MOX fuel in Tennessee Valley Authority reactors. Supports the **PDP – LANL, Dilute – SRS, and C&P – SRS** capabilities.	**[2015] 80 FR 80348** ROD: DOE decided the Preferred Alternative is to prepare the 6 MT of non-pit surplus plutonium for eventual disposal at the WIPP facility. **[2016] 81 FR 19588** ROD: DOE decided to prepare 6 MT of non-pit surplus plutonium for disposal at the WIPP facility. The following Interim Actions were issued during the development of DOE/EIS-0283-S2 (DOE 2015): **[2008] Processing of Plutonium Materials from the DOE Standard 3013 Surveillance Program in H-Canyon at the Savannah River Site** (DOE 2008b): Decision to process approximately 180 kg of plutonium materials that would be removed from DOE-STD-3013 containers as required by the surveillance program. DOE found DOE/EIS-0220 analyses (DOE 1995a) to be representative of impacts. **[2009] Processing of Plutonium Materials in H-Canyon at the Savannah River Site** (DOE 2009a): Decision to process up to 420 kg of plutonium materials in H-Canyon for vitrification in the Defense Waste Processing Facility. DOE found DOE/EIS-0220 (DOE 1995a) analyses to be representative of impacts. **[2011] Disposition of Plutonium Materials from the DOE Standard 3013 Surveillance Program at the Savannah River Site (SRS)** (DOE 2011a): Amended the 2008 Determination by adding WIPP disposal as a second alternative. Proposal to dispose of approximately 85 kg of plutonium materials that would be removed from DOE-STD-3013 containers as required by the surveillance program. DOE found the analyses in DOE/EIS-0220 (DOE 1995a) and DOE/EIS-0217 (DOE 1995b) to be representative of impacts. **[2011] Flexible Manufacturing Capability for the MFFF** (DOE 2011d): Proposal to modify the MFFF design to allow the flexibility necessary to manufacture fuel for a variety of reactor designs. DOE found that impacts would be bound by DOE/EIS-0283 (DOE 1999d) analyses.

NEPA Review	Overview	Decision Document(s)
		[2011] Disposition of Certain Plutonium Materials Stored at the Savannah River Site (DOE 2011c): Proposal to dispose of approximately 500 kg of surplus, non-pit surplus plutonium materials at the WIPP facility. DOE found the analyses in DOE/EIS-0220 (DOE 1995a) and DOE/EIS-0217 (DOE 1995b) to be representative of impacts. **[2012] Use of H-Canyon/HB-Line to Prepare Feed for the Mixed Oxide Fuel Fabrication Facility at the Savannah River Site** (DOE 2012b): Proposal to prepare up to 2.4 MT of plutonium metal and oxide as feed material for MFFF using the H-Canyon/HB-Line. DOE found that the impacts of processing these materials would be significantly less than the historical levels of operating the H-Canyon/HB-Line facilities. **[2013] K-Area Materials Storage (KAMS) Area Expansion at the Savannah River Site (SRS)** (DOE 2013b): Decision to expand plutonium storage into the Final Storage Area and Presentation Room of the K-Area Complex. DOE found that there would be no significant impacts on the environment. **[2013] Disposition of Certain Plutonium Materials at the K-Area Complex, Savannah River Site** (DOE 2013a): Amends the 2011 decision by adding a second SRS facility (K-Area Complex) to prepare surplus plutonium for disposal at the WIPP facility. DOE found the analyses in DOE/EIS-0220 (DOE 1995a) and DOE/EIS-0217 (DOE 1995b) to be representative of impacts.
2017 Categorical Exclusion 017321: Construction of Concrete Storage Pad with Soft Enclosure, K-Area (DOE 2017a)	Evaluated the proposal for the construction of a concrete storage pad with soft enclosure for C&P of diluted surplus plutonium in K-Area at SRS and determined that the proposed action meets the requirements for a categorical exclusion. Supports the **C&P – SRS** capability.	NA

NEPA Review	Overview	Decision Document(s)
2018 Memorandum for the Installation and Operation of Gloveboxes for Plutonium Processing at K-Area, Savannah River Site (DOE 2018b)	Evaluated the proposal to install and operate three additional gloveboxes in K-Area at SRS. DOE found that the analysis in DOE/EIS-0283-S2 (DOE 2015) coupled with documentation demonstrating the timing and throughput assumption of the three gloveboxes and ROD (81 FR 19588) acknowledging the need for additional glovebox capability are sufficient and no additional NEPA review is required. Supports the **Dilute – SRS** capability.	NA
[1995] DOE/EIS-0220: *Final Environmental Impact Statement Interim Management of Nuclear Materials* (DOE 1995a)	Evaluated alternatives for stabilization of nuclear materials stored at SRS. The following SAs were issued: **[1996] DOE/EIS-0220-SA-05 (formerly identified as DOE/EIS-0220-SA-00)**: Supplement Analysis of Seismic Activity on F-Canyon (DOE 1996c): Evaluated new information regarding the effect of a severe earthquake on F-Canyon at SRS and compared the new information with the evaluation of earthquake accident impacts presented in the IMNM EIS. **[1997] DOE/EIS-0220-SA-03 (formerly identified as DOE/EIS-0220-SA-01)**: Supplement Analysis of Seismic Activity on H-Canyon (DOE 1997c): Incorporated up-to-date seismic data, including a detailed evaluation of the likelihood of a severe earthquake and the estimated resulting structural damage of H-Canyon. This evaluation indicated that a severe earthquake capable of producing structural damage comparable to that described in the IMNM EIS would not occur more frequently than once in 5,500 years. That is less frequent than	**[1995] 60 FR 65300** [60 FR 65300] ROD: DOE decided to initiate actions to stabilize SRS materials that represent vulnerabilities in their current storage condition or may present a vulnerability in the next 10 years, and to continue to manage stable materials. **[1996] 61 FR 6633** [61 FR 6633] Supplemental ROD: DOE decided to initiate actions to stabilize additional SRS materials including Mark-16 and Mark-22 fuels, as well as other aluminum-clad targets. **[1996] 61 FR 48474** [61 FR 48474] Supplemental ROD: DOE decided to stabilize additional SRS materials including plutonium-239 solutions, and neptunium-237 solution and targets. **[1997] 62 FR 17790** [62 FR 17790] Supplemental ROD: DOE decided to stabilize the remaining TRR spent nuclear fuel located in the RBOF at SRS, using the F-Canyon and FB-Line facilities. **[1997] 62 FR 61099** [62 FR 61099] Supplemental ROD: DOE decided to (1) add an additional method, Processing and Storage for Vitrification in the Defense Waste Processing Facility, to those being implemented for the management of plutonium and uranium stored in vaults; and (2) amend its September 6, 1996, ROD to stabilize the plutonium-239 and neptunium-237 solutions stored in H-Canyon and obsolete neptunium-237 targets stored in K-Reactor to oxide forms using H-Canyon.

NEPA Review	Overview	Decision Document(s)
	the severe earthquake occurrence assumed in the IMNM EIS. **[1997] DOE/EIS-0220-SA-04**: Supplement Analysis for Stabilization of TRR Fuel (DOE 1997b): Evaluated stabilizing the TRR fuel by the Processing to Metal alternative in the IMNM EIS. **[2009] DOE/EIS-0220-SA-01**: Supplement Analysis Interim Management of Nuclear Materials Final Environmental Impact Statement (DOE 2009b): Evaluated chemically processing and vitrifying in SRS facilities approximately 5 kgs of low assay plutonium material received from the Hanford Site. **[2016] DOE/EIS-0220-SA-02**: Supplement Analysis of the Mark-18A Target Material Recovery Program at the Savannah River Site (DOE 2016b): Evaluated processing 65 Mark-18A targets stored at Savannah River National Laboratory to recover isotopes needed for nonproliferation and medical purposes.	**[2001] 66 FR 7888** [66 FR 7888] AROD: DOE decided to cancel the Actinide Packaging and Storage Facility and instead install the stabilization and packaging capability in Building 235–F, an existing plutonium storage and processing facility at SRS. DOE also decided to use existing SRS vault storage space, including space in Building 235–F, to store plutonium (and other nuclear material) pending disposition. **[2001] 66 FR 55166** [66 FR 55166] AROD: DOE canceled the Building 235–F Plutonium Packaging and Stabilization project and the F-Canyon Americium/Curium Vitrification project. To establish the capability to package plutonium in accordance with the plutonium storage standard, DOE will modify existing furnaces, or install new ones, and install an outer can welding capability within the FB-Line facility, in Building 221–F. To stabilize the F-Canyon Americium/Curium solution, DOE will implement the Processing and Storage for Vitrification in the Defense Waste Processing Facility Alternative. **[2002] 67 FR 45710** [67 FR 45710] Supplemental ROD: DOE decided to implement the Processing and Storage for Vitrification in the Defense Waste Processing Facility Alternative as well as the Process to Oxide Alternative previously selected for the H-Canyon plutonium solutions. **[2003] 68 FR 44329** [68 FR 44329] AROD: DOE decided to dispose of as waste the majority of one type and a small portion of a second type of nuclear materials analyzed in the IMNM EIS. **[2018] 83 FR 9847** [83 FR 9847] AROD: DOE decided to process 65 Mark-18A targets stored at Savannah River National Laboratory to recover plutonium-244 and other valued isotopes.

ARIES = Advanced Recovery and Integrated Extraction System; AROD = Amended Record of Decision; C&P = characterization and packaging; CH-TRU = contact-handled transuranic; DOE = U.S. Department of Energy; EA = Environmental Assessments; EIS = environmental impact statement; FONSI = Finding of No Significant Impact; FR = *Federal Register;* HEU = highly enriched uranium; IMNM = Interim Management of Nuclear Materials; KAMS = K-Area Materials Storage; LANL = Los Alamos National Laboratory; NA = not applicable because there is no associated decision document; NEPA = *National Environmental Policy Act*; MFFF = Mixed Oxide Fuel Fabrication Facility; MOX = mixed oxide; PDP = pit disassembly and processing; RBOF = Receiving Basin for Offsite Fuels; ROD = Record of Decision; SA = supplement analysis; SPD = Surplus Plutonium Disposition; SRS = Savannah River Site; TRR = Taiwan Research Reactor; WIPP = Waste Isolation Pilot Plant.

A.2 Other Related NEPA Reviews

Table A-2 describes additional NEPA reviews for activities that support carrying out the SPDP as described in this SPDP EIS. Descriptions for applicable NEPA reviews in Table A-1 are not repeated in Table A-2.

Table A-2. Summary of Other Related DOE NEPA Reviews

NEPA Review	Overview	Decision Document(s)
[1996] DOE/EIS-0225: *Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components*	Evaluated the environmental consequences related to storage, including storage of up to 20,000 pits at Pantex. Supports the **Pit Storage – Pantex** capability. The following six SAs were issued: **[1998] DOE/EIS-0225-SA-01**: *Supplement Analysis for: Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components – AL-R8 Sealed Insert Container* (DOE 1998b) **[2000] DOE/EIS-0225-SA-02**: *Final Supplement Analysis for Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapons Components Hazardous Waste Treatment and Processing Facility* (DOE 2000a) SA-03 through SA-06 were prepared in accordance with DOE's NEPA implementing procedures, which require evaluation of its site-wide EISs at least every 5 years by preparation of a SA. **[2003] DOE/EIS-0225/SA-03**: *Supplement Analysis for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE 2003c) **[2008] DOE/EIS-0225/SA-04**: *Supplement Analysis for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE 2008e)	**[1997] 62 FR 3880** ROD: DOE decided to implement the Preferred Alternative, including storage of up to 20,000 pits at Pantex.

NEPA Review	Overview	Decision Document(s)
	[2012] DOE/EIS-0225-SA-05: *Supplement Analysis for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE 2012a) **[2018] DOE/EIS-0225-SA-06**: *Final Supplement Analysis for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapons Components* (DOE 2018a)	
[1999] DOE/EIS-0293: *Final Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracts Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico* (DOE 1999a)	On November 26, 1997, Congress passed Public Law 105-119, the *Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act*, 1998 (the Act). This Act, in part, directs the Secretary of Energy to convey to the Incorporated County of Los Alamos, New Mexico (the County), or its designee, and transfer to the Secretary of the Interior, in trust for the Pueblo of San Ildefonso, parcels of land under the jurisdictional administrative control of the Secretary at LANL.	**[2000] 65 FR 14952** ROD: DOE selected the Preferred Alternative; seven tracts will be conveyed or transferred in full, and three tracts will be conveyed or transferred in part, based on DOE's continuing or future need for an individual tract, or a portion of the tract, to meet the national security mission support function at the LANL. **[2002] 65 FR 45495** AROD: NNSA amended the previous ROD to reflect that NNSA would no longer need to retain an 8 ac portion located at the western end of the Airport Tract. Additionally, two portions of the White Rock Y Tract comprising about 74 ac of highway easement are no longer required as health and safety buffer areas. **[2005] 70 FR 48378** AROD: NNSA amended the previous ROD to reflect that NNSA no longer needs to retain a 32.3 ac portion of the Airport Tract located along the south side of State Road 502 as a health and safety buffer area. **[2012] 77 FR 3257** AROD: NNSA amended the previous ROD to reflect that NNSA no longer needs to retain the remaining acreage of LANL's Technical Area 21 Tract (about 245 ac) and the remaining acreage of the Airport Tract (about 55 ac).

NEPA Review	Overview	Decision Document(s)
[2008] DOE/EIS-0380: *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2008a)	Site-Wide EIS that updated the 1999 Site-Wide EIS (DOE/EIS-0238 [DOE 1999b]) and evaluated the environmental consequences associated with the continued operation of LANL, including the production of plutonium oxide. Supports the **PDP – LANL** capability. **[2018] DOE/EIS-0380-SA-05**: *Supplement Analysis of the 2008 Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory* (DOE 2018d). This analysis was prepared in accordance with DOE's NEPA implementing procedures, which require evaluation of its site-wide EISs at least every 5 years by preparation of an SA. **[2020] DOE/EIS-0380-SA-06**: *Final Supplement Analysis of the 2008 Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory for Plutonium Operations* (DOE 2020b). NNSA determined that no further NEPA analysis is required prior to implementing elements of the Expanded Operations Alternative, as needed, to produce a minimum of 30 pits per year during 2026 and to implement surge efforts to exceed 30 pits per year.	**[2008] 73 FR 55833** ROD: DOE selected the No Action Alternative, continued operation, including the ability to produce plutonium oxide onsite, and to ship such materials from LANL to other sites within the DOE Complex. **[2009] 74 FR 33232** ROD: DOE decided to proceed with seismic upgrades to the Plutonium Facility in Technical Area 55 at LANL. **[2020] 85 FR 54544** AROD: DOE decided to implement elements of the 2008 LANL Site-Wide EIS Expanded Operations Alternative needed to produce a minimum of 30 pits per year during 2026 and to implement surge efforts to exceed 30 pits per year.
[1980] DOE/EIS-0026: *Final Environmental Impact Statement for the Waste Isolation Pilot Plant* (DOE 1980)	Evaluated environmental consequences of managing waste generated in the national defense program, including the development, operation, and transportation activities associated with the WIPP facility. Supports the **WIPP Disposition** capability.	**[1981] 46 FR 9162** ROD: DOE decided to proceed with the WIPP project.
[1990] DOE/EIS-0026-S1: *Final Supplement Environmental Impact Statement Waste Isolation Pilot Plant* (DOE 1990)	Evaluated new geological and hydrological information and information/assumptions used to analyze environmental consequences. Supports the **WIPP Disposition** capability.	**[1990] 55 FR 25689** ROD: DOE decided to continue the phased development of the WIPP facility to demonstrate the safe disposal of post-1970 TRU waste.
[1997] DOE/EIS-0026-S-2: *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997d)	Evaluated the environmental consequences of ways to dispose of TRU waste at the WIPP facility and how much TRU waste to dispose of at the WIPP facility. Supports the **WIPP Disposition** capability.	**[1998] 63 FR 3624** ROD: DOE will dispose of up to 175,600 m^3 (6.2 million ft^3) of TRU waste generated by defense activities at the WIPP facility after preparation (i.e., treatment, as necessary, including packaging) to meet WIPP's waste acceptance criteria.

NEPA Review	Overview	Decision Document(s)
	The following SAs support operations related to disposal of diluted plutonium oxide CH-TRU waste: **[2005] DOE/EIS-0026-SA05**: *Supplement Analysis for the Waste Isolation Pilot Plant Site-Wide Operations* (DOE 2005c). This analysis was prepared in accordance with DOE's NEPA implementing procedures, which require evaluation of its site-wide EISs at least every 5 years by preparation of an SA. **[2009] DOE/EIS-0026-SA-07**: *Supplement Analysis for the Waste Isolation Pilot Plant Site-Wide Operations* (DOE 2009c). This analysis was prepared in accordance with DOE's NEPA implementing procedures, which require evaluation of its site-wide EISs at least every 5 years by preparation of an SA. **[2014] DOE/EIS-0026-SA-09**: *Supplement Analysis for a Proposal to Temporarily Store Defense Transuranic Waste Prior to Disposal at the Waste Isolation Pilot Plant* (DOE 2014). This analysis examined a proposal to temporarily store a limited amount of TRU waste at the Waste Control Specialists, LLC facility in Andrews, Texas. Based on the analyses, DOE concluded that neither a supplemental EIS nor an amended ROD were necessary. **[2016] DOE/EIS-0026-SA-10**: *Supplement Analysis for the Waste Isolation Pilot Plant Site-Wide Operations* (DOE 2016a). This analysis evaluated the proposed action to resume the transportation of TRU waste to the WIPP facility by truck and the operation of the WIPP facility for the disposal of TRU waste. **[2017] DOE/EIS-0026-SA-11**: *Supplement Analysis for the New Permanent Ventilation System* (DOE 2017b). This analysis evaluated construction and operation of the proposed Permanent Ventilation System.	

NEPA Review	Overview	Decision Document(s)
	[2021] DOE/EIS-0026-SA-12: *Supplement Analysis for the Waste Isolation Pilot Plant Site-Wide Operation* (DOE 2021). This analysis evaluated the excavation of two underground replacement panels for the disposal of TRU waste.	
[1995] DOE/EIS-0217: *Savannah River Site Waste Management Final Environmental Impact Statement* (DOE 1995b)	Evaluated the environmental consequences of a site-wide approach to managing present and future wastes generated at SRS. Supports the **Waste Management** capabilities.	**[1995] 60 FR 55249** ROD: DOE decided to implement the moderate treatment configuration alternative. **[2001] 66 FR 34431** AROD: DOE decided to use exemptions granted consistent with the requirements of DOE Order 435.1, *Radioactive Waste Management*, to treat and dispose of some SRS wastes at commercial facilities or other DOE facilities.
[1997] DOE/EIS-0200: *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE 1997a)	Programmatic EIS that evaluated the environmental consequences of managing five types of waste generated by past, present, and future nuclear defense and research activities. Supports the **Waste Management** capabilities. **[2000] DOE/EIS-0200-SA-01**: *Supplement Analysis and Determination for the Proposed Characterization for Disposal of Contact-Handled Transuranic Waste at the Waste Isolation Pilot Plant (WIPP)* (DOE 2000b)	**[1998] 63 FR 3629** ROD: DOE designated DOE sites for preparation and storage of TRU waste prior to disposal. **[1998] 63 FR 41810** ROD: DOE decided to continue to use offsite facilities for treatment of major portions of non-wastewater hazardous waste. **[2000] 65 FR 82985** Revision of the ROD: DOE decided to establish the capability at the WIPP facility to prepare for disposal up to 1,250 m^3 of CH-TRU waste. **[2000] 65 FR 10061** ROD: DOE decision on treatment and disposal of low-level waste and mixed low-level waste. **[2001] 66 FR 38646** Revision of the ROD: DOE decided to transfer 300 m^3 of CH-TRU to the WIPP facility.
[1996] DOE/EIS-0240: *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE 1996a)	Evaluated the environmental consequences associated with the disposition of surplus U.S.-origin HEU. This supports the disposition of **HEU recovered during PDP**. **[2007] DOE/EIS-0240-SA1**: *Supplement Analysis – Disposition of Surplus Highly Enriched Uranium* (DOE 2007a)	**[1996] 61 FR 40619** ROD: DOE decided to implement a HEU Disposition Program to render surplus HEU non-weapons-usable by blending the HEU down to low-enriched uranium. **[2011] 76 FR 51358** AROD: DOE decided to increase the quantity of HEU available for down-blending and continue down-blending operations beyond the 20 years anticipated in the 1996 HEU EIS.

NEPA Review	Overview	Decision Document(s)
[2011] DOE/EIS-0387: *Final Site-Wide Environmental Impact Statement for the Y-12 National Security Complex* (DOE 2011b)	The Y-12 SWEIS analyzed the potential environmental impacts of alternatives for ongoing and foreseeable future operations and activities at Y-12, including impacts associated with radioactive materials transported from Y-12 to multiple offsite locations. **[2018] DOE/EIS-0387-SA-03**: *Supplement Analysis for the Site-Wide Environmental Impact Statement for the Y-12 National Security Complex* (DOE 2018c). This analysis was prepared in accordance with DOE's NEPA implementing procedures, which require evaluation of its site-wide EISs at least every 5 years by preparation of an SA.	**[2011] 76 FR 43319** ROD: DOE decided to continue operation of Y-12 and construct and operate a capability-sized UPF. **[2019] 84 FR 53133** AROD: DOE decided to continue to implement on an interim basis a revised approach for meeting EU requirements by upgrading existing EU processing buildings and constructing a new UPF.
[2020] DOE/EIS-0541: *Final Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site in South Carolina* (DOE 2020a)	Evaluated the potential environmental impacts of producing plutonium pits at SRS at a rate of at least 50 pits per year and developing a short-term surge capacity to enable production at a rate of at least 80 pits per year, beginning in 2030.	**[2020] 85 FR 70601** ROD: DOE decided to repurpose the Mixed-Oxide Fuel Fabrication Facility to produce a minimum of 50 pits per year at SRS for the nuclear weapons stockpile, and to develop the ability to implement a short-term surge capacity at a rate of not less than 80 pits per year beginning in 2030.

AROD = Amended Record of Decision; CH-TRU = contact-handled transuranic; DOE = U.S. Department of Energy; EIS = environmental impact statement; EU = enriched uranium; FR = *Federal Register;* HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; NEPA = *National Environmental Policy Act*; NNSA = National Nuclear Security Administration; ROD = Record of Decision; PDP = pit disassembly and processing; SA = Supplement Analysis; SRS = Savannah River Site; SWEIS = Site-Wide Environmental Impact Statement; TRU = transuranic; UPF = Uranium Processing Facility; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Complex.

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APPENDIX B

FACILITIES DESCRIPTION

In this *Surplus Plutonium Disposition Program Environmental Impact Statement* (SPDP EIS), the National Nuclear Security Administration (NNSA) evaluates the impacts of two alternatives related to the disposition of 34 metric tons (MT) of surplus plutonium—the Preferred Alternative and the No Action Alternative. These alternatives are described in Section 2.0 of this SPDP EIS. However, this appendix describes, in greater detail than Section 2.0, the existing, modified, and new facilities where activities associated with the alternatives are proposed. Table B-1 lists the facilities or areas associated with each alternative and provides the duration of any construction or modification activities necessary before operations commence. Proposed modifications to existing facilities and designs for new facilities are in various stages of design, and final designs may differ from those presented here. Any impacts resulting from changes in the final design, delays in implementation, or changes in throughput associated with these facilities would be compared to the impacts analyzed in this SPDP EIS. If new or significant impacts emerge, these impacts would be considered and analyzed in a subsequent environmental review.

Table B-2 provides the throughput (i.e., processing rate) of surplus plutonium, the total processing duration, and the total amount of plutonium processed for the Preferred Alternative and the No Action Alternative. Activities will be integrated with continuing operations at the Pantex Plant (Pantex), Los Alamos National Laboratory (LANL), Y-12 National Security Complex (Y-12), Savannah River Site (SRS), and the Waste Isolation Pilot Plant (WIPP) facility. The United States (U.S.) Department of Energy (DOE) has authorized WIPP to use fiscal year (FY) 2050 as a planning assumption for a closure date for project management plans related to capital asset projects and other strategic planning initiatives (DOE 2015b). Therefore, NNSA has chosen FY 2050 as the date for completion of the 34 MT mission described in this environmental impact statement (EIS). NNSA estimated operational durations based on throughputs that would result in mission completion in FY 2050. Throughput rates are based on currently available planning data including operating experience and estimates of the capability of new or modified equipment. However, throughput rates could change based on program funding, NNSA priorities, design changes, safety considerations, and other factors.

Table B-1. Duration of Construction and Modification Activities

Process Step in Facility and/or Area	Years for Preferred Alternative Construction/Modification	Years for No Action Alternative Construction/Modification
LANL – PDP in TA-55 (Modifications to PF-4)[a]	8	NA
LANL – NPMP in TA-55 (PF-4)[a]	Included in PDP construction	No construction[b]
LANL – Dilution in TA-55 (Modifications to PF-4)[a]	2[c]	NA
LANL – Logistical Support Center, TA-55[a]	2	NA
LANL – Office Building, TA-52[a]	2	NA
LANL – Weather Enclosure, TA-55[a]	2	NA
LANL – Warehouse, TA-52[a]	2	NA
LANL – Security Portal, TA-55[a]	2	NA
LANL – C&P in TA-55 (Drum Handling Facility)	2	NA

Process Step in Facility and/or Area	Years for Preferred Alternative Construction/Modification	Years for No Action Alternative Construction/Modification
SRS – PDP and NPMP in F-Area (modifications to Building 226-F and construction of various support buildings)[(d)]	8	NA
SRS – PDP and NPMP in K-Area (modifications to Building 105-K and construction of various support buildings)[(a)(e)]	8	NA
SRS – NPMP in K-Area in Building 105-K[(a)]	6[(f)]	6[(f)]
SRS – NPMP in K-Area Modular System	Would be fabricated and tested offsite - 1 year for site preparation and installation	NA
SRS – Dilution in K-Area (in Building 105-K)[(a)(g)]	Ongoing - Anticipated completion in 2027	Ongoing - Anticipated completion in 2027

C&P = characterization and packaging; EIS = Environmental Impact Statement; LANL = Los Alamos National Laboratory; NA = not available; NPMP = non-pit metal processing; PDP = pit disassembly and processing; PF-4 = Plutonium Facility; SPD = Surplus Plutonium Disposition; SRS = Savannah River Site; TA = Technical Area.

(a) These structures will support multiple process steps.
(b) No construction in PF-4 would be needed for NPMP under the No Action Alternative.
(c) The 2-year duration for development of the dilution capability in PF-4 is based on the duration for constructing the Drum Handling Facility. It is assumed that both activities would occur concurrently.
(d) An 8-year construction duration was assumed based on similar activities described in a preconceptual study for PDP and NPMP in K-Area (SRNS 2021|Section 3.1, item 4|).
(e) An 8-year construction duration was based on a preconceptual study for PDP and NPMP in K-Area (SRNS 2021|Section 3.1, item 4|).
(f) The 6-year period for construction for the NPMP capability in Building 105-K includes 3 years for the design of the NPMP project, which occurs concurrently with the dismantlement and removal of existing equipment, and 3 years to construct the capability.
(g) A description of the dilution capability construction activities can be found in the 2015 SPD Supplemental EIS (DOE 2015a|B.1.2.5|).

Sources: LANL 2023|Section 1.3|; SRNS 2023b|Section 2, 12.2|; SRNS 2021|Section 3|.

Table B-2. Maximum Annual Plutonium Throughput, Duration of Operations, and Total Amount Processed

Process Step in Facility	Preferred Alternative Maximum Annual Pu Throughput (MT/yr)[(a)]	Preferred Alternative Years of Operations[(a)]	Preferred Alternative Total Pu Processed (MT)	No Action Alternative Maximum Annual Pu Throughput (MT/yr)[(a)]	No Action Alternative Years of Operations[(a)]	No Action Alternative Total Pu Processed (MT)
Pantex – Pit Packaging	2.5[(b)]	27[(b)]	34	NA	NA	NA
LANL – PDP in PF-4	2[(c)]	27[(c)]	34	NA	NA	NA
LANL – NPMP in PF-4	(d)	(d)	(d)	0.4[(e)]	13[(e)]	7.1[(e)]
LANL – Dilution in PF-4	2[(c)]	27[(c)]	34	NA	NA	NA
LANL – C&P in PF-4	2[(c)]	27[(c)]	34	NA	NA	NA

Process Step in Facility	Preferred Alternative Maximum Annual Pu Throughput (MT/yr)[a]	Preferred Alternative Years of Operations[a]	Preferred Alternative Total Pu Processed (MT)	No Action Alternative Maximum Annual Pu Throughput (MT/yr)[a]	No Action Alternative Years of Operations[a]	No Action Alternative Total Pu Processed (MT)
SRS – PDP and NPMP in F-Area	2.5[f]	13[f]	34	NA	NA	NA
SRS – PDP and NPMP in K-Area	2.5[g]	15[g]	34	NA	NA	NA
SRS – NPMP in K-Area in Building 105-K	0.4[e]	13[e]	7.1[e]	0.4[e]	13[e]	7.1[e]
SRS – NPMP in K-Area Modular System	0.6[h]	13[h]	7.1[h]	NA	NA	NA
SRS – Dilution in K-Area	2.5[i]	27[i]	34[i]	0.4[j]	13[j]	7.1[j]
SRS – C&P in K-Area	2.5[k]	27[k]	34[k]	0.4[l]	13[l]	7.1[l]
WIPP facility – Receipt for disposal of CH-TRU waste	2 (LANL)[m] 2.5 (SRS)[n]	28	34	NA	NA	NA

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; NA = not available; NEPA = *National Environmental Policy Act;* NNSA = National Nuclear Security Administration; NPMP = non-pit metal processing; Pantex = Pantex Plant; PDP = pit disassembly and processing; PF-4 = Plutonium Facility; Pu = plutonium; SPD = Surplus Plutonium Disposition; SPDP EIS = Surplus Plutonium Disposition Program Environmental Impact Statement; SRS = Savannah River Site; WIPP = Waste Isolation Pilot Plant.

(a) Maximum annual throughput rates and durations are presented as rounded maximums for analysis. Actual throughput rates and durations vary as the capability ramps up. The rates may also fluctuate based on NNSA priorities, safety considerations, and other factors.

(b) The 2.5 MT/yr annual pit packaging throughput rate and duration for Pantex are assumed to be the maximum annual throughput rate for PDP at SRS.

(c) The throughput rate for PDP at LANL of 34 MT of pits is assumed to be 0.4 MT/yr by year 4 of the project and 2 MT/yr by year 19 of the project. Dilution would begin at 0.1 MT/yr in year 8 of the project and increase to 2 MT/yr by year 15 of the project (LANL 2023|Section 2.12.1.2|). Maximum throughput for C&P is assumed to match the maximum throughput for dilution. A temporary increase in the throughput rate may be needed if interruptions or downtime in processing are encountered. A surge of 2.5 MT for a nominal year is also analyzed in this SPDP EIS for PDP, dilution, and C&P (LANL 2023|Section 2|).

(d) The throughput rate for NPMP in PF-4 is bounded by the throughput and duration for PDP in PF-4 in the row above.

(e) The NPMP of 400 kg of non-pit surplus plutonium over a period of 13 years does not complete processing of the full 7.1 MT non-pit surplus plutonium. However, a portion of the 7.1 MT has already been processed and is in oxide form, as discussed in Section 2.1. Even without a decision on this document, LANL still has NEPA coverage to allow processing of up to 400 kg/yr of actinides (DOE 2008|p. 2-62|).

(f) A throughput of 2.5 MT/yr is assumed for PDP and NPMP in Building 226-F at SRS. This throughput rate assumes that some surplus plutonium is already in oxide form, as discussed in Section 2.1.

(g) Throughput is assumed to be equivalent to assumptions for PDP in F-Area. A 15-year operating duration was based on a preconceptual study (SRNS 2021|Section 3.1, item 5|).

(h) NPMP throughput using the modular system is 0.6 MT/yr (SRNS 2023b|Section 12.5|). A portion of the 7.1 MT non-pit surplus plutonium has already been processed and is in oxide form.

(i) Dilution at SRS is based on an assumed maximum of 2.5 MT/yr in three gloveboxes in the SPD dilute capability. The maximum process rate will not occur for all 27 years of operations.

(j) Dilution of the plutonium oxide resulting from NPMP for the No Action Alternative assumes the same throughput rate and duration as for the NPMP in the Preferred Alternative. However, the dilution processing will start a year after the NPMP begins and end a year after the NPMP ends.

(k) The throughput rate and duration for C&P in the Preferred Alternative are assumed to be the same as for dilution (SRNS 2023b|Section 2|).
(l) The throughput rate and duration for C&P in the No Action Alternative are assumed to be the same as for dilution.
(m) WIPP facility receipt of CH-TRU waste shipped from LANL matches the C&P rate of 2.0 MT/yr, with a potential surge for a nominal year to 2.5 MT/yr.
(n) WIPP facility receipt of CH-TRU waste shipped from SRS matches the C&P rate of 2.5 MT/yr.

B.1 Preferred Alternative

The Preferred Alternative involves the use of existing, modified, and new facilities at Pantex, LANL, SRS, and the WIPP facility. Figure B-1 shows the potential flow of material and waste between different facilities. The different pathways were the basis of the definition of the sub-alternatives for the Preferred Alternative. Each sub-alternative alone would not use all of the facilities illustrated.

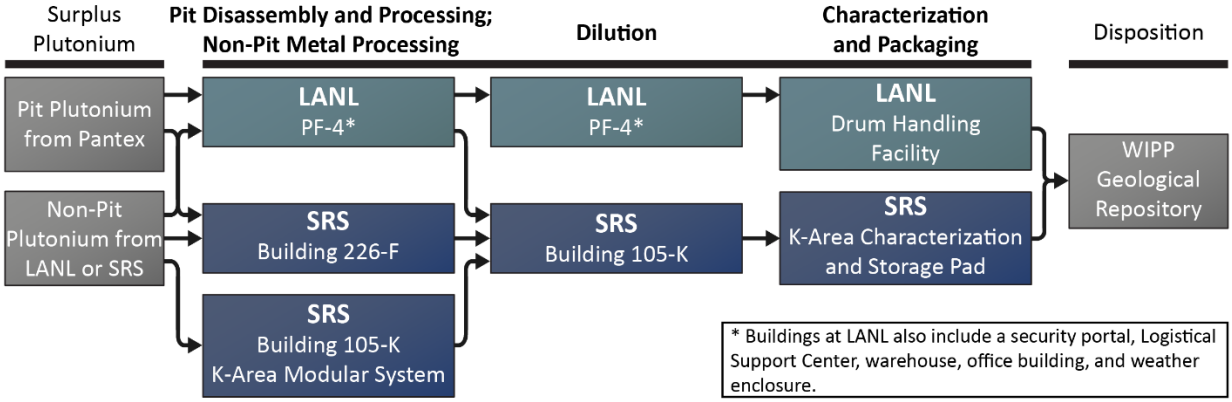

Figure B-1. Total Process Steps and Facilities Analyzed for the Sub-Alternatives under the Preferred Alternative

B.1.1 Capabilities at Pantex

Pantex is located near Amarillo, Texas. Pantex's location, affected environment, and its operations, including storage of surplus plutonium, are described in the *Final Supplement Analysis for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE 2018b). Pantex is the primary facility for final assembly, maintenance, and dismantlement of nuclear weapons in the United States. Pits are stored at Pantex. Surplus pits have been packaged at Pantex and shipped to LANL periodically since 1999 for processing by the Advanced Recovery and Integrated Extraction System (ARIES), a demonstration project to develop the technology that is needed for disassembly of pits and processing of the plutonium from the pit into an oxide form (LANL 2023|Section 1.1.2, Table 2-15|; ARQ 2008|p. 2|). Under the Preferred Alternative, the integration of additional packaging line(s), if needed to support the packaging of pits and their preparation for shipping to LANL or SRS, would occur in existing facilities as a continuation of ongoing activities that were the subject of previous *National Environmental Policy Act* (NEPA) reviews (DOE 2018b) and are therefore not reanalyzed in this SPDP EIS. Surplus pits would be packaged in Type B[2] packages in

[2] Type B packages are designed in accordance with Federal regulations (49 CFR Parts 100-177) governed by the U.S. Nuclear Regulatory Commission for transporting materials that could be a radiation hazard to the environment or the public if the contents were released.

packaging lines for shipment to LANL or SRS (CNS 2019; DOE 2018b). A brief discussion of Pantex's location and affected environment can be found in Section 3.1.

B.1.2 Capabilities at LANL

LANL is located in Los Alamos, New Mexico. A discussion of LANL's location and affected environment can be found in Section 3.2.

As discussed in Section 2.1.1, for the Preferred Alternative's Base Approach Sub-Alternative and All LANL Sub-Alternative, pit disassembly and processing (PDP) and non-pit metal processing (NPMP) would occur at LANL, the only site that has an existing capability. PDP but not NPMP would occur at LANL for the SRS NPMP Sub-Alternative. Dilution of plutonium oxide and its characterization and packaging (C&P) for shipment to the WIPP facility would only occur at LANL under the All LANL Sub-Alternative. These activities would be conducted in existing, modified, and new facilities at LANL located in Technical Area (TA)-55 and in TA-52. These areas are described in Section 3.0 and are shown in Figure 3-1. The proposed locations of the new facilities are presented in Section 2.0 in Figures 2-6 and 2-7.

Adequate storage capacity would be maintained to provide a buffer for approximately 6 months for inbound surplus plutonium, 12 months for outbound surplus plutonium as oxide for shipment to SRS, and approximately 2 years for plutonium as oxide if a dilution capability is developed at LANL (LANL 2023|Sections 1.1.2.1, 1.1.2.2|). Support facilities for the Preferred Alternative would be in TA-50, TA-52, TA-55, and TA-63. The facilities in TA-50 and TA-63 currently exist and no modifications are anticipated (LANL 2023|Sections 1.7.2, 1.7.4|). The facilities in TA-55 and TA-52 that require construction are discussed in the following subsections.

B.1.2.1 Pit Disassembly and Processing and Non-Pit Metal Processing

The operational activities associated with PDP and NPMP would occur in the existing Plutonium Facility (PF-4). LANL would build a Logistical Support Center (LSC), a warehouse building, an office building, a security portal, and a weather enclosure in TA-52 and TA-55 to support operational activities (LANL 2023|Section 1.1.2|). PDP and NPMP operations would occur on a single shift (LANL 2023|Section 1.1.2.1|).

Plutonium Facility

PF-4 is located in the main complex at TA-55 (DOE 2008|Section 2.4.15|). Building PF-4 would be the primary facility for PDP and NPMP (LANL 2023|Section 1.1.2|). PF-4 started operations in 1978 and was built to withstand credible seismic events at that time, as well as winds of up to 200 mph (NNSA 2016). Structural upgrades at PF-4 were started in 2010 and are ongoing in order to reduce the risks that could occur during a seismic event and to meet the DOE seismic code requirements (LANL 2023|Section 2.6.3|; LANL 2019|p. 1|).

PF-4 currently houses multiple programs or projects (LANL 2022), which include:

- The production of plutonium components for defense-related programs, including pits for the nuclear weapons stockpile with a current mission of producing 30 pits a year
- The radioisotope power systems program that supports DOE and the National Aeronautics and Space Administration in the design, surveillance, development, and surveillance of power and heat sources for use in remote and challenging environments

- DOE Isotope Program to separate and recover americium-241 from residues resulting from plutonium purification operations at LANL
- The 3013 Surveillance and Monitoring program to safely store plutonium-bearing materials across DOE Complex
- The ARIES program to disassemble plutonium pits and convert the resulting weapons-usable plutonium to oxide for disposition. This program has been operating since 1999 (LANL 2023|Section 1.1.2|).

The ARIES operations would be expanded to support the disposition of surplus plutonium under the Preferred Alternative. Existing rooms and systems in PF-4 would be modified and new or modified equipment would be installed to increase the production capacity to support the disassembly and processing of 34 MT of surplus plutonium. This expansion would include installation of 14 new gloveboxes and 6 material entry hoods and would increase the current space used for PDP from 5,200 ft^2 to 6,800 ft^2 (LANL 2023|Section 1.1.2 and 1.1.2.1|).[3] Direct metal oxidation and muffle furnaces located in the gloveboxes would be used to convert plutonium metal to oxide. NNSA anticipates that lathes or pit cutters would be replaced every 15 years and direct metal oxidation furnaces and muffle furnaces would be refurbished/replaced every 10 years (LANL 2023|Section 1.1.2.1|). Gloveboxes would be interconnected to allow for movement of material between process steps (LANL 2023|Section 1.1.2|). The gloveboxes would remain completely sealed and operate independently, except during material transfer operations. The gloveboxes would be maintained at lower pressure than that in the surrounding areas so that any potential leaks of gaseous or suspended particulate matter would be contained and filtered appropriately (LANL 2023|Section 1.1.2|). In addition, the exhaust air from gloveboxes would be continuously monitored to detect any unplanned releases of radioactive contamination (LANL 2023| Section 1.1.2|). An area would be designated for interim storage of the plutonium oxide in SAVY 4000 or equivalent non-welded nested containers within PF-4 (LANL 2023|Section 1.1.2.2|).

Logistical Support Center

The LSC would be constructed on previously disturbed land in TA-55 separate from, but adjacent to, PF-4 to provide offices, meeting areas, and locker rooms for the staff required to support PDP (LANL 2023|Section 1.1.2|). The LSC would be an approximately 21,600 ft^2 two-story facility with a building footprint of about 10,800 ft^2 (0.25 ac) (LANL 2023|Section 2.8.1|). The building would be constructed with a steel frame and steel siding and have rooftop heating, ventilation, and air-conditioning (HVAC) units. The LSC would not contain or process special nuclear material[4] (LANL 2023|Section 1.1.2|).

Office Building

A two-story office building would be constructed on undisturbed land at TA-52 just south of Puye Road (LANL 2023|Section 1.1.2, Figure 1-12|). The office building footprint would be approximately 12,000 ft^2

[3] The variation in the amount of equipment that would be used during processing activities at LANL and SRS is also reflected in the number of staff and number of shifts anticipated at each site.

[4] "Special nuclear material" is defined by Title I of the *U.S. Atomic Energy Act* of 1954 as "plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission [U.S. Nuclear Regulatory Commission] pursuant to the provisions of section 51, determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material."

(0.28 ac). A 12,600 ft^2 (0.29 ac) parking area would be constructed to the east of the office building with a 3,000 ft^2 (0.069 ac) road extension from Puye Road (LANL 2023|Section 2.8.1|).

Security Portal

A new 4,620 ft^2 (0.1 ac) security portal for vehicle and pedestrian traffic would be constructed on disturbed land on the west side of TA-55. Road widening for a parking area and a road extension near the security portal would occupy approximately 3,000 ft^2 (0.09 ac) and 6,000 ft^2 (0.14 ac), respectively (LANL 2023|Figure 1-11, Section 2.8.1|).

Warehouse

A new warehouse approximately 180 ft by 100 ft and 20 ft tall would occupy 18,000 ft^2 (0.4 ac) on undisturbed land in TA-52 just south of Puye Road (LANL 2023|Figure 1-12, Section 2.8.1|). A laydown area and staging area north of the warehouse (on the opposite side of Puye Road) would occupy 10,200 ft^2 (0.23 ac). A parking area on the east side of the Warehouse would occupy 12,600 ft^2 (0.29 ac). A road extension of 1,800 ft^2 (0.041 ac) would be added from Puye Road to the entrance of the warehouse parking area (LANL 2023|Figure 1-12|).

Weather Enclosure

A new approximately 4,000 ft^2 (0.1 ac) weather enclosure would be installed at the PF-4 loading dock to allow for continuation of operations regardless of the weather (LANL 2023|Sections 1.1.2, 2.8.1|).

B.1.2.2 Dilution of Plutonium Oxide

The operational activities associated with the dilution of oxidized plutonium would occur within PF-4. PF-4 would be modified to support this capability. Interim storage of the oxide would be in SAVY 4000 or equivalent non-welded nested containers in PF-4 (LANL 2023|Section 1.1.2.2|). Eleven additional gloveboxes would be dedicated to diluting the plutonium oxide. An additional 1,600 ft^2 would be needed to conduct dilution operations (LANL 2023). Dilution activities would operate with two 10-hour shifts, 4 days a week. Mixers would be installed in the gloveboxes to uniformly mix the plutonium oxide with an adulterant preloaded into the blend cans.

B.1.2.3 Characterization and Packaging

Operational activities associated with C&P of diluted plutonium oxide as contact-handled transuranic (CH-TRU) waste (also referred to as defense CH-TRU waste)[5] would occur in a new 20,000 ft^2 (0.5 ac) Drum Handling Facility (DHF) located on an existing 41,000 ft^2 (0.9 ac) laydown area in the northwest corner of TA-55 (LANL 2023|Sections 1.1.2.2, 2.8.2|). This area was previously disturbed and is not being used. The road extension for entry and exit roadways would occupy 7,000 ft^2 (0.2 ac) (LANL 2023|Section 2.8.2|). Characterization of the diluted plutonium oxide CH-TRU waste in criticality control overpack (CCO) containers would be performed to verify that the waste meets WIPP Waste Acceptance Criteria (WAC), prior to loading them into approved waste containers (e.g., Transuranic Package Transporter Model-II [TRUPACT-II]) for transport to the WIPP facility (LANL 2023|Section

[5] The WIPP facility is authorized to accept TRU waste that was generated from atomic energy defense activities. All CH-TRU wastes described in this SPDP EIS are defense-related wastes. Throughout this SPDP EIS, the defense-related TRU wastes described as shipped from LANL or SRS to WIPP are referred to as CH-TRU waste.

1.1.2.2|). The DHF would provide capabilities for waste staging, characterization to meet WIPP WAC, and loading of the diluted plutonium oxide CH-TRU waste for transport in TRUPACT-II containers. Neutron counters, radiography, gamma spectrometers, and an integrated waste assay system would be installed to verify the diluted plutonium oxide CH-TRU waste before shipment to the WIPP facility (LANL 2023|Section 1.1.2.2|).

B.1.2.4 Support Facilities at LANL

Existing LANL facilities that would support Preferred Alternative activities include a Radioactive Liquid Waste Treatment Facility, Radiological Laboratory/Utility/Office Building, and Transuranic Waste Facility, as described below.

- **Radioactive Liquid Waste Treatment Facility (RLWTF)**. The RLWTF, located in TA-50, is currently the principal facility for collecting, storing, treating, and disposing of radioactive liquid waste at LANL (DOE 2008|Table 2-2|). The small amounts of liquid waste that would be produced during PDP at LANL would be processed through the RLWTF (LANL 2023|Section 2.2.3|). The RLWTF capabilities are being upgraded under a separate project to support site-wide needs (LANL 2023|Section 2.18.1.1.11).
- **Radiological Laboratory/Utility/Office Building (RLUOB)**. The RLUOB, located in TA-55, is an administrative and support function building, and office space will be provided in this building for the Surplus Plutonium Disposition Program (SPDP). No modifications are needed to the RLUOB to support the surplus plutonium disposition activities discussed in this SPDP EIS. However, it may be reconfigured for other projects, and if so, the space could be used for equipment for analytical chemical and materials characterization capabilities that could support the PDP, the NPMP, and the dilution process (LANL 2023|Section 1.8, Table 1-5|; DOE 2018a).
- **Transuranic Waste Facility (TWF)**. The TWF, located in TA-63, is used for storing, processing, and shipping transuranic (TRU) waste (LANL 2023|Section 1.8|). LANL would not use services from the TWF for the diluted plutonium oxide CH-TRU waste but would use the TWF for CH-TRU job control waste (LANL 2023|Section 1.8, Table 1-5|). CH-TRU job control waste would be staged at the TWF prior to shipment to the WIPP facility for disposal. As described in Section B.1.2.3, the DHF would be used for handling and shipping the diluted plutonium oxide CH-TRU waste (LANL 2023|Section 1.1.2.2, Table 1-5|). A replacement Transuranic Liquid Waste Facility is currently in the design phase (LANL 2023| 2.18.1.1.11|).

B.1.3 Capabilities at SRS

SRS is located near Aiken, South Carolina. A discussion of SRS's location and affected environment can be found in Section 3.3.

For the Preferred Alternative's All SRS Sub-Alternative, PDP and NPMP could occur in Building 226-F (Savannah River Plutonium Processing Facility [SRPPF]) in F-Area at SRS, or in Building 105-K in K-Area, specifically using the disassembly basin area. In SRS NPMP Sub-Alternative, NPMP could occur in either Building 105-K (not the disassembly basin area) or in a modular system installed adjacent to Building 105-K in K-Area.

In all sub-alternatives except the All LANL Sub-Alternative, dilution would occur in a portion of Building 105-K that is currently being modified to support dilution of plutonium oxide. C&P of the diluted plutonium oxide CH-TRU waste would occur on an existing enclosed storage pad in the K-Area Complex (KAC).

B.1.3.1 Pit Disassembly and Processing and Non-Pit Metal Processing

This SPDP EIS analyzes two different locations at SRS for the capability for PDP and NPMP as part of the All SRS Sub-Alternative. One option is modification of Building 226-F (SRPPF) in F-Area and a second option is modification of Building 105-K in K-Area.

Building 226-F in F-Area

Construction of Building 226-F (SRPPF) as the Mixed Oxide Fuel Fabrication Facility (MFFF) began in August 2007. Construction ceased on October 10, 2018, when DOE terminated the contract for the MFFF. The MFFF was designed to safety and security standards (including Seismic Performance Category 3+) to meet U.S. Nuclear Regulatory Commission requirements. The exterior walls and roof have been designed and constructed to resist all credible manmade and natural phenomena hazards. Design changes are currently being evaluated for modifying Building 226-F (SRPPF) for the primary function of pit production, as discussed in a recent EIS (DOE 2020).

There is currently no formal conceptual design for the modification of Building 226-F (SRPPF) at SRS to provide capabilities for PDP and NPMP. This SPDP EIS assumes that adequate space is available for processing as well as for interim storage of incoming and outgoing materials in addition to that required for pit production operations. However, the total square footage and percentage of the building that may be available are not known at this time. Additional areas for support activities, including office spaces, change rooms, mechanical shops, an emergency generator to supply power to critical safety systems in the event of a power outage, a warehouse, waste storage, and parking, would be needed. Additional support systems would include an active confinement ventilation, HVAC, radiation monitoring, criticality alarm system, safeguards, and security system, electrical, fire detection, suppression, and water collection system, compressed gas and air systems, and gas supply. Some of these systems may be shared with other activities occurring in Building 226-F (SRPPF) (DOE 2012|Section 2.4.1.2|).

PDP and NPMP in F-Area were analyzed in the *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (2015 SPD Supplemental EIS or 2015 SPD SEIS [DOE 2015a]) as occurring in a stand-alone building in F-Area to convert surplus pit and non-pit plutonium to an oxide form that would be suitable for feed for mixed oxide fuel, immobilization, or disposal at the WIPP facility. However, the concept of using Building 226-F for PDP and NPMP in this SPDP EIS has more in common with the 2015 SPD SEIS analysis of PDP and NPMP in an existing building in K-Area. Because a conceptual design for PDP and NPMP in an existing building in F-Area does not exist, the assumptions for modification of Building 226-F are based on PDP and NPMP in K-Area from the 2015 SPD SEIS (DOE 2015a), with some adjustments to more realistically reflect the construction and modification activities that are anticipated to occur in F-Area. For example, approximately 20 ac of previously disturbed land are assumed to be needed in F-Area for buildings, parking areas, and temporary construction and laydown areas, based on the ability to use existing infrastructure.

Operations for PDP and NPMP in F-Area would be similar to those described previously for PDP and NPMP at PF-4 in LANL in Section 2.1.1.2.2, although they are assumed to occur on a 24-hr, 7-days-a-week schedule using five shifts. Plutonium oxide produced during operations in F-Area would be loaded into an appropriate NNSA Office of Secure Transportation transporter for the 7.6 mi transport to Building 105-K in K-Area where dilution would occur.

Building 105-K in K-Area

The second option for the PDP and NPMP at SRS is the modification of the existing Building 105-K in K-Area. Building 105-K was constructed as K-Reactor in the 1950s for the purpose of producing tritium and plutonium. K-Reactor was initially shut down in 1988 and then underwent seismic and structural upgrades for its restart in 1991. K-Reactor was operated last in 1992 and placed in cold-standby condition in 1993 and then shut down in 1996 and subsequently deactivated. Nuclear fuel and equipment needed for reactor operation were removed, as were irradiated materials stored in the disassembly basin. The structure and security at the KAC have been upgraded for plutonium storage. Surveillance capabilities have also been upgraded. Building 105-K is also used for storage of heavy water that has been excessed from reactors at SRS (DOE 2015a|Section B.1.2|).

A conceptual design for PDP and NPMP in K-Area does not exist, but this analysis assumes that the disassembly basin area in Building 105-K would be used for the installation of the PDP and NPMP capability based on a preconceptual study (SRNS 2021). Necessary modifications would include removal of existing components and or scrap and removal of water that currently exists in Building 105-K disassembly basins, using an evaporation process similar to that used during decommissioning at two other reactor facilities at SRS, including C- and P-Reactors. Once the water is removed, grout would be poured into the basins to form a floor. Support buildings such as a ventilation building and a diesel generator building, would be built adjacent to or in the vicinity of Building 105-K. Additional support facilities such as a waste-staging building, a warehouse, an office building, and parking lots may be placed in K-Area to support PDP and NPMP (SRNS 2013). Similar to the F-Area option, approximately 20 ac are also assumed to be available in K-Area for buildings, parking areas, temporary construction, and laydown areas.

Operations for PDP and NPMP in K-Area would be similar to those described previously for PDP and NPMP at PF-4 in LANL, as described in Section 2.1.1.2.2, but plutonium oxide produced in K-Area would be fed into the dilution capability that would be located in the same building.

B.1.3.2 Non-Pit Metal Processing

Two options are considered in this SPDP EIS for stand-alone NPMP capabilities (not combined with PDP as discussed in the previous section) for the SRS NPMP Sub-Alternative. These two options could occur in the K-Area: inside Building 105-K or in a modular system adjacent to Building 105-K.

Building 105-K

If a NPMP capability is not developed as part of a PDP capability at LANL or SRS, then a separate NPMP capability could be installed at Building 105-K in K-Area for the SRS NPMP Sub-Alternative.

Adding a stand-alone NPMP capability at Building 105-K would involve installation of one or more gloveboxes containing a furnace along with other equipment. The K-Area Interim Storage (KIS) facility in Building 105-K, which is currently being used for downblending 6 MT of non-pit surplus plutonium (81 FR 19588) and up to 7.1 MT of non-pit surplus plutonium (85 FR 53350), would be modified to provide a capability for NPMP. This could occur after the SPD dilute capability that is currently being constructed in K-Area becomes operational (SRNS 2023b|Section 3.1|). Once the SPD dilute capability is operational, the KIS glovebox and support systems would be dismantled, removed, and the installation of equipment for NPMP in the KIS portion of the facility could begin. Support systems such as HVAC, electrical, and fire protection would be installed within the footprint that currently exists for similar

support systems. No conceptual design for the NPMP capability exists, but based on preliminary estimates, a total of 816 ft^2 is available in the KIS portion of the facility for the processing equipment. An additional 816 ft^2 are needed for the support systems. The NPMP capability could likely locate the HVAC system on the roof of the KIS facility in the same manner that the KIS HVAC systems are currently located on the roof. A new diesel generator would be installed to supply power during a loss of normal power. Features would be installed to control releases of airborne contaminants, control releases of waterborne contaminants, prevent criticality, provide safeguards, and provide fire protection (SRNS 2023b|Section 3.1|).

K-Area Modular System

A second option for a stand-alone NPMP capability is a modular system that could be constructed and tested offsite and then assembled within the boundaries of the KAC. The modular system would comply with DOE regulations as part of a Hazardous Category 2 facility and would be located inside the K-Area Perimeter Intrusion Detection and Assessment System area adjacent to Building 105-K. The modular system would include physical barriers and appropriate safeguards and security components. Because there is currently no conceptual design for this option, the decision has not been made about the exact location. The modular units would require full concrete pads totaling approximately 4,500 ft^2. The entire land area required for the modules and a perimeter security barrier, would be approximately 14,450 ft^2 in a 170 ft by 85 ft perimeter configuration (SRNS 2023b|Section 3.2|).

The modular units would be constructed out of approximately 20 ft by 8 ft by 8 ft intermodal shipping containers. These units would be modified as needed to include HVAC systems, power, and insulation, and would include features such as additional steel wall thicknesses and rock wool insulation for additional security and fire protection. The modular units would be constructed of steel exteriors that are certified for load stacking, as needed, for transportation by truck, sea, or air. The overall area is estimated to be approximately 37 ft × 81 ft and would include a surrounding security fence (SRNS 2023b|Section 3.2|).

There would be approximately twelve 20 ft modular units on the first level and three 20 ft modules on the second level. These modules would be interconnected physically to enhance the rigidity of the overall modular structure. The modular units would support the processing activities, as well as storage, receipt and packaging, air locks, safeguards and security, and would provide utilities, including the electrical distribution, HVAC and high-efficiency particulate (HEPA) air filters, and exhaust fans (SRNS 2023b|Section 3.2|).

B.1.3.3 Dilution of Plutonium Oxide

The operational activities associated with the dilution of plutonium oxide are occurring in Building 105-K in K-Area. NNSA is diluting up to 7.1 MT non-pit surplus plutonium discussed in the Record of Decision (ROD) issued on August 28, 2020 (85 FR 53350) and the 6 MT non-pit surplus plutonium discussed in the ROD issued on April 5, 2016 (81 FR 19588) in one glovebox. Three additional gloveboxes are being installed and the future operations would occur on a 24-hr, 7-days-a-week schedule.[6] This additional dilution capability is being installed in close proximity to the KIS section of the facility that is discussed in Section B.1.3.2. The installation of the additional dilute capability is ongoing pursuant to previous NEPA analyses (DOE 2015a) and the ROD for disposition of the 6 MT (81 FR 19588). The proposed dilution

[6] The variation in the amount of equipment that would be used during processing activities at LANL and SRS is reflected in the number of staff and number of shifts anticipated at each site.

activities in K-Area would be functionally identical to the dilution process currently being conducted in the KIS glovebox in Building 105-K. The dilution process is described in Section 2.1.1.2.2 and would occur on a 24-hr, 7-days-a-week schedule (SRNS 2023a|Section 3|).

B.1.3.4 Characterization and Packaging

The operational activities associated with C&P would occur on a 24-hr, 7-days-a-week schedule (SRNS 2023a|Table 3) at the K-Area Characterization and Storage Pad, an existing concrete storage pad under a soft enclosure in K-Area (SRNS 2017a; SRNS 2017b; SRNS 2023b|Section 1|). This storage pad was completed in 2021. Loaded CCO containers would be transferred to the storage pad in K-Area, where characterization would verify compliance with WIPP WAC (DOE 2016). CCO containers would then be packaged into approved transuranic (TRU) waste transport containers (e.g., TRUPACT-II) and loaded for shipment to the WIPP facility (SRNS 2023b|Section 1, 20.3|). Capacity for storing approximately 1 years' worth of diluted plutonium oxide CH-TRU waste would be maintained as part of the C&P capability (SRNS 2023b|Section 1|).

B.1.3.5 Support Facilities

The E-Area Solid Waste Management Facility provides waste management capabilities for CH-TRU waste, LLW, and mixed LLW (MLLW) at SRS. CH-TRU job control waste generated during pit disassembly and processing, NPMP, or dilution would be sent to E-Area before being shipped to the WIPP facility (|p. B-27|; (SRNS 2023b|Section 20.3|). Small amounts of MLLW are anticipated from PDP activities, discussed in Section B.1.3.1. These wastes would be sent to E-Area before being shipped offsite. The transportation analysis assumes that they would be shipped to the Nevada National Security Site in Nevada, as discussed in Section 2.1.1.2.6. The LLW would be disposed of in E-Area facilities (SRNS 2023|Section 20.3|).

B.1.4 Capabilities at the WIPP Facility

The WIPP facility, located in southeastern New Mexico, is the only facility authorized to dispose of TRU waste generated by *U.S. Atomic Energy Act* defense activities. As discussed in Section 2.1.1.1, diluted plutonium oxide CH-TRU waste and CH-TRU job control waste generated under the Preferred Alternative would be disposed at the WIPP facility. The WIPP repository is located in ancient salt beds, 2,150 ft below the ground surface (DOE 2015a|p. B-30|). The *WIPP Land Withdrawal Act* (Public Law No. 102-579) authorized the disposal of up to 175,600 m^3 of TRU waste generated by the nation's atomic energy defense activities. The disposal of TRU waste from the DOE Complex at the WIPP facility is analyzed in the 1990 Final Supplement EIS, WIPP (DOE 1990), the 1997 *WIPP Disposal Phase Final Supplemental EIS* (DOE 1997), and subsequent supplement analyses.

B.1.5 Capabilities at the Y-12 National Security Complex

As discussed in Section 2.1.1.2.4 under the Preferred Alternative, highly enriched uranium (HEU) recovered during pit disassembly would be decontaminated, oxidized, and prepared for shipment to Y-12 at Oak Ridge, Tennessee (LANL 2023|Section 1.1.2.1, 2.15.1.2.2|). Y-12 is the primary site in the Nation for enriched uranium operations, including safe and secure storage and management of special nuclear material and waste from operations and the disposition of surplus materials (DOE 2018c). Any activities that would occur at Y-12 would be a continuation of ongoing activities that were the subject of previous NEPA reviews (DOE 2011; DOE 2018c) and are therefore not reanalyzed in this SPDP EIS.

B.2 No Action Alternative

The No Action Alternative is the continued management of 34 MT of surplus plutonium. It involves the use of existing, modified, and new facilities at Pantex, LANL, SRS, and the WIPP facility.

Under the No Action Alternative, most pits would continue to be stored at Pantex, although the shipment of some pits from Pantex to LANL and the ongoing processing of up to 400 kg/yr of actinides (including surplus plutonium) at PF-4 at LANL would continue (DOE 2008|p. 2-62|), as explained in Section B.1.1. The No Action Alternative includes NPMP, dilution, and C&P of up to 7.1 MT of non-pit surplus plutonium. The process steps and facilities for processing the non-pit surplus plutonium are shown in Figure B-2.

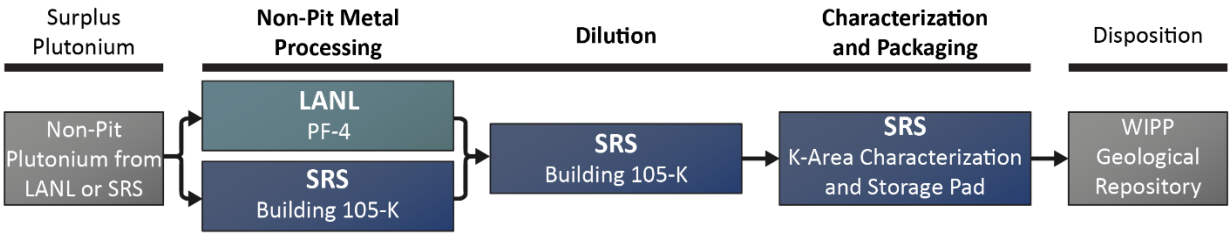

Figure B-2. Process Steps and Facilities Analyzed Under the No Action Alternative

B.2.1 Capabilities at Pantex

Under the No Action Alternative, surplus pits would remain in storage at Pantex under its existing management plan as evaluated in the *Final Supplement Analysis for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE 2018b).

B.2.2 Capabilities at LANL

For the No Action Alternative, NPMP of up to 7.1 MT of non-pit surplus plutonium could occur at LANL (85 FR 53350).

B.2.2.1 Non-Pit Metal Processing

If NPMP occurs at LANL, the associated operational activities would primarily take place in PF-4. These activities would be conducted using existing equipment located in gloveboxes that are currently being used for the ARIES project described in Section B.1.2.1; thus, no construction or modification activities would be needed. Using existing facilities, plutonium oxide would be packaged and shipped in Type B packages to SRS for dilution (LANL 2023|Section 2.15.1.2.3|).

B.2.2.2 Support Facilities at LANL

Existing LANL facilities that support NPMP include the RLWTF, RLUOB, and TWF, as described in Section B.1.2.4.

B.2.3 Capabilities at SRS

For the No Action Alternative, NPMP of up to 7.1 MT of non-pit surplus plutonium could occur at SRS, and dilution and C&P of surplus plutonium would occur at SRS (85 FR 53350). These capabilities would be located in existing and modified facilities within K-Area.

B.2.3.1 Non-Pit Metal Processing, Dilution, and Characterization and Packaging

The operational activities associated with NPMP and dilution for the No Action Alternative could be conducted in Building 105-K, as described in Sections B.1.3.2 and B.1.3.3. The operational activities associated with C&P would be conducted in K-Area, as discussed in Section B.1.3.4.

B.2.3.2 Support Facilities

The only SRS support facility that would support the No Action Alternative is E-Area, as described in Section B.1.3.4.

B.2.4 Capabilities at the WIPP Facility

The capabilities at the WIPP facility necessary for the No Action Alternative are the same as those for the Preferred Alternative and are discussed in Section B.1.4.

B.3 References

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APPENDIX C

DETAILED ENVIRONMENTAL CONSEQUENCES TABLES

This appendix contains tables showing the detailed potential impacts for applicable resource areas in this *Surplus Plutonium Disposition Program Environmental Impact Statement* (SPDP EIS). The tables for Los Alamos National Laboratory (LANL) are presented in Section C.1. Tables for Savannah River Site (SRS) are presented in Section C.2. Cross-site tables are presented in Section C.3, followed by references in Section C.4.

Roadmaps are provided as Table C-1 and Table C-13 to assist readers in orienting to the activities that would occur at each site for each of the sub-alternatives of the Preferred Alternative, as well as for the No Action Alternative. The activities shown in gray italicized text in the roadmap figures indicate that the activity does not occur at the site being discussed. The impact tables in this appendix reflect these same activities as being not applicable to the site by identifying them as "NA."

The resource-specific tables that follow display the contributions from each facility or capability. When added together, the contributions from the facilities or capabilities are used to generate the totals presented in Section 4 for LANL and SRS for each sub-alternative.

C.1 Los Alamos National Laboratory

Table C-1. Roadmap for Alternative/Sub-Alternative Capabilities Conducted at LANL

Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP Sub-Alternative	Preferred Alternative All LANL Sub-Alternative	No Action Alternative
PDP	LANL	LANL	LANL	*(No PDP)*
NPMP	LANL	*(SRS)*	LANL	LANL
Dilution	*(SRS)*	*(SRS)*	LANL	*(SRS)*
C&P	*(SRS)*	*(SRS)*	LANL	*(SRS)*

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

Table C-2. Land Disturbance at LANL by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[(a)] Base Approach and SRS NPMP Sub-Alternatives[(b)]	Preferred Alternative[(a)] All LANL Sub-Alternative	No Action Alternative
Land Disturbance (ac)	PDP	5.1	5.1	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	(e)	NA

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
	C&P	NA	0.6[f]	NA
	Total	**5.1**	**5.1[f]**	**(d)**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not available; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site; TA-55 = Technical Area 55.

(a) A column for the All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The construction/modification impacts associated with the Base Approach and SRS NPMP Sub-Alternatives would be the same.

(c) Construction/modification activities for NPMP at LANL are not distinct from PDP construction/modification activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL.

(d) No construction/modification activities are anticipated.

(e) Dilution activities occur within PDP facilities and would have no additional impacts from associated building modifications.

(f) The Drum Handling Facility for C&P in the All LANL Sub-Alternative replaces one of the TA-55 laydown areas in the Base Approach Sub-Alternative after it is first used as a laydown area under the All LANL Sub-Alternative, so the total area for the Base Approach and the All LANL Sub-Alternatives are the same.

Note: Values are rounded to the nearest tenth of an acre.

Source: LANL 2023.

Table C-3. Geologic Materials Used at LANL by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
Geologic Materials Used (sand, gravel, crushed stone) (yd^3)	PDP	30,000	30,000	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	(e)	NA
	C&P	NA	11,000	NA
	Total	**30,000**	**41,000**	**(d)**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not available; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The construction/modification impacts associated with the Base Approach and the SRS NPMP Sub-Alternatives would be the same.

(c) Construction/modification activities for NPMP at LANL are not distinct from PDP construction/modification activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL.

(d) No construction/modification activities are anticipated.

(e) Dilution activities would occur within PDP facilities and would have no additional impacts from associated building modifications.

Note: Values rounded to two significant digits.

Source: LANL 2023|Section 2.13|.

Table C-4. Estimated Annual Criteria Air Pollutant Emissions at LANL During Construction/Modification for the Preferred and No Action Alternatives (T/yr)

Pollutant	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b] Capability: PDP (includes NPMP)	Preferred Alternative[a] All LANL Sub-Alternative Capability: PDP (includes NPMP) and Dilution	Preferred Alternative[a] All LANL Sub-Alternative Capability: C&P	Preferred Alternative[a] All LANL Sub-Alternative Total	No Action Alternative Capability: NPMP
CO	11	11	3.1	14	(c)
NO_x	20	20	5.5	25	(c)
PM_{10}	1.8	1.8	0.50	2.3	(c)
$PM_{2.5}$	1.7	1.7	0.49	2.2	(c)
SO_x	1.7	1.7	0.48	2.2	(c)
VOCs	2.9	2.9	0.81	3.7	(c)

C&P = characterization and packaging; CO = carbon monoxide; LANL = Los Alamos National Laboratory; NO_x = nitrogen oxide; NPMP = non-pit metal processing; PDP = pit disassembly and processing; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_x = sulfur oxide; SRS = Savannah River Site; VOC = volatile organic compound.

(a) A column for the All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The construction/modification impacts associated with the Base Approach and SRS NPMP Sub-Alternatives would be the same.

(c) No construction/modification activities are anticipated.

Note: Values rounded to two significant digits.

Source: Construction emissions are from LANL 2023|Section 2.2| according to the peak construction year (LANL 2023|Section 1.3|).

Table C-5. Radiation Dose and Impacts at LANL by Capability During Construction/Modification for the Preferred and No Action Alternatives

Receptor (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
Worker – Dose Rate (rem/yr)	PDP	0.38	0.38	NA
	NPMP	(c)	(c)	None[d]
	Dilution	NA[e]	0.38	NA[e]
	C&P	NA[e]	0	NA[e]
	Total	**(f)**	**(f)**	**(f)**
Worker – Project Dose (rem and LCF risk)	PDP	2.3/ 0.001	2.3/ 0.001	NA
	NPMP	(c)	(c)	None
	Dilution	NA[e]	0.8/ 0.0005	NA[e]
	C&P	NA[e]	0	NA[e]
	Total	**2.3/ 0.001**	**3.0/ 0.002**	**None**
Workforce – Project Collective Dose (person-rem and number of LCFs)	PDP	13/ 0 (0.008)	13/ 0 (0.008)	NA
	NPMP	(c)	(c)	None[d]
	Dilution	NA[e]	3.0/ 0 (0.002)	NA[e]
	C&P	NA[e]	0	NA[e]
	Total	**13/ 0 (0.008)**	**16/ 0 (0.01)**	**None**
Public – MEI Dose (rem and LCF risk)	PDP	(g)	(g)	NA
	NPMP	(c)	(c)	None[d]
	Dilution	NA[e]	0	NA[e]
	C&P	NA[e]	0	NA[e]
	Total	**(g)**	**(g)**	**None[d]**
Public – Population Dose (person-rem and number of LCFs)	PDP	(g)	(g)	NA
	NPMP	(c)	(c)	None[d]
	Dilution	NA[e]	0	NA[e]
	C&P	NA[e]	0	NA[e]
	Total	**(g)**	**(g)**	**None[d]**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; NNSA = National Nuclear Security Administration; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The construction/modification impacts associated with the Base Approach and the SRS NPMP Sub-Alternatives would be the same.

(c) Construction/modification activities for NPMP at LANL are not distinct from PDP construction/modification activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL.

(d) No construction/modification activities and no potential dose/impact.

(e) Not applicable because dilution and C&P would not occur at LANL except under the All LANL Sub-Alternative. No potential dose/impact from activities at LANL.

(f) Totals are not listed, because different individuals would work on different capabilities or work during different years.

(g) LCFs to the public and the MEI from construction activities for the sub-alternatives were not calculated because doses and corresponding LCFs to workers at the site were extremely low and the expectation is that a negligible dose and corresponding LCF would be received by noninvolved workers, the MEI, and other members of the public.

Notes: Numbers are rounded to one or two significant digits. Columns may not sum to totals due to rounding of individual values and totals. LCFs calculated using a conversion of 0.0006 LCFs per rem or person-rem (DOE 2003). NNSA considers LCFs <0.5 to be 0 for the Workforce – Project Collective Dose and Public – Population Dose.

Source: LANL 2023.

Table C-6. Radiation Dose and Impacts at LANL by Capability During Operations for the Preferred and No Action Alternatives

Receptor (Units)	Capability	Preferred Alternative[(a)] Base Approach and SRS NPMP Sub-Alternatives[(b)]	Preferred Alternative[(a)] All LANL Sub-Alternative	No Action Alternative
Worker – Dose Rate (rem/yr)	PDP	0.45	0.45	NA
	NPMP	(c)	(c)	0.45
	Dilution	NA[(d)]	0.66	NA[(d)]
	C&P	NA[(d)]	0.28	NA[(d)]
	Total	**(e)**	**(e)**	**(e)**
Worker – Project Dose (rem and LCF risk)	PDP	7.7/ 0.005	7.7/ 0.005	NA
	NPMP	(c)	(c)	8.1/ 0.005
	Dilution	NA[(d)]	11/ 0.007	NA[(d)]
	C&P	NA[(d)]	4.8/ 0.003	NA[(d)]
	Total	**(e)**	**(e)**	**(e)**
Workforce – Project Collective Dose (person-rem and number of LCFs)	PDP	2,000/ 1 (1.2)	2,000/ 1 (1.2)	NA
	NPMP	(c)	(c)	780/ 1 (0.5)
	Dilution	NA[(d)]	970/ 1 (0.6)	NA[(d)]
	C&P	NA[(d)]	150/ 1 (0.09)	NA[(d)]
	Total	**2,000/ 1 (1.2)**	**3,100/ 2 (1.8)**	**780/ 0 (0.46)**
Public – MEI Dose Rate (rem/yr)	PDP	2.9×10^{-6}	2.9×10^{-6}	NA
	NPMP	(c)	(c)	7.1×10^{-7}
	Dilution	NA[(d)]	3.5×10^{-6}	NA[(d)]
	C&P	NA[(d)]	0	NA[(d)]
	Total	**2.9×10^{-6}**	**6.4×10^{-6}**	**7.1×10^{-7}**
Public – MEI Dose (rem and LCF risk)	PDP	0.000047/ 3×10^{-8}	0.000047/ 3×10^{-8}	NA
	NPMP	(c)	(c)	0.000013/ 8×10^{-9}
	Dilution	NA[(d)]	0.000060/ 4×10^{-8}	NA[(d)]
	C&P	NA[(d)]	0	NA[(d)]
	Total	**0.000047/ 3×10^{-8}**	**0.00011/ 6×10^{-8}**	**0.000013/ 8×10^{-9}**

Receptor (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
Public – Population Dose (person-rem and number of LCF)	PDP	0.16/ 0 (0.0001)	0.16/ 0 (0.0001)	NA
	NPMP	(c)	(c)	0.044/ 0 (0.00003)
	Dilution	NA[d]	0.21/ 0 (0.0001)	NA[d]
	C&P	NA[d]	0 (0)	NA[d]
	Total	**0.16/ 0 (0.0001)**	**0.37/ 0 (0.0002)**	**0.044/ 0 (0.00003)**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; NNSA = National Nuclear Security Administration; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for All SRS Sub-Alternative is not included because no capabilities would occur at LANL.
(b) The operation impacts associated with the Base Approach and SRS NPMP Sub-Alternatives would be the same.
(c) Operations activities for NPMP at LANL are not distinct from PDP operations activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL.
(d) Not applicable because dilution and C&P would not occur at LANL except under the All LANL Sub-Alternative. No potential dose/impact from activities at LANL.
(e) Totals are not listed, because different individuals would work on different capabilities.

Notes: Numbers are rounded to one or two significant digits. Columns may not sum to totals due to rounding of individual values and totals. LCFs calculated using a conversion of 0.0006 LCFs per rem or person-rem (DOE 2003). NNSA considers LCFs <0.5 to be 0 for the Workforce – Project Collective Dose and Public – Population Dose.

Source: LANL 2023.

Table C-7. Peak-Year Economic Impacts at LANL by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
Direct Employment (FTE in peak year)	PDP	116	116	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	23	NA
	C&P	NA	(e)	NA
	Total	**116**	**139**	**(d)**
Total ROI Employment (Jobs in peak year)	PDP	221	221	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	42	NA
	C&P	NA	(e)	NA
	Total	**221**	**263**	**(d)**

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
Direct Earnings ($Million in peak year)	PDP	19.4	19.4	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	3.8	NA
	C&P	NA	(e)	NA
	Total	**19.4**	**23.2**	**(d)**
Total ROI Earnings ($Million in peak year)	PDP	23.6	23.6	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	4.6	NA
	C&P	NA	(e)	NA
	Total	**23.6**	**28.2**	**(d)**
Direct Output ($Million in peak year)	PDP	20.3	20.3	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	3.9	NA
	C&P	NA	(e)	NA
	Total	**20.3**	**24.2**	**(d)**
Total ROI Output ($Million in peak year)	PDP	36.3	36.3	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	7.0	NA
	C&P	NA	(e)	NA
	Total	**36.3**	**43.3**	**(d)**

C&P = characterization and packaging; FTE = full-time equivalent (employee); LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; ROI = region of influence; SRS = Savannah River Site.

(a) A column for All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The construction/modification impacts associated with the Base Approach and SRS NPMP Sub-Alternatives would be the same.

(c) Construction/modification activities for NPMP at LANL are not distinct from PDP construction/modification activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL.

(d) No construction/modification activities are anticipated.

(e) C&P impacts are included in totals for PDP and dilution – staff are shared between activities.

Source: Calculated from LANL 2023|derived from Section 2.14|.

Table C-8. Peak-Year Economic Impacts at LANL by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
Direct Employment (FTE in peak year)[c]	PDP	395	395	NA
	NPMP	(d)	(d)	147
	Dilution	NA	114	NA
	C&P	NA	40	NA
	Total	**395**	**549**	**147**
Total ROI Employment (Jobs in peak year)	PDP	1,301	1,301	(e)
	NPMP	(d)	(d)	376
	Dilution	NA	365	NA
	C&P	NA	128	NA
	Total	**1,301**	**1,794**	**376**
Direct Earnings ($Million in peak year)	PDP	458.1	458.1	(e)
	NPMP	(d)	(d)	83.6
	Dilution	NA	41.2	NA
	C&P	NA	14.4	NA
	Total	**458.1**	**513.7**	**83.6**
Total ROI Earnings ($Million in peak year)	PDP	627.3	627.3	(e)
	NPMP	(d)	(d)	114.2
	Dilution	NA	56.1	NA
	C&P	NA	19.7	NA
	Total	**627.3**	**703.1**	**114.2**
Direct Output ($Million in peak year)	PDP	1,276.5	1,276.5	(e)
	NPMP	(d)	(d)	228.9
	Dilution	NA	112.7	NA
	C&P	NA	39.6	NA
	Total	**1,276.5**	**1,428.8**	**228.9**
Total ROI Output ($Million in peak year)	PDP	1,851.3	1,851.3	(e)
	NPMP	(d)	(d)	332.9
	Dilution	NA	163.9	NA
	C&P	NA	57.5	NA
	Total	**1,851.3**	**2,072.7**	**332.9**

C&P = characterization and packaging; FTE = full-time equivalent (employee); LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; ROI = region of influence; SRS = Savannah River Site.

(a) A column for All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The operation impacts associated with the Base Approach and SRS NPMP Sub-Alternatives would be the same.

(c) The differences in staffing numbers between LANL and SRS relates to the amount of equipment that is used at each of the sites for processing activities.

(d) Operations activities for NPMP at LANL are not distinct from PDP operations activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL.

(e) Similar activities are currently ongoing, thus no new impacts.

Source: Calculated from LANL 2023|derived from Sections 1.4.1, 1.4.2|.

Table C-9. Infrastructure Impacts at LANL by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
Electricity Use (MWh/yr)	PDP	160	160	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	(c)	NA
	C&P	NA	0	NA
	Total	**160**	**160**	**(d)**
Electricity Peak Load (MW)	PDP	0.02	0.02	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	(c)	NA
	C&P	NA	0	NA
	Total	**0.02**	**0.02**	**(d)**
Fuel Use (gal/yr)	PDP	54,000	54,000	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	(c)	NA
	C&P	NA	15,000	NA
	Total	**54,000**	**69,000**	**(d)**
Water Use (millions of gal/yr)	PDP	2.6[e]	2.6[e]	NA
	NPMP	(f)	(f)	(d)
	Dilution	NA	(f)	NA
	C&P	NA	(f)	NA
	Total	**2.6**	**2.6**	**(d)**
Sewage Generation (millions of gal/yr)	PDP	0.055	0.055	NA
	NPMP	(g)	(g)	(d)
	Dilution	NA	(g)	NA
	C&P	NA	(g)	NA
	Total	**0.055**	**0.055**	**(d)**

C&P = characterization and packaging; DHF = Drum Handling Facility; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PF-4 = Plutonium Facility-4; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The impacts associated with the Base Approach and SRS NPMP Sub-Alternative would be the same.

(c) Construction/modification activities are not distinct from PDP construction/modification activities and are included in PDP impacts.

(d) No construction/modification activities are anticipated.

(e) The maximum water requirements for the Preferred Alternative is during construction activities in Year 5, which is 2.6 million gal (LANL 2023|Section 2.16.1.1|). Construction of DHF starts in Year 6, which is not a peak year, water requirements would be included in PDP activities.

(f) Water requirements for staff performing construction/modifications activities for NPMP, dilution, and C&P capability are included in PDP activities.

(g) Sewage generation for workers performing construction/modification activities inside PF-4 are included in requirements for PDP activities. Construction workers outside PF-4 would use portable toilets. (LANL 2023|Section 2.16.1.1|)

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Source: LANL 2023.

Table C-10. Infrastructure Impacts at LANL by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative[c]
Electricity Use (MWh/yr)	PDP	2,400	2,400	NA
	NPMP	(d)	(d)	905
	Dilution	NA	500	NA
	C&P	NA	190	NA
	Total	**2,400**	**3,100**	**905**
Electricity Peak Load (MW)	PDP	0.39	0.39	NA
	NPMP	(d)	(d)	0.10
	Dilution	NA	0.06	NA
	C&P	NA	0.08	NA
	Total	**0.39**	**0.5**	**0.10**
Fuel Use (gal/yr)	PDP	0	0	NA
	NPMP	0	0	0
	Dilution	NA	0	NA
	C&P	NA	0	NA
	Total	**0**	**0**	**0**
Water Use (millions of gal/yr)	PDP	1.7	1.7	NA
	NPMP	(e)	(e)	0.61
	Dilution	NA	0.85	NA
	C&P	NA	(f)	NA
	Total	**1.7**	**2.5**	**0.61**
Sewage Generation (millions of gal/yr)	PDP	1.7	1.7	NA
	NPMP	(e)	(e)	0.61
	Dilution	NA	0.85	NA
	C&P	NA	(f)	NA
	Total	**1.7**	**2.5**	**0.61**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The operation impacts associated with the Base Approach and SRS NPMP Sub-Alternatives would be the same.

(c) For the No Action Alternative, operations to process up to 7.1 MT of non-pit would be within the scope of current and ongoing operations at LANL. The 7.1 MT of non-pit surplus plutonium oxidized at LANL is part of the 34 MT considered in the Base Approach Sub-Alternative and as a result, infrastructure impacts would be a fraction (approximately 37 percent) of that used for the Base Approach Sub-Alternative, based on number of workers. The Base Approach Sub-Alternative assumes 395 workers, whereas the No Action Alternative assumes 147 workers (see Table 4-8) (LANL 2023|Sections 2.7.1.2, 2.7.2|).

(d) Operations activities for NPMP at LANL are not distinct from PDP operations activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL (LANL 2023|Sections 2.7.1.2, 2.7.2|).

(e) Water and sewage requirements for operations of NPMP (staff and process equipment) are included in the PDP activities (LANL 2023|Section 2.16.1.2|).

(f) Water and sewage requirements for performing C&P activities are included in the dilution activities (LANL 2023|Section 2.16.2.2|).

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Sources: LANL 2023; LANL 2013.

Table C-11. Total Waste Generation at LANL by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Unit)	Capability	Preferred Alternative[a] Base Approach and SRS NPMP Sub-Alternatives[b]	Preferred Alternative[a] All LANL Sub-Alternative	No Action Alternative
CH-TRU Waste (job control waste) (m^3)	PDP	69	69	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	38	NA
	C&P	NA	(e)	NA
	Total	**69**	**110**	**(d)**
LLW (m^3)	PDP	360	360	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	200	NA
	C&P	NA	(e)	NA
	Total	**360**	**560**	**(d)**
MLLW (m^3)	PDP	4.8	4.8	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	2.6	NA
	C&P	NA	(e)	NA
	Total	**4.8**	**7.4**	**(d)**
Liquid LLW (L)	PDP	0	0	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	0	NA
	C&P	NA	(e)	NA
	Total	**0**	**0**	**(d)**
Solid Hazardous Waste (m^3)	PDP	2.4	2.4	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	0.68	NA
	C&P	NA	(e)	NA
	Total	**2.4**	**3.1**	**(d)**
Solid Non-hazardous waste (m^3)	PDP	210	210	NA
	NPMP	(c)	(c)	(d)
	Dilution	NA	61	NA
	C&P	NA	(e)	NA
	Total	**210**	**280**	**(d)**

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The construction/modification impacts associated with the Base Approach and SRS NPMP Sub-Alternatives would be the same.

(c) Construction/modification activities for NPMP at LANL are not distinct from PDP construction/modification activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL.

(d) No construction/modification activities are anticipated for the No Action Alternative.

(e) C&P waste generation is included in the dilution estimate.

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Source: Calculated from LANL 2023.

Table C-12. Total Waste Generation at LANL by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[(a)] Base Approach and SRS NPMP Sub-Alternatives[(b)]	Preferred Alternative[(a)] All LANL Sub-Alternative	No Action Alternative
CH-TRU Waste (diluted plutonium oxide) (m^3 and CCOs)	**Total**	**0**	**1,500 m^3 113,400 CCOs**	**0**
CH-TRU Waste (job control waste) (m^3)	PDP	670	670	NA
	NPMP	(c)	(c)	59
	Dilution	NA	970	NA
	C&P	NA	0	NA
	Total	**670**	**1,600**	**59**
LLW (m^3)	PDP	3,200	3,200	NA
	NPMP	(c)	(c)	280
	Dilution	NA	14,000	NA
	C&P	NA	0	NA
	Total	**3,200**	**17,000**	**280**
MLLW (m^3)	PDP	42	42	NA
	NPMP	(c)	(c)	3.7
	Dilution	NA	47	NA
	C&P	NA	0	NA
	Total	**42**	**89**	**3.7**
Liquid LLW (L)	PDP	65,000	65,000	NA
	NPMP	(c)	(c)	0
	Dilution	NA	0	NA
	C&P	NA	0	NA
	Total	**65,000**	**65,000**	**0**
Solid Hazardous Waste (m^3)	PDP	6.6	6.6	NA
	NPMP	(c)	(c)	0.7
	Dilution	NA	0.17	NA
	C&P	NA	0	NA
	Total	**6.6**	**6.8**	**0.7**
Solid Non-hazardous waste (m^3)	PDP	1,500	1,500	NA
	NPMP	(c)	(c)	150
	Dilution	NA	18	NA
	C&P	NA	0	NA
	Total	**1,500**	**1,500**	**150**

C&P = characterization and packaging; CCO = criticality control overpack; CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for All SRS Sub-Alternative is not included because no capabilities would occur at LANL.

(b) The operation impacts associated with the Base Approach and SRS NPMP Sub-Alternatives would be the same.

(c) Operations activities for NPMP at LANL are not distinct from PDP operations activities and are included in PDP impacts. For the SRS NPMP Sub-Alternative, operations for NPMP would occur at SRS rather than LANL.

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Source: Calculated from LANL 2023|Sections 2.12.1.2, 17|.

C.2 Savannah River Site

Table C-13. Roadmap for Alternative/Sub-Alternatives Activities Conducted at SRS

Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP Sub-Alternative	Preferred Alternative All SRS Sub-Alternative	No Action Alternative
PDP	*(LANL)*	*(LANL)*	SRS	*(No PDP)*
NPMP	*(LANL)*	SRS	SRS	SRS
Dilution	SRS	SRS	SRS	SRS
C&P	SRS	SRS	SRS	SRS

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

Table C-14. Land Disturbance at SRS by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[(a)] Base Approach Sub-Alternative	Preferred Alternative[(a)] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[(a)] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[(a)] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[(a)] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Land Disturbance (ac)	PDP	NA	NA	NA	20	20	NA
	NPMP	NA	0	0.3	(b)	(b)	0
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**0**	**0.3**	**20**	**20**	**0**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) Construction/modification activities for NPMP are included in PDP construction/modification activities.

(c) No construction/modification activities are anticipated.

Source: SRNS 2023b.

Table C-15. Geologic Materials Used at SRS by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Geologic Materials Used (sand, gravel, crushed stone) (yd^3)	PDP	NA	NA	NA	260,000	260,000	NA
	NPMP	NA	0	0	(b)	(b)	0
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**0**	**0**	**260,000**	**260,000**	**0**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) Construction/modification activities for NPMP are included in PDP construction/modification activities.

(c) No construction/modification activities are anticipated.

Note: Values rounded to two significant digits.

Source: SRNS 2023b.

Table C-16. Estimated Criteria Air Pollutant Emissions at SRS During Construction/Modification and Operations for the Preferred and No Action Alternatives (T/yr)

Air Emissions	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K and Modular NPMP Options)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
PM_{10}	**Construction**	**(b)**	**<0.001[c]**	**5.5**	**5.9**	**<0.001**
	Operations – PDP/NPMP	NA	0.033	0.99	0.99	0.033
	Operations – Dilution	0.031	0.031	0.031	0.031	0.031
	Operations – C&P	(d)	(d)	(d)	(d)	(d)
	Operations – Annual On-Site Transportation	NA	NA	<0.001	NA	NA
	Total Operations	**0.031**	**0.63[e]**	**1.0**	**1.0**	**0.063**
$PM_{2.5}$	**Construction**	**(b)**	**<0.001[c]**	**5.0**	**5.4**	**<0.001**
	Operations – PDP/NPMP	NA	0.033	0.66	0.66	0.033
	Operations – Dilution	0.031	0.031	0.031	0.031	0.031
	Operations – C&P	(d)	(d)	(d)	(d)	(d)
	Operations – Annual On-Site Transportation	NA	NA	<0.001	NA	NA
	Total Operations	**0.031**	**0.063[e]**	**0.69**	**0.69**	**0.063**
SO_x	**Construction**	**(b)**	**(d)**	**0.049**	**0.085**	**(d)**
	Operations – PDP/NPMP	NA	<0.001	0.018	0.018	<0.001
	Operations – Dilution	<0.001	<0.001	<0.001	<0.001	<0.001
	Operations – C&P	(d)	(d)	(d)	(d)	(d)
	Operations – Annual On-Site Transportation	NA	NA	<0.001	NA	NA
	Total Operations	**<0.001**	**0.002[e]**	**0.019**	**0.019**	**0.002**
NO_x	**Construction**	**(b)**	**(d)**	**23**	**26**	**(d)**
	Operations – PDP/NPMP	NA	0.061	39	39	0.061
	Operations – Dilution	0.061	0.061	0.061	0.061	0.061
	Operations – C&P	(d)	(d)	(d)	(d)	(d)
	Operations – Annual On-Site Transportation	NA	NA	0.001	NA	NA
	Total Operations	**0.061**	**0.12[e]**	**39**	**39**	**0.12**

Air Emissions	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K and Modular NPMP Options)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
CO	**Construction**	**(b)**	**<0.001[c]**	**29**	**30**	**<0.001**
	Operations – PDP/NPMP	NA	0.54	10	10	0.54
	Operations – Dilution	0.54	0.54	0.54	0.54	0.54
	Operations – C&P	(d)	(d)	(d)	(d)	(d)
	Operations – Annual On-Site Transportation	NA	NA	0.002	NA	NA
	Total Operations	**0.54**	**1.1[e]**	**11**	**11**	**1.1**
VOCs	**Construction**	**(b)**	**0.94[c]**	**4.7**	**4.8**	**0.94**
	Operations – PDP/NPMP	NA	0.23	0.99	0.99	0.23
	Operations – Dilution	0.23	0.23	0.23	0.23	0.23
	Operations – C&P	(d)	(d)	(d)	(d)	(d)
	Operations – Annual On-Site Transportation	NA	NA	<0.001	NA	NA
	Total Operations	**0.23**	**0.47[e]**	**1.2**	**1.2**	**0.47**

C&P = characterization and packaging; CO = carbon monoxide; LANL = Los Alamos National Laboratory; NO_x = nitrogen oxide; NPMP = non-pit metal processing; PDP = pit disassembly and processing; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter; SO_x = sulfur oxide; SRS = Savannah River Site; VOC = volatile organic compound.

(a) A row for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) No construction/modification activities are anticipated.

(c) Emissions from construction of modular system would be higher that these values but lower than those for construction of the F-Area PDP Option.

(d) Emissions not expected.

(e) Emissions from modular system are equal to emissions from Building 105-K.

Note: Values rounded to two significant digits.

Sources: Emissions under the Base Approach and SRS NPMP Sub-Alternatives are based on SRNS 2023a, scaled for 2.5 MT/yr throughput. SO_x values were adjusted for ultra-low sulfur diesel emission factors. Emissions under the All SRS F-Area and K-Area PDP Option Sub-Alternatives include emissions from the Base Approach Sub-Alternative and values from DOE 2012|Table 2.2-7|. SRS 2020 Emissions are from SRNS 2021|Page 1/95|.

Table C-17. Radiation Dose and Impacts at SRS by Capability During Construction/Modification for the Preferred and No Action Alternatives

Receptor (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Worker –Dose Rate (rem/yr)	PDP	NA[b]	NA[b]	NA[b]	0	0.13	NA
	NPMP	NA[b]	0.03	0	(c)	(c)	0.03
	Dilution	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	Total	**(e)**	**(e)**	**(e)**	**(e)**	**(e)**	**(e)**
Worker –Project Dose (rem and LCF risk)	PDP	NA[b]	NA[b]	NA[b]	0	0.19/ 0.0001	NA
	NPMP	NA[b]	0.075/ 0.00005	0	(c)	(c)	0.075/ 0.00005
	Dilution	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	Total	**None[d]**	**0.075/ 0.00005**	**0**	**0**	**0.19/ 0.0001**	**0.075/ 0.00005**
Workforce – Project Collective Dose (person-rem and number of LCFs)	PDP	NA[b]	NA[b]	NA[b]	0	5.3/ 0 (0.003)	NA
	NPMP	NA[b]	1.1/ 0 (0.0007)	0	(c)	(c)	1.1/ 0 (0.0007)
	Dilution	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	Total	**None[d]**	**1.1/ 0 (0.0007)**	**0**	**0**	**5.3/ 0 (0.003)**	**1.1/ 0 (0.0007)**
Public – MEI Dose (rem and LCF risk)	PDP	NA[b]	NA[b]	NA[b]	0	0.000054/ 3×10^{-8}	NA
	NPMP	NA[b]	(f)	0	(c)	(c)	(f)
	Dilution	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	Total	**None[d]**	**(f)**	**0**	**0**	**0.000054/ 3×10^{-8}**	**(f)**

Receptor (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Public – Population Dose (person-rem and number of LCFs)	PDP	NA[b]	NA[b]	NA[b]	0	2.7/ 0 (0.002)	NA
	NPMP	NA[b]	(f)	0	(c)	(c)	(f)
	Dilution	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	None[d]	None[d]	None[d]
	Total	**None[d]**	**(f)**	**0**	**0**	**2.7/ 0 (0.002)**	**(f)**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) Not applicable because PDP would not occur at SRS except under the All SRS Sub-Alternative and NPMP would not occur at SRS under the Base Approach Sub-Alternative. No potential dose/impact at SRS.

(c) Construction of the PDP and NPMP capabilities occur together for the All SRS Sub-Alternative.

(d) No construction/modification activities are anticipated. No potential dose/impact from activities at SRS.

(e) Totals are not listed, because different individuals would work on different capabilities or work during different years.

(f) LCFs to the public and the MEI from construction activities for the sub-alternatives other than the All SRS Sub-Alternative were not calculated because doses and corresponding LCFs to workers at the site were extremely low and the expectation is that a negligible dose and corresponding LCF would be received by noninvolved workers, the MEI, and other members of the public.

Notes: Numbers are rounded to one or two significant digits. Columns may not sum to totals due to rounding of individual values and totals. LCFs calculated using a conversion of 0.0006 LCFs per rem or person-rem (DOE 2003). NNSA considers LCFs <0.5 to be 0 for the Workforce – Project Collective Dose and Public – Population Dose.

Source: SRNS 2023b.

Table C-18. Radiation Dose and Impacts at SRS by Capability During Operations for the Preferred and No Action Alternatives

Receptor (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Worker – Dose Rate (rem/yr)	PDP	NA[b]	NA[b]	NA[b]	0.45	0.45	NA
	NPMP	NA[b]	0.63	0.63	(c)	(c)	0.63
	Dilution	0.63	0.63	0.63	0.63	0.63	0.63
	C&P	0.27	0.27	0.27	0.27	0.27	0.27
	Total	**(d)**	**(d)**	**(d)**	**(d)**	**(d)**	**(d)**
Worker – Project Dose (rem and LCF risk)	PDP	NA[b]	NA[b]	NA[b]	6.1/ 0.004	6.1/ 0.004	NA
	NPMP	NA[b]	11/ 0.007	7.5/ 0.004	(c)	(c)	11/ 0.007
	Dilution	8.6/ 0.005	8.6/ 0.005	8.6/ 0.005	8.6/ 0.005	8.6/ 0.005	11/ 0.007
	C&P	3.7/ 0.002	3.7/ 0.002	3.7/ 0.002	3.7/ 0.002	3.7/ 0.002	4.8/ 0.003
	Total	**(d)**	**(d)**	**(d)**	**(d)**	**(d)**	**(d)**
Workforce – Project Collective Dose (person-rem/yr and number of LCFs)	PDP	NA[b]	NA[b]	NA[b]	2,000/ 1 (1.2)	2,000/ 1 (1.2)	NA
	NPMP	NA[b]	800/ 1 (0.5)	180/ 0 (0.1)	(c)	(c)	800/ 1 (0.5)
	Dilution	1,900/ 1 (1.1)	1,900/ 1 (1.1)	1,900/ 1 (1.1)	1,900/ 1 (1.1)	1,900/ 1 (1.1)	590/ 0 (0.35)
	C&P	200/ 0 (0.1)	200/ 0 (0.1)	200/ 0 (0.1)	200/ 0 (0.1)	200/ 0 (0.1)	50/ 0 (0.030)
	Total	**2,100/ 1 (1.2)**	**2,900/ 2 (1.7)**	**2,300/ 1 (1.4)**	**4,000/ 2 (2.4)**	**4,000/ 2 (2.4)**	**1,400/ 1 (0.9)**
Public – MEI Dose Rate (rem/yr)	PDP	NA[b]	NA[b]	NA[b]	1.1×10^{-7}	8.8×10^{-8}	NA
	NPMP	NA[b]	1.8×10^{-8}	2.7×10^{-8}	(c)	(c)	1.8×10^{-8}
	Dilution	1.1×10^{-7}	1.1×10^{-7}	1.1×10^{-7}	1.4×10^{-7}	1.1×10^{-7}	1.8×10^{-8}
	C&P	0	0	0	0	0	0
	Total	**1.1×10^{-7}**	**1.3×10^{-7}**	**1.4×10^{-7}**	**2.4×10^{-7}**	**2.0×10^{-7}**	**3.6×10^{-8}**

Receptor (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Public –MEI Dose (rem and LCF risk)	PDP	NA[b]	NA[b]	NA[b]	1.5×10^{-6}/ 9×10^{-10}	1.2×10^{-6}/ 7×10^{-10}	NA
	NPMP	NA[b]	3.2×10^{-7}/ 2×10^{-10}	3.2×10^{-7}/ 2×10^{-10}	(c)	(c)	3.2×10^{-7}/ 2×10^{-10}
	Dilution	1.5×10^{-6}/ 9×10^{-10}	1.5×10^{-6}/ 9×10^{-10}	1.5×10^{-6}/ 9×10^{-10}	1.5×10^{-6}/ 9×10^{-10}	1.5×10^{-6}/ 9×10^{-10}	3.2×10^{-7}/ 2×10^{-10}
	C&P	0	0	0	0	0	0
	Total	**1.5×10^{-6}/ 9×10^{-10}**	**1.8×10^{-6}/ 1×10^{-9}**	**1.8×10^{-6}/ 1×10^{-9}**	**3.0×10^{-6}/ 2×10^{-9}**	**2.7×10^{-6}/ 2×10^{-9}**	**6.3×10^{-7}/ 4×10^{-10}**
Public – Population Dose (person-rem and number of LCFs)	PDP	NA[b]	NA[b]	NA[b]	0.060/ 0 (0.00004)	0.060/ 0 (0.00004)	NA
	NPMP	NA[b]	0.016/ 0 (0.00001)	0.016/ 0 (0.00001)	(c)	(c)	0.016/ 0 (0.00001)
	Dilution	0.076/ 0 (0.00005)	0.076/ 0 (0.00005)	0.076/ 0 (0.00005)	0.076/ 0 (0.00005)	0.076/ 0 (0.00005)	0.016/ 0 (0.00001)
	C&P	0	0	0	0	0	0
	Total	**0.076/ 0 (0.00005)**	**0.092/ 0 (0.00006)**	**0.092/ 0 (0.00006)**	**0.14/ 0 (0.00008)**	**0.14/ 0 (0.00008)**	**0.032/ 0 (0.00002)**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) Not applicable because PDP would not occur at SRS except under the All SRS Sub-Alternative and NPMP would not occur at SRS under the Base Approach Sub-Alternative. No potential dose/impact from activities at SRS.

(c) NPMP is included in PDP activities.

(d) Totals are not listed, because different individuals would work on different capabilities.

Notes: Numbers are rounded to one or two significant digits. Columns may not sum to totals due to rounding of individual values and totals. LCFs calculated using a conversion of 0.0006 LCFs per rem or person-rem (DOE 2003). NNSA considers LCFs <0.5 to be 0 for the Workforce – Project Collective Dose and Public – Population Dose.

Source: SRNS 2023b.

Table C-19. Peak-Year Economic Impacts at SRS by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Direct Employment (FTE in peak year)	PDP	NA	NA	NA	525	525	NA
	NPMP	NA	78	30	(b)	(b)	78
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**78**	**30**	**525**	**525**	**78**
Total ROI Employment (Jobs in peak year)	PDP	NA	NA	NA	1,092	1,092	NA
	NPMP	NA	197	69	(b)	(b)	197
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**197**	**69**	**1,092**	**1,092**	**197**
Direct Earnings ($Million in peak year)	PDP	NA	NA	NA	131.3	131.3	NA
	NPMP	NA	19.5	7.5	(b)	(b)	19.5
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**19.5**	**7.5**	**131.3**	**131.3**	**19.5**
Total ROI Earnings ($Million in peak year)	PDP	NA	NA	NA	176.7	176.7	NA
	NPMP	NA	24.3	7.9	(b)	(b)	24.3
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**24.3**	**7.9**	**176.7**	**176.7**	**24.3**

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Direct Output ($Million in peak year)	PDP	NA	NA	NA	168.5	168.5	NA
	NPMP	NA	19.3	6.3	(b)	(b)	19.3
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**19.3**	**6.3**	**168.5**	**168.5**	**19.3**
Total ROI Output ($Million in peak year)	PDP	NA	NA	NA	306.8	306.8	NA
	NPMP	NA	37.1	12.1	(b)	(b)	37.1
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**37.1**	**12.1**	**306.8**	**306.8**	**37.1**

C&P = characterization and packaging; FTE = full-time equivalent (employee); LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; ROI = region of influence; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) Construction/modification activities for NPMP are included in PDP construction/modification activities.

(c) No construction/modification activities are anticipated.

Sources: Calculated from data in SRNS 2023b; DOE 2012|Table 2.4-2|; DOE 2015|Table F-8|.

Table C-20. Peak-Year Economic Impacts at SRS by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Direct Employment (FTE in peak year)[b]	PDP	NA	NA	NA	494	494	NA
	NPMP	NA	113	38	(c)	(c)	113
	Dilution	447	447	447	447	447	85
	C&P	75	75	75	75	75	14
	Total	**522**	**635**	**560**	**1,016**	**1,016**	**212**
Total ROI Employment (Jobs in peak year)	PDP	NA	NA	NA	2,125	2,125	NA
	NPMP	NA	293	99	(c)	(c)	293
	Dilution	1,170	1,170	1,170	1,170	1,170	222
	C&P	290	290	290	290	290	52
	Total	**1,460**	**1,753**	**1,559**	**3,585**	**3,585**	**567**
Direct Earnings ($Million in peak year)	PDP	NA	NA	NA	239.2	239.2	NA
	NPMP	NA	30.8	7.8	(c)	(c)	30.8
	Dilution	121.5	121.5	121.5	121.5	121.5	23.1
	C&P	19.8	19.8	19.8	19.8	19.8	3.8
	Total	**141.2**	**172.1**	**149.0**	**350.3**	**350.3**	**57.7**
Total ROI Earnings ($Million in peak year)	PDP	NA	NA	NA	285.9	285.9	NA
	NPMP	NA	31.6	10.7	(c)	(c)	31.6
	Dilution	125.4	125.4	125.4	125.4	125.4	23.8
	C&P	25.9	25.9	25.9	25.9	25.9	4.7
	Total	**151.3**	**182.9**	**162.0**	**437.2**	**437.2**	**60.1**

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Direct Output ($Million in peak year)	PDP	NA	NA	NA	300.2	300.2	NA
	NPMP	NA	32.9	11.1	(c)	(c)	32.9
	Dilution	136.4	136.4	136.4	136.4	136.4	25.9
	C&P	68.4	68.4	68.4	68.4	68.4	11.5
	Total	**204.8**	**237.7**	**215.9**	**505.0**	**505.0**	**70.3**
Total ROI Output ($Million in peak year)	PDP	NA	NA	NA	539.6	539.6	NA
	NPMP	NA	59.2	20.0	(c)	(c)	59.2
	Dilution	242.6	242.6	242.6	242.6	242.6	46.1
	C&P	101.4	101.4	101.4	101.4	101.4	17.2
	Total	**344.0**	**403.2**	**364.0**	**883.6**	**883.6**	**122.5**

C&P = characterization and packaging; FTE = full-time equivalent (employee); LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; ROI = region of influence; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at LANL.

(b) The differences in staffing numbers between LANL and SRS relates to the amount of equipment that is used at each of the sites for processing activities.

(c) NPMP is included in PDP activities.

Sources: Calculated from data in SRNS 2023b; DOE 2012; DOE 2015; LANL 2023.

Table C-21. Infrastructure Impacts at SRS by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Electricity Use (MWh/yr)	PDP	NA	NA	NA	16,000	16,000	NA
	NPMP	NA	minimal	minimal	(b)	(b)	minimal
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**minimal**	**minimal**	**16,000**	**16,000**	**minimal**
Electricity Peak Load (MW)	PDP	NA	NA	NA	1.8	1.8	NA
	NPMP	NA	minimal	minimal	(b)	(b)	minimal
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**minimal**	**minimal**	**1.8**	**1.8**	**minimal**
Fuel Use (gal/yr)[d]	PDP	NA	NA	NA	300,000	540,000	NA
	NPMP	NA	4,000	750	(b)	(b)	4,000
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**4,000**	**750**	**300,000**	**540,000**	**4,000**
Water Use (millions of gal/yr)	PDP	NA	NA	NA	1.1	2	NA
	NPMP	NA	1	0.5	(b)	(b)	1
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**1**	**0.5**	**1.1**	**2**	**1**

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Sewage Generation (millions of gal/yr)	PDP	NA	NA	NA	1.1	1.1	NA
	NPMP	NA	1	0.5	(b)	(b)	1
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**1**	**0.5**	**1.1**	**1.1**	**1**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) Infrastructure resource for construction of NPMP capability is included in the PDP activities.

(c) No construction/modification activities are anticipated.

(d) Fuel is diesel and gasoline combined for construction of NPMP capability in Building 105-K.

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Sources: SRNS 2023b; DOE 2015|Table F-26|; SRNS 2010; ACI 2013.

Table C-22. Infrastructure Impacts at SRS by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Electricity Use (MWh/yr)	PDP	NA	NA	NA	41,000	41,000	NA
	NPMP	NA	1,700	2,300	(b)	(b)	1,700
	Dilution	8,700	8,700	8,700	8,700	8,700	1,800[c]
	C&P	2,800	2,800	2,800	2,800	2,800	580[c]
	Total	**11,000**	**13,000**	**14,000**	**52,000**	**52,000**	**4,100**
Electricity Peak Load (MW)	PDP	NA	NA	NA	4.7	4.7	NA
	NPMP	NA	0.19	0.26	(b)	(b)	0.19
	Dilution	1.2	1.2	1.2	1.2	1.2	0.26[c]
	C&P	0.39	0.39	0.39	0.39	0.39	0.08[c]
	Total	**1.6**	**1.8**	**1.9**	**6.3**	**6.3**	**0.53**
Fuel Use (gal/yr)[d]	PDP	NA	NA	NA	170,000	170,000	NA
	NPMP	NA	7,200	7,200	(b)	(b)	1,500
	Dilution	7,200	7,200	7,200	7,200	7,200	1,500[c]
	C&P[e]	0	0	0	0	0	0
	Total	**7,200**	**14,000**	**14,000**	**180,000**	**180,000**	**3,000**
Water Use (millions of gal/yr)	PDP	NA	NA	NA	5	5	NA
	NPMP	NA	1	1	(b)	(b)	1
	Dilution	3	3	3	3	3	0.6[c]
	C&P	0.6	0.6	0.6	0.6	0.6	0.1[c]
	Total	**3.6**	**4.6**	**4.6**	**8.6**	**8.6**	**1.8**

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Sewage Generation (millions of gal/yr)	PDP	NA	NA	NA	5	5	NA
	NPMP	NA	1	1	(b)	(b)	1
	Dilution	3	3	3	3	3	0.6[c]
	C&P	0.6	0.6	0.6	0.6	0.6	0.1[c]
	Total	**3.6**	**4.6**	**4.6**	**8.6**	**8.6**	**1.8**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) Infrastructure resources for operations of NPMP are included in PDP activities.

(c) For the No Action Alternative, operation of dilution and C&P activities would result in a fraction (7.1/34 or 21%) of the resources impacted in the Base Approach Sub-Alternative.

(d) Diesel fuel is used for operations and maintenance of a diesel generator.

(e) Propane would be needed for propane powered fork trucks for C&P operations (1,600 lbs/yr) and is not reflected in the table. For the No Action Alternative, a fraction (7.1/34 or 21%) of the propane use would be required (334 lbs/yr).

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Sources: SRNS 2023b; DOE 2012|Section 2.2.3, Table 2.2-7|; DOE 2015|Table F-27|.

Table C-23. Total Waste Generation at SRS by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
CH-TRU Waste (job control waste) (m^3)	PDP	NA	NA	NA	0	0	NA
	NPMP	NA	110	0	(b)	(b)	110
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**110**	**0**	**0**	**0**	**110**
LLW (m^3)	PDP	NA	NA	NA	0	12,000	NA
	NPMP	NA	0	0	(b)	(b)	0
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**0**	**0**	**0**	**12,000**	**0**
MLLW (m^3)	PDP	NA	NA	NA	0	210	NA
	NPMP	NA	0	0	(b)	(b)	0
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**0**	**0**	**0**	**210**	**0**
Liquid LLW (L)	PDP	NA	NA	NA	0	0	NA
	NPMP	NA	0	0	(b)	(b)	0
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**0**	**0**	**0**	**0**	**0**

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Solid Hazardous Waste (m^3)	PDP	NA	NA	NA	45	6,600	NA
	NPMP	NA	0	0	(b)	(b)	0
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**0**	**0**	**45**	**6,600**	**0**
Solid Non-hazardous waste (m^3)	PDP	NA	NA	NA	1,000	6,900	NA
	NPMP	NA	66	66	(b)	(b)	66
	Dilution	(c)	(c)	(c)	(c)	(c)	(c)
	C&P	(c)	(c)	(c)	(c)	(c)	(c)
	Total	**(c)**	**66**	**66**	**1,000**	**6,900**	**66**

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NA = not applicable; NPMP = not-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) Construction/modification activities for NPMP are included in PDP construction/modification activities.

(c) No construction/modification activities are anticipated.

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Source: Calculated from SRNS 2023b.

Table C-24. Total Waste Generation at SRS by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative[b] (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative[b] (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
CH-TRU Waste (diluted plutonium oxide) (m^3 and CCOs)	**Total**	**1,500 m^3 113,400 CCOs**	**1,500 m^3 113,400 CCOs**	**1,500 m^3 113,400 CCOs**	**1,500 m^3 113,400 CCOs**	**1,500 m^3 113,400 CCOs**	**310 m^3 24,000 CCOs**
CH-TRU Waste (job control waste) (m^3)	PDP[c]	NA	NA	NA	670	670	NA
	NPMP	NA	170	220	(b)	(b)	35
	Dilution	1,400	1,400	1,400	1,400	1,400	140
	C&P	0	0	0	0	0	0
	Total	**1,400**	**1,500**	**1,600**	**2,000**	**2,000**	**170**
LLW (m^3)	PDP[c]	NA	NA	NA	3,200	3,200	NA
	NPMP	NA	2,300	3,100	(b)	(b)	490
	Dilution	19,000	19,000	19,000	19,000	19,000	2,000
	C&P	0	0	0	0	0	0
	Total	**19,000**	**22,000**	**23,000**	**23,000**	**23,000**	**2,400**
MLLW (m^3)	PDP[c]	NA	NA	NA	42	42	NA
	NPMP	NA	0	0	(b)	(b)	0
	Dilution	0	0	0	0	0	0
	C&P	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**42**	**42**	**0**
Liquid LLW (L)	PDP[c]	NA	NA	NA	65,000	65,000	NA
	NPMP	NA	0	0	(b)	(b)	0
	Dilution	0	0	0	0	0	0
	C&P	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**65,000**	**65,000**	**0**

Impact Indicator (Units)	Capability	Preferred Alternative[a] Base Approach Sub-Alternative	Preferred Alternative[a] SRS NPMP Sub-Alternative[b] (105-K NPMP Option)	Preferred Alternative[a] SRS NPMP Sub-Alternative[b] (Modular NPMP Option)	Preferred Alternative[a] All SRS Sub-Alternative (F-Area PDP Option)	Preferred Alternative[a] All SRS Sub-Alternative (K-Area PDP Option)	No Action Alternative
Solid Hazardous Waste (m^3)	PDP[c]	NA	NA	NA	6.6	6.6	NA
	NPMP	NA	0	0	(b)	(b)	0
	Dilution	0	0	0	0	0	0
	C&P	0	0	0	0	0	0
	Total	**0**	**0**	**0**	**6.6**	**6.6**	**0**
Solid Non-hazardous waste (m^3)	PDP[c]	NA	NA	NA	1,500	1,500	NA
	NPMP	NA	1,700	1,700	(b)	(b)	360
	Dilution	11,000	11,000	11,000	11,000	11,000	1,100
	C&P	2,000	2,000	2,000	2,000	2,000	200
	Total	**13,000**	**14,000**	**14,000**	**14,000**	**14,000**	**1,600**

C&P = characterization and packaging; CCOs = criticality control overpacks; CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NA = not applicable; NPMP = not-pit metal processing PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) A column for the All LANL Sub-Alternative is not included because no activities would occur at SRS.

(b) NPMP activities are included in PDP activities.

(c) Waste generation rates are based on values reported by LANL because it reflects the expected process for PDP at SRS (LANL 2023).

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Sources: Calculated from LANL 2023; SRNS 2023b.

C.3 Cross-Site Tables

Table C-25. Land Disturbance by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capa-bility	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[(a)] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[(b)] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[(b)] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Land Disturbance (ac)	PDP	5.1	5.1	5.1	5.1	20	20	NA	NA
	NPMP	(c)	0	0.3	(c)	(c)	(c)	0	(d)
	Dilution	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	0.6[(f)]	(d)	(d)	(d)	(d)
	Total	**5.1**	**5.1**	**5.4**	**5.1[(f)]**	**20**	**20**	**0**	**(d)**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site; TA-55 = Technical Area 55.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Construction/modification activities for NPMP are not distinct from PDP construction/modification activities and are included in PDP impacts.

(d) No construction/modification activities are anticipated.

(e) Dilution activities occur within PDP facilities and would have no additional impacts from associated building modifications.

(f) The Drum Handling Facility for C&P in the All LANL Sub-Alternative replaces one of the TA-55 laydown areas in the Base Approach Sub-Alternative after it is first used as a laydown area in the All LANL Sub-Alternative, so the total area used at LANL for the Base Approach and the All LANL Sub-Alternatives are the same.

Sources: LANL 2023; SRNS 2023b.

Table C-26. Geologic Materials Used by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Geologic Materials Used (sand, gravel, crushed stone) (yd^3)	PDP	30,000	30,000	30,000	30,000	260,000	260,000	NA	NA
	NPMP	(c)	0	0	(c)	(c)	(c)	0	(d)
	Dilution	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	11,000	(d)	(d)	(d)	(d)
	Total	**30,000**	**30,000**	**30,000**	**41,000**	**260,000**	**260,000**	**0**	**(d)**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Construction/modification activities for NPMP are not distinct from PDP construction/modification activities and are included in PDP impacts.

(d) No construction/modification activities are anticipated.

(e) Dilution activities occur within PDP facilities and would have no additional impacts from associated building modifications.

Note: Values rounded to two significant digits.

Sources: LANL 2023|Section 2.13|; SRNS 2023b.

Table C-27. LCF Impacts by Capability During Construction/Modification for the Preferred and No Action Alternatives

Receptor (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Worker – total risk of LCF	PDP	0.001	0.001	0.001	0.001	0	0.0001	NA	NA
	NPMP	(c)	0.00005	0	(c)	(c)	(c)	0.00005	None[d]
	Dilution	None[d]	None[d]	None[d]	0.0005	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	0	None[d]	None[d]	None[d]	None[d]
	Total[e]	**0.001**	**0.001**	**0.001**	**0.002**	**0**	**0.0001**	**0.00005**	**None[d]**
Workforce – number of LCFs	PDP	0 (0.008)	0 (0.008)	0 (0.008)	0 (0.008)	0 (0)	0 (0.003)	NA	NA
	NPMP	(c)	0 (0.0007)	0 (0)	(c)	(c)	(c)	0 (0.0007)	None[d]
	Dilution	None[d]	None[d]	None[d]	0.002	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	0	None[d]	None[d]	None[d]	None[d]
	Total	**0 (0.008)**	**0 (0.009)**	**0 (0.008)**	**0 (0.01)**	**0 (0)**	**0 (0.003)**	**0 (0.0007)**	**None[d]**
Public – MEI total risk of LCF	PDP	(f)	(f)	(f)	(f)	0	3×10^{-8}	NA	NA
	NPMP	(c)	(f)	0	(c)	(c)	(c)	(f)	None[d]
	Dilution	None[d]	None[d]	None[d]	(f)	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	(f)	None[d]	None[d]	None[d]	None[d]
	Total	**(f)**	**(f)**	**(f)**	**(f)**	**0**	**3×10^{-8}**	**(f)**	**None[d]**
Public – population number of LCFs	PDP	(f)	(f)	(f)	(f)	0 (0)	0 (0.002)	NA	NA
	NPMP	(c)	(f)	0 (0)	(c)	(c)	(c)	(f)	None[d]
	Dilution	None[d]	None[d]	None[d]	(f)	None[d]	None[d]	None[d]	None[d]
	C&P	None[d]	None[d]	None[d]	(f)	None[d]	None[d]	None[d]	None[d]
	Total	**(f)**	**(f)**	**(f)**	**(f)**	**0 (0)**	**0 (0.002)**	**(f)**	**None[d]**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; LCF= latent cancer fatality (the risk of LCF in an individual and the number of LCF in an exposed population); MEI = maximally exposed individual; NA = not applicable; NNSA = National Nuclear Security Administration; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP construction would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Construction/modification activities for NPMP are not distinct from PDP construction/modification activities and are included in PDP impacts.

(d) No construction/modification activities are anticipated.

(e) Totals are for a "maximum" worker who works on all construction activities regardless of the location, and is shown on this table to allow a comparison between the sub-alternatives.

(f) LCFs to the public and the MEI from construction activities for the sub-alternatives other than the All SRS Sub-Alternative were not calculated because doses and corresponding LCFs to workers at the site were extremely low and the expectation is that a negligible dose and corresponding LCF would be received by noninvolved workers, the MEI, and other members of the public.

Notes: Numbers are rounded to one or two significant digits. Columns may not sum to totals due to rounding of individual values and totals. NNSA considers LCFs <0.5 to be 0 for the Workforce – Project Collective Dose and Public – Population Dose.

Sources: LANL 2023; SRNS 2023b.

Table C-28 LCF Impacts by Capability During Operations for the Preferred and No Action Alternatives

Receptor (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Worker – total risk of LCF	PDP	0.005	0.005	0.005	0.005	0.004	0.004	NA	NA
	NPMP	(c)	0.007	0.004	(c)	(c)	(c)	0.007	0.005
	Dilution	0.005	0.005	0.005	0.007	0.005	0.005	0.007	0.007
	C&P	0.002	0.002	0.002	0.003	0.002	0.002	0.003	0.003
	Total	**(d)**	**(d)**	**(d)**	**(d)**	**(d)**	**(d)**	**(d)**	**(d)**
Workforce – total number of LCFs	PDP	1 (1.2)	1 (1.2)	1 (1.2)	1 (1.2)	1 (1.2)	1 (1.2)	NA	NA
	NPMP	(c)	1 (0.5)	0 (0.1)	(c)	(c)	(c)	0 (0.5)	0 (0.5)
	Dilution	1 (1.1)	1 (1.1)	1 (1.1)	1 (0.6)	1 (1.1)	1 (1.1)	0 (0.3)	0 (0.3)
	C&P	0 (0.1)	0 (0.1)	0 (0.1)	0 (0.09)	0 (0.1)	0 (0.1)	0 (0.03)	0 (0.03)
	Total	**2 (2.4)**	**3 (2.9)**	**3 (2.5)**	**2 (1.8)**	**2 (2.4)**	**2 (2.4)**	**1 (0.9)**	**1 (0.9)**
Public – MEI risk of LCF	PDP	3×10^{-8}	3×10^{-8}	3×10^{-8}	3×10^{-8}	9×10^{-10}	7×10^{-10}	NA	NA
	NPMP	(c)	2×10^{-10}	2×10^{-10}	(c)	(c)	(c)	2×10^{-10}	8×10^{-9}
	Dilution	9×10^{-10}	9×10^{-10}	9×10^{-10}	4×10^{-8}	9×10^{-10}	9×10^{-10}	2×10^{-10}	2×10^{-10}
	C&P	0	0	0	0	0	0	0	0
	Total[e]	**3×10^{-8}**	**3×10^{-8}**	**3×10^{-8}**	**6×10^{-8}**	**2×10^{-9}**	**2×10^{-9}**	**4×10^{-10}**	**8×10^{-9}**
Public – Population number of LCFs	PDP	0 (0.0001)	0 (0.0001)	0 (0.0001)	0 (0.0001)	0 (0.00004)	0 (0.00004)	NA	NA
	NPMP	(c)	0 (0.00001)	0 (0.00001)	(c)	(c)	(c)	0 (0.00001)	0 (0.00003)
	Dilution	0 (0.00005)	0 (0.00005)	0 (0.00005)	0 (0.0001)	0 (0.00005)	0 (0.00005)	0 (0.00001)	0 (0.00001)
	C&P	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
	Total	**0 (0.0001)[f]**	**0 (0.0002)[f]**	**0 (0.0002)[f]**	**0 (0.0002)**	**0 (0.00008)**	**0 (0.00008)**	**0 (0.00002)**	**0 (0.00004)[f]**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; LCF= latent cancer fatality (the risk of LCF in an individual and the number of LCF in an exposed population); MEI = maximally exposed individual; NA = not applicable; NNSA = National Nuclear Security Administration; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Operations activities for NPMP are not distinct from PDP activities and are included in PDP impacts.

(d) Totals are not listed, because different individuals would work on different capabilities.

(e) Total for the site with the highest risk of LCF. The total does not sum across LANL and SRS.

(f) Population doses and the resulting LCFs are split between LANL and SRS. The population LCF at any one site will be lower than the total LCF shown.

Notes: Numbers are rounded to one or two significant digits. Columns may not sum to totals due to rounding of individual values and totals. NNSA considers LCFs <0.5 to be 0 for the Workforce – Project Collective Dose and Public – Population Dose.

Sources: LANL 2023; SRNS 2023b.

Table C-29. Bounding Accident – LCF Risk and Population LCFs by Site During Operations for the Preferred and No Action Alternatives

Receptor (Units)	Location	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[a][b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[a] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)[c]
Noninvolved worker – maximum LCF Risk	LANL	0.1	0.06	0.06	0.1	NA	NA	NA	0.1
	SRS K-Area	0.002	0.004	0.03	NA	0.002	0.004	0.004	0.001
	SRS F-Area	NA	NA	NA	NA	0.004	NA	NA	NA
Public – MEI maximum LCF Risk	LANL	0.004	0.003	0.003	0.004	NA	NA	NA	0.004
	SRS K-Area	0.00006	0.0001	0.0004	NA	0.00006	0.0001	0.0001	0.00004
	SRS F-Area	NA	NA	NA	NA	0.0001	NA	NA	NA
Public – Population maximum LCFs	LANL	0 (0.2)	0 (0.1)	0 (0.1)	0 (0.2)	NA	NA	NA	0 (0.2)
	SRS K-Area	0 (0.05)	0 (0.09)	0 (0.3)	NA	0 (0.05)	0 (0.09)	0 (0.08)	0 (0.03)
	SRS F-Area	NA	NA	NA	NA	0 (0.1)	NA	NA	NA

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; LCF= latent cancer fatality (the risk of LCF in an individual and the number of LCF in an exposed population); MEI = maximally exposed individual; MEI = maximally exposed individual; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) Values for PDP and NPMP occurring in F-Area and K-Area are found in Table D-8.

(b) Values for K-Area processing activities (dilution and C&P) for the F-Area PDP option are found in Table D-4.

(c) The dilute and C&P capabilities at SRS are used for the LANL NPMP option of the No Action Alternative. Values for these process activities at SRS are found in Table D-10.

Note: Beyond Extremely Unlikely accidents are not included in this table. See Appendix D for more detail.

Source: See tables, calculations, and references in Appendix D.

Table C-30. Peak-Year Economic Impacts by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Direct Employment (FTE in Peak Year)	PDP	116	116	116	116	525	525	NA	NA
	NPMP	(c)	78	30	(c)	(c)	(c)	78	(d)
	Dilution	(d)	(d)	(d)	23	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**116**	**194**	**146**	**139**	**525**	**525**	**78**	**(d)**
Total ROI Employment (FTE in Peak Year)	PDP	221	221	221	221	1,092	1,092	NA	NA
	NPMP	(c)	197	69	(c)	(c)	(c)	197	(d)
	Dilution	(d)	(d)	(d)	42	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**221**	**418**	**290**	**263**	**1,092**	**1,092**	**197**	**(d)**
Direct Earnings ($Million in peak year)	PDP	19.4	19.4	19.4	19.4	131.3	131.3	NA	NA
	NPMP	(c)	19.5	7.5	(c)	(c)	(c)	19.5	(d)
	Dilution	(d)	(d)	(d)	3.8	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**19.4**	**38.9**	**26.9**	**23.2**	**131.3**	**131.3**	**19.5**	**(d)**
Total ROI Earnings ($Million in peak year)	PDP	23.6	23.6	23.6	23.6	176.7	176.7	NA	NA
	NPMP	(c)	24.3	7.9	(c)	(c)	(c)	24.3	(d)
	Dilution	(d)	(d)	(d)	4.6	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**23.6**	**47.9**	**31.5**	**28.2**	**176.7**	**176.7**	**24.3**	**(d)**

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Direct Output ($Million in peak year)	PDP	20.3	20.3	20.3	20.3	168.5	168.5	NA	NA
	NPMP	(c)	19.3	6.3	(c)	(c)	(c)	19.3	(d)
	Dilution	(d)	(d)	(d)	3.9	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**20.3**	**39.6**	**26.6**	**24.2**	**168.5**	**168.5**	**19.3**	**(d)**
Total ROI Output ($Million in peak year)	PDP	36.3	36.3	36.3	36.3	306.8	306.8	NA	NA
	NPMP	(c)	37.1	12.1	(c)	(c)	(c)	37.1	(d)
	Dilution	(d)	(d)	(d)	7.0	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**36.3**	**73.4**	**48.4**	**43.3**	**306.8**	**306.8**	**37.1**	**(d)**

C&P = characterization and packaging; FTE = full-time equivalent (employee); LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; ROI = region of influence; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Construction/modification activities for NPMP are not distinct from PDP construction/modification activities and are included in PDP impacts.

(d) No construction/modification activities are anticipated.

(e) C&P are included in the totals for PDP and dilution – staff are shared between activities.

Sources: Calculated from data in LANL 2023|derived from Section 2.14|; SRNS 2023b; DOE 2012|Table 2.4-2|; DOE 2015|Table F-8|.

Table C-31. Peak-Year Economic Impacts by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Direct Employment (FTE in Peak Year)[d]	PDP	395	395	395	395	494	494	NA	NA
	NPMP	(c)	113	38	(c)	(c)	(c)	113	147
	Dilution	447	447	447	114	447	447	85	85
	C&P	75	75	75	40	75	75	14	14
	Total	**917**	**1,030**	**955**	**549**	**1,016**	**1,016**	**212**	**246**
Total ROI Employment (FTE in Peak Year)	PDP	1,301	1,301	1,301	1,301	2,624	2,624	NA	NA
	NPMP	(c)	293	99	(c)	(c)	(c)	293	376
	Dilution	1,170	1,170	1,170	365	1,170	1,170	222	222
	C&P	290	290	290	128	290	290	52	52
	Total	**2,761**	**3,054**	**2,860**	**1,794**	**4,084**	**4,084**	**567**	**650**
Direct Earnings ($Million in peak year)	PDP	458.1	458.1	458.1	458.1	573.0	573.0	NA	NA
	NPMP	(c)	30.8	7.8	(c)	(c)	(c)	30.8	83.6
	Dilution	121.5	121.5	121.5	41.2	121.5	121.5	23.1	23.1
	C&P	19.8	19.8	19.8	14.4	19.8	19.8	3.8	3.8
	Total	**599.4**	**630.2**	**607.2**	**513.7**	**714.3**	**714.3**	**57.7**	**110.5**
Total ROI Earnings ($Million in peak year)	PDP	627.3	627.3	627.3	627.3	874.0	874.0	NA	NA
	NPMP	(c)	31.6	10.7	(c)	(c)	(c)	31.6	114.2
	Dilution	125.4	125.4	125.4	56.1	125.4	125.4	23.8	23.8
	C&P	25.9	25.9	25.9	19.7	25.9	25.9	4.7	4.7
	Total	**778.6**	**810.2**	**789.3**	**703.1**	**1,025.3**	**1,025.3**	**60.1**	**142.7**

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Direct Output ($Million in peak year)	PDP	1,276.5	1,276.5	1,276.5	1,276.5	1,579.5	1,579.5	NA	NA
	NPMP	(c)	32.9	11.1	(c)	(c)	(c)	23.9	228.9
	Dilution	136.4	136.4	136.4	112.7	136.4	136.4	25.9	25.9
	C&P	68.4	68.4	68.4	39.6	68.4	68.4	11.5	6.211.5
	Total	**1,481.3**	**1,514.2**	**1,492.4**	**1,428.8**	**1,481.3**	**1,481.3**	**70.3**	**266.3**
Total ROI Output ($Million in peak year)	PDP	1,851.3	1,851.3	1,851.3	1,851.3	2,493.7	2,493.7	NA	NA
	NPMP	(c)	59.2	20.0	(c)	(c)	(c)	59.2	332.9
	Dilution	242.6	242.6	242.6	163.9	242.6	242.6	46.1	46.1
	C&P	101.4	101.4	101.4	57.5	101.4	101.4	17.2	17.2
	Total	**2,195.3**	**2,254.5**	**2,215.3**	**2,027.7**	**2,837.7**	**2,837.7**	**122.5**	**396.2**

C&P = characterization and packaging; FTE = full-time equivalent (employee); LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; ROI = region of influence; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Operations activities for NPMP are not distinct from PDP activities and are included in PDP impacts.

(d) The number of staff anticipated at each site (LANL or SRS) for equivalent processing activities varies based on the equipment that would be used at each site for processing activities.

Sources: Calculated from data in LANL 2023|Sections 1.4.1, 1.4.2|; SRNS 2023b; DOE 2012; DOE 2015.

Table C-32. Infrastructure by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Electricity Use (MWh/yr)	PDP	160	160	160	160	16,000	16,000	NA	NA
	NPMP	(c)	minimal	minimal	(c)	(c)	(c)	minimal	(d)
	Dilution	(d)	(d)	(d)	(c)	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	0	(d)	(d)	(d)	(d)
	Total	**160**	**160**	**160**	**160**	**16,000**	**16,000**	**minimal**	**(d)**
Electricity Peak Load (MW)	PDP	0.02	0.02	0.02	0.02	1.8	1.8	NA	NA
	NPMP	(c)	minimal	minimal	(c)	(c)	(c)	minimal	(d)
	Dilution	(d)	(d)	(d)	(c)	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	0	(d)	(d)	(d)	(d)
	Total	**0.02**	**0.02**	**0.02**	**0.02**	**1.8**	**1.8**	**minimal**	**(d)**
Fuel Use (gal/yr)	PDP	54,000	54,000	54,000	54,000	300,000	540,000	NA	NA
	NPMP	(c)	4,000	750	(c)	(c)	(c)	4,000	(d)
	Dilution	(d)	(d)	(d)	(c)	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	15,000	(d)	(d)	(d)	(d)
	Total	**54,000**	**58,000**	**55,000**	**69,000**	**300,000**	**540,000**	**4,000**	**(d)**
Water Use (millions of gal/yr)	PDP	2.6	2.6	2.6	2.6	1.1	2	NA	NA
	NPMP	(c)	1	0.5	(c)	(c)	(c)	1	(d)
	Dilution	(d)	(d)	(d)	(c)	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(c)	(d)	(d)	(d)	(d)
	Total	**2.6**	**3.6**	**3.1**	**2.6**	**1.1**	**2**	**1**	**(d)**

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Sewage Generation (millions of gal/yr)	PDP	0.055	0.055	0.055	0.055	1.1	1.1	NA	NA
	NPMP	(c)	1	0.5	(c)	(c)	(c)	1	(d)
	Dilution	(d)	(d)	(d)	(c)	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**0.055**	**1.1**	**0.56**	**0.055**	**1.1**	**1.1**	**1**	**(d)**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; PF-4 = Plutonium Facility-4; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Construction/modification activities are not distinct from PDP construction/modification activities and are included in PDP impacts.

(d) No construction/modification activities are anticipated.

(e) Sewage generation for workers performing construction/modification activities inside PF-4 are included in the requirements for PDP activities. Construction workers outside PF-4 would use portable toilets (LANL 2023|Section 2.16.1.1|).

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Sources: LANL 2023; SRNS 2023b; DOE 2015|Table F-26|; SRNS 2010; ACI 2013.

Table C-33. Infrastructure by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Electricity Use (MWh/yr)	PDP	2,400	2,400	2,400	2,400	41,000	41,000	NA	NA
	NPMP	(c)	1,700	2,300	(c)	(c)	(c)	1,700	910
	Dilution	8,700	8,700	8,700	500	8,700	8,700	1,800	1,800
	C&P	2,800	2,800	2,800	200	2,800	2,800	580	580
	Total	**14,000**	**16,000**	**16,000**	**3,100**	**53,000**	**53,000**	**4,100**	**3,300**
Electricity Peak Load (MW)	PDP	0.39	0.39	0.39	0.39	4.7	4.7	NA	NA
	NPMP	(c)	0.19	0.26	(c)	(c)	(c)	0.19	0.10
	Dilution	1.2	1.2	1.2	0.06	1.2	1.2	0.26	0.26
	C&P	0.39	0.39	0.39	0.08	0.39	0.39	0.08	0.08
	Total	**2.0**	**2.2**	**2.2**	**0.53**	**6.3**	**6.3**	**0.53**	**0.44**
Fuel Use (gal/yr)	PDP	0	0	0	0	170,000	170,000	NA	NA
	NPMP	(c)	7,200	7,200	(c)	(c)	(c)	1,500	0
	Dilution	7,200	7,200	7,200	0	7,200	7,200	1,500	1,500
	C&P	0[d]	0[d]	0[d]	0	0[d]	0[d]	0[d]	0[d]
	Total	**7,200**	**14,000**	**14,000**	**0**	**180,000**	**180,000**	**3,000**	**1,500**
Water Use (millions of gal/yr)	PDP	1.7	1.7	1.7	1.7	5	5	NA	NA
	NPMP	(c)	1	1	(c)	(c)	(c)	1	0.6
	Dilution	3	3	3	0.85	3	3	0.6	0.6
	C&P	0.6	0.6	0.6	(e)	0.6	0.6	0.1	0.1
	Total	**5.3**	**6.3**	**6.3**	**2.5**	**8.6**	**8.6**	**1.8**	**1.4**

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Sewage Generation (millions of gal/yr)	PDP	1.7	1.7	1.7	1.7	5	5	NA	NA
	NPMP	(c)	1	1	(c)	(c)	(c)	1	0.6
	Dilution	3	3	3	0.85	3	3	0.6	0.6
	C&P	0.6	0.6	0.6	(e)	0.6	0.6	0.1	0.1
	Total	**5.3**	**6.3**	**6.3**	**2.5**	**8.6**	**8.6**	**1.8**	**1.4**

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Operations activities are not distinct from PDP activities and are included in PDP impacts.

(d) Propane would be needed for SRS C&P operations for propane powered fork trucks (1,600 lb/yr) and is not reflected in the table. For the No Action Alternative, a fraction (7.1/34 or 21%) of the propane use would be required (334 lb/yr).

(e) Operation activities are not distinct and are included in dilution impacts.

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Sources: LANL 2023; SRNS 2023b; DOE 2015|Table F-27|; DOE 2012|Section 2.2.3, Table 2.2-7|.

Table C-34. Total Waste Generation by Capability During Construction/Modification for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
CH-TRU Waste (job control waste) (m^3)	PDP	69	69	69	69	0	0	NA	NA
	NPMP	(c)	110	0	(c)	(c)	(c)	110	(d)
	Dilution	(d)	(d)	(d)	38	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**69**	**170**	**69**	**110**	**0**	**0**	**110**	**(d)**
LLW (m^3)	PDP	360	360	360	360	0	12,000	NA	NA
	NPMP	(c)	0	0	(c)	(c)	(c)	0	(d)
	Dilution	(d)	(d)	(d)	200	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**360**	**360**	**360**	**560**	**0**	**12,000**	**0**	**(d)**
MLLW (m^3)	PDP	4.8	4.8	4.8	4.8	0	210	NA	NA
	NPMP	(c)	0	0	(c)	(c)	(c)	0	(d)
	Dilution	(d)	(d)	(d)	2.6	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**4.8**	**4.8**	**4.8**	**7.4**	**0**	**210**	**0**	**(d)**
Liquid LLW (m^3)	PDP	0	0	0	0	0	0	NA	NA
	NPMP	(c)	0	0	(c)	(c)	(c)	0	(d)
	Dilution	(d)	(d)	(d)	0	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**(d)**

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Solid Hazardous Waste (m^3)	PDP	2.4	2.4	2.4	2.4	45	6,600	NA	NA
	NPMP	(c)	0	0	(c)	(c)	(c)	0	(d)
	Dilution	(d)	(d)	(d)	0.68	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**2.4**	**2.4**	**2.4**	**3.1**	**45**	**6,600**	**0**	**(d)**
Solid Non-Hazardous Waste (m^3)	PDP	210	210	210	210	1,000	6,900	NA	NA
	NPMP	(c)	66	66	(c)	(c)	(c)	66	(d)
	Dilution	(d)	(d)	(d)	61	(d)	(d)	(d)	(d)
	C&P	(d)	(d)	(d)	(e)	(d)	(d)	(d)	(d)
	Total	**210**	**280**	**280**	**280**	**1,000**	**6,900**	**66**	**(d)**

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Construction/modification activities for NPMP are not distinct from PDP construction/modification activities and are included in PDP impacts.

(d) No construction/modification activities are anticipated.

(e) C&P waste generation is included in the dilution estimate at LANL.

Notes: Numbers are rounded to two significant digits. Columns may not sum to totals due to rounding of individual values and totals.

Sources: Calculated from LANL 2023; SRNS 2023b.

Table C-35. Total Waste Generation by Capability During Operations for the Preferred and No Action Alternatives

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
CH-TRU Waste (job control waste) (m^3)	PDP[c]	670	670	670	670	670	670	NA	NA
	NPMP	(d)	170	220	(d)	(d)	(d)	35	59
	Dilution	1,400	1,400	1,400	970	1,400	1,400	140	140
	C&P	0	0	0	0	0	0	0	0
	Total	**2,000**	**2,200**	**2,300**	**1,600**	**2,000**	**2,000**	**170**	**200**
LLW (m^3)	PDP[c]	3,200	3,200	3,200	3,200	3,200	3,200	NA	NA
	NPMP	(d)	2,300	3,100	(d)	(d)	(d)	490	280
	Dilution	19,000	19,000	19,000	14,000	19,000	19,000	2,000	2,000
	C&P	0	0	0	0	0	0	0	0
	Total	**23,000**	**25,000**	**26,000**	**17,000**	**23,000**	**23,000**	**2,400[e]**	**2,200[e]**
MLLW (m^3)	PDP[c]	42	42	42	42	42	42	NA	NA
	NPMP	(d)	0	0	(d)	(d)	(d)	0	3.7
	Dilution	0	0	0	47	0	0	0	0
	C&P	0	0	0	0	0	0	0	0
	Total	**42**	**42**	**42**	**89**	**42**	**42**	**0**	**3.7**
Liquid LLW (m^3)	PDP[c]	65,000	65,000	65,000	65,000	65,000	65,000	NA	NA
	NPMP	(d)	0	0	(d)	(d)	(d)	0	0
	Dilution	0	0	0	0	0	0	0	0
	C&P	0	0	0	0	0	0	0	0
	Total	**65,000**	**65,000**	**65,000**	**65,000**	**65,000**	**65,000**	**0**	**0**

Impact Indicator (Units)	Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP[a] Sub-Alternative (105-K NPMP Option)	Preferred Alternative SRS NPMP[a] Sub-Alternative (Modular NPMP Option)	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative (F-Area PDP[b] Option)	Preferred Alternative All SRS Sub-Alternative (K-Area PDP[b] Option)	No Action Alternative (SRS NPMP Option)	No Action Alternative (LANL NPMP Option)
Solid Hazard-ous Waste (m^3)	PDP[c]	6.6	6.6	6.6	6.6	6.6	6.6	NA	NA
	NPMP	(d)	0	0	(d)	(d)	(d)	0	0.7
	Dilution	0	0	0	0.17	0	0	0	0
	C&P	0	0	0	0	0	0	0	0
	Total	**6.6**	**6.6**	**6.6**	**6.8**	**6.6**	**6.6**	**0.0**	**0.7**
Solid Non-Hazard-ous Waste (m^3)	PDP[c]	1,500	1,500	1,500	1,500	1,500	1,500	NA	NA
	NPMP	(d)	1,700	1,700	(d)	(d)	(d)	360	150
	Dilution	11,000	11,000	11,000	18	11,000	11,000	1,100	1,100
	C&P	2,000	2,000	2,000	0	2,000	2,000	200	200
	Total	**14,000**	**16,000**	**16,000**	**1,500**	**14,000**	**14,000**	**1,600**	**1,400**

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NA = not applicable; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) Impacts are presented for PDP and NPMP separately because PDP and NPMP would occur at different sites in the SRS NPMP Sub-Alternative, unlike the other sub-alternatives. The impacts of 34 MT PDP and 7.1 MT NPMP together bound the impacts of the total 34 MT of surplus plutonium that would be processed in the Preferred Alternative.

(b) Both PDP and NPMP would occur in F-Area and K-Area, respectively, in the F-Area PDP Option and K-Area PDP Option.

(c) Waste generation rates at SRS are based on values reported by LANL because it reflects the expected process for PDP at SRS (LANL 2023).

(d) Operations activities for NPMP are not distinct from PDP activities and are included in PDP impacts.

(e) This column does not sum to the total due to rounding individual values and totals.

Sources: Calculated from LANL 2023; SRNS 2023b.

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APPENDIX D

EVALUATION OF HUMAN HEALTH EFFECTS FROM FACILITY ACCIDENTS

This appendix details the potential human health effects on noninvolved workers, maximally exposed individual (MEI) offsite, and the general population associated with postulated accidents that result in radiological releases. As discussed in Section 2.0, anticipated activities at Pantex Plant, the Y-12 National Security Complex, and the Waste Isolation Pilot Plant are a continuation of ongoing activities that were previously evaluated. Therefore, this evaluation focuses on the activities occurring at Los Alamos National Laboratory (LANL) and the Savannah River Site (SRS) that are associated with the alternatives in this *Surplus Plutonium Disposition Program Environmental Impact Statement* (SPDP EIS).

The operational accidents selected are those used in the LANL Technical Area (TA)-55 Documented Safety Analysis (DSA) (LANL 2021) for pit disassembly and processing (PDP) and the SRS KAC DSA (SRNS 2021) for dilution and characterization and packaging (C&P) because these accidents were deemed to remain representative of the proposed plutonium disposition activities under the Preferred and No Action Alternatives. Operational accidents are primarily analyzed based on the Surplus Plutonium Disposition Program (SPDP) throughput for the material at risk (MAR). Facility-wide events (e.g., seismic, external impacts) are analyzed for both the SPDP inventory and the total facility inventory because the actions will be carried out in a portion of the identified facilities, with other activities also occurring in the same facility. The calculation using the total inventory is considered in the cumulative analysis provided in Section 4.2 of Volume 1. The accident consequences are based on updated population data, updated meteorological data, and the use of dose conversion factors based on a supplement to Federal Guidance Report [FGR] 13 (EPA 2002 and EPA 1988). The National Nuclear Security Administration (NNSA) assumed the most conservative of the pit (weapons-grade) and non-pit (K-Area bounding isotopic) isotopic mixes in the consequence analyses.

Surplus plutonium disposition activities do not require the use or storage of large amounts of hazardous chemicals; therefore, the impacts from postulated chemical releases are limited to the immediate accident vicinity and present negligible risks to the noninvolved worker, MEI, and the population. The occupational risks associated with postulated chemical releases are managed under the required industrial hygiene program. Because no substantial hazardous chemical releases are expected, chemical releases are not analyzed in this SPDP EIS.

Section D.1 describes the consequence analysis methodologies used in this SPDP EIS. Section D.2 provides the potential radiological impacts of postulated accidents associated with alternatives in this SPDP EIS. Section D.3 provides a list of references.

D.1 Consequence Analysis Methodology

Consequences for each of the postulated accidents are presented in terms of the estimated dose and the potential resultant latent cancer fatality (LCF) risk for the individual receptor (noninvolved workers and MEI) and the number of LCFs for the exposed population. For individuals or population groups, estimates of potential LCFs are made using a factor of 0.0006 LCF per rem or person-rem (or 600 LCF per 1 million rem or person-rem) (DOE 2003). For cases where the individual (MEI or noninvolved worker) dose would be equal to or greater than 20 rem, the LCF risk was doubled (NCRP 1993). If the dose given to an individual exceeds 400 rem, it is assumed to result in a fatality, with the LCF risk = 1.

Accident frequencies are grouped into the bins of "anticipated," "unlikely," "extremely unlikely," and "beyond extremely unlikely," with estimated annual frequencies of greater than or equal to 1 in 100 ($\geq 1 \times 10^{-2}$), 1 in 100 to 1 in 10,000 (1×10^{-2} to 1×10^{-4}), 1 in 10,000 to 1 in 1 million (1×10^{-4} to 1×10^{-6}), and less than 1 in 1 million (1×10^{-6}), respectively (DOE 2014).

Accident Frequencies

Frequency Bin	Estimated Probability Per Year
Anticipated	Is greater than 1×10^{-2}
Unlikely	Is between 1×10^{-2} and 1×10^{-4}
Extremely Unlikely	Is between 1×10^{-4} and 1×10^{-6}
Beyond Extremely Unlikely	Is less than or equal to 1×10^{-6}

Consequences from accidental releases are estimated for the following three receptors:

- noninvolved worker
- MEI
- the projected 2040 population within a radius of 50 mi from the release point.

Individual and population doses were computed for unit releases from each of the LANL and SRS locations:

- LANL Technical Area (TA)-55,
- SRS F-Area, and
- SRS K-Area.

The accidents selected for this SPDP EIS and the analysis assumptions are those used in the LANL TA-55 DSA (LANL 2021) and SRS KAC DSA (SRNS 2021), augmented to reflect new systems or facilities, and SPDP MAR as appropriate. Specifically, the identification of postulated accidents during proposed pit disassembly and processing (PDP) and non-pit metal processing (NPMP) activities analyzed for SRS are based on the accidents evaluated in the DSA for LANL. Likewise, the identification of postulated accidents at LANL from dilution and C&P processing are based on the accidents evaluated in the DSA for SRS. As a result, representative accidents from the LANL TA-55 DSA and SRS KAC DSA were included at each location even if not previously identified in the existing DSA for each site (e.g., a Direct Metal Oxidation steam explosion has been analyzed for all locations).

The development of the source terms is based on the MAR, which is derived from the throughputs for the processing activities as shown in Table B-2 in Appendix B of this EIS. The analysis only considers activities that are inherent to the SPDP processes rather than any other activities that are either currently being conducted or are proposed to be conducted in the same building. This allows a more direct comparison between the accident consequences of the different SPDP alternatives and sub-alternatives. However, facility-wide events (e.g., seismic, external impacts) are also analyzed for the total facility inventory because the actions will be carried out in a portion of the identified facilities, with other activities also occurring in the same facility. The calculation using the total inventory is considered in the cumulative analysis provided in Section 4.2 of Volume 1. Table D-1 provides the assumed SPDP MAR for the LANL and SRS process and storage.

Table D-1. SPDP Assumed MAR for Preferred Alternative

Site	SPDP MAR (kg Pu)
LANL Process MAR	333
LANL Storage MAR	533
LANL Total Facility SPDP MAR	**866**
SRS Process MAR	417
SRS Storage MAR	667
SRS Total Facility SPDP MAR	**1084**

LANL = Los Alamos National Laboratory; MAR = material at risk; Pu = Plutonium; SPDP = Surplus Plutonium Disposition Program; SRS = Savannah River Site.
Source: MAR is calculated based on throughputs in Table B-2 and process descriptions from LANL 2023 and SRNS 2023.

In general, DSA factors that were provided in the LANL DSA for PDP in PF-4 were used for the accident analyses of PDP activities at SRS in Buildings 105-K and 226-F. Likewise, the SRS DSA factors for dilution, and characterization, and packaging activities were used for the accident analyses for these activities in PF-4 and the Drum Handling Facility (DHF) at LANL for the All LANL Sub-Alternative. The DSA factors used for the calculation of the postulated accident doses include the following:

- Damage ratio (DR) is the fraction of MAR exposed to the effects of the energy, force, or stress generated by the postulated event. For the accident scenarios discussed in this analysis, the value of the DR varies depending on the details of the accident scenario but can range up to 1.0.
- Airborne release fraction (ARF) is the fraction of material that becomes airborne due to the accident, and the respirable fraction (RF) is the fraction of material with a particulate aerodynamic diameter less than or equal to 10 microns (0.0004 inches) that could be retained in the respiratory system following inhalation. The ARF and RF values used in this SPDP EIS are those presented in the LANL DSA, SRS DSA, or estimated using DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities* (DOE 1994).
- Leak path factor (LPF) accounts for the action of removal mechanisms (e.g., containment systems, filtration, and deposition) to reduce the amount of airborne radioactivity ultimately released to occupied spaces in the facility or the environment. An LPF of 0.005 is used for the dilution accident scenarios. This LPF is based on at least one stage of HEPA filter functioning. For PDP and C&P accident scenarios, more conservative LPFs are used, which range from 0.05 to 1.0.

DSAs prepared by LANL for PF-4 and by SRS for the 105-K building were reviewed as a valuable source of information during the development of the accident consequence analysis for the SPDP EIS. A central focus of the DSA process is to demonstrate that safety controls sufficient to protect workers and the public from accidents that could occur as infrequently as once every 1,000,000 years have been or will be put in place during facility operations. The DSA process assists in determining what aspects of facility operation require engineered or administrative controls to reduce the probability and consequences of accidents. In contrast, the purpose of the National Environmental Policy Act (NEPA) analysis is to quantify the risk and provide estimates of the probabilities or consequences of postulated accidents.

Consistent with the DSA purpose, source terms and other assumptions used for bounding safety analysis frequency and consequence estimates are conservative; that is, they overestimate the expected impacts. In reality, the actual risk of facility operations is expected to be much lower than portrayed in DSAs when the necessary controls, brought to light by the DSA process, are applied. In general, a NEPA analysis will make many assumptions since the proposed facility or proposed facility modifications have

not been designed at the time of the NEPA analysis. These assumptions are based on experience with similar facilities and operations and expert engineering judgment. As a result, this leads to differences between a NEPA document and a DSA in assumptions and estimated doses to the noninvolved worker, the maximally exposed individual, and the public. Therefore, the doses presented in this SPDP EIS may not match those presented in the DSAs. The NNSA has compared the doses presented in this SPDP EIS against the DSAs and determined that they are more realistic, while still conservative, estimates of doses that could result under accident conditions.

D.1.1 MACCS

The MELCOR Accident Consequence Code System (MACCS) (WinMACCS computer code version 4.2) was used for this SPDP EIS analysis to compute unit doses (for plutonium-239 and fission products released during a criticality event) (Chanin and Young 1998; Jow et al. 1990). Unit doses (1 gram of plutonium-239) were used to estimate the doses to the noninvolved worker, MEI, and the projected 2040 population within a 50-mi radius. Three requisite input files, which separately provide population distributions, meteorological data, and dose coefficients, were also updated as described in Sections D.1.2, D.1.3, and D.1.4.

WinMACCS 4.2 models the offsite consequences of an accident that releases a plume of radioactive materials into the atmosphere, specifically the degree of dispersion versus distance as a function of historical wind direction, speed, and atmospheric conditions. Were such an accidental release to occur, the radioactive gases and aerosols in the plume would be transported by the prevailing wind and dispersed in the atmosphere, and the population would be exposed to radiation. WinMACCS2 generates the distribution of downwind doses at specified distances, as well as the distribution of population doses out to 50 mi (80 km).

As implemented in this SPDP EIS for accidents at DOE facilities, the WinMACCS 4.2 model evaluates doses due to inhalation of aerosols such as respirable plutonium, as well as external exposure to the passing plume. This represents the major portion of the dose that a noninvolved worker or member of the public would receive as a result of a plutonium disposition facility accident. The deposition velocity of the radioactive material was set to zero, so that material that might otherwise be deposited on surfaces remains airborne and available for inhalation. This adds conservatism to inhalation doses that can become considerable at large distances (as much as two orders of magnitude of conservatism at the 50-mi [80-km] limit). Thus, the method used in this SPDP EIS is conservative (results in higher doses) compared with the dose results that would be obtained if deposition and resuspension were taken into account.

The region around the facility is divided by a polar-coordinate grid centered on the facility itself. The user specifies the number of radial divisions and their endpoint distances. The angular divisions used to define the spatial grid correspond to the 16 directions of the compass. Dose distributions were calculated in a probabilistic manner. Releases during each of the 8,760 hrs of the year were simulated, resulting in a distribution of dose reflecting variations in weather conditions at the time of the postulated accidental release. The code outputs the conditional probability of exceeding an individual or population dose as a function of distance. The mean consequences are analyzed in this SPDP EIS.

Section 2.0 of this SPDP EIS describes the surplus plutonium disposition activities that would occur in each of the facilities that are considered for each alternative and sub-alternative.

D.1.2 Population Distribution

For each of the surplus plutonium disposition locations, the population distribution was derived using the same base census data as used in the *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (2015 SPD Supplemental EIS or 2015 SPD SEIS [DOE 2015]), but projected to the year 2040, which was selected as a representative year for full-scale operations (USCB 2021a). The 2040 projections were based on the 2000 and 2010 Census data, in addition to the annual estimates for 2010 to 2017 (USCB 2021b). The distributions consisted of the 2040 projected populations as a function of compass sectors and distance grids up to 50 mi for each of the locations described in Section D.1. These updated population distributions were used to compute the population doses presented in this SPDP EIS.

D.1.3 Meteorological Data

At least 5 years of meteorological data for both LANL and SRS were evaluated to determine which meteorological data set provided the largest doses. Doses presented in this SPDP EIS were calculated using the annual meteorological data that generated the greatest doses.

D.1.4 Dose Coefficients

Source terms are presented in plutonium-239 equivalent grams applicable to the isotopic mix and are identified based on the most conservative of the K-Area bounding isotopic and weapons-grade isotopic mixes that could be present for analyzing the potential consequences of activities. The 2015 SPD SEIS contains background information and a general discussion of plutonium equivalency (PuE) (DOE 2015). For activities only involving pit disassembly and processing, the weapons-grade isotopic mixture is used. Table D-2 provides the updated isotopic distributions and FGR 13 PuE values for bounding isotopic mixes:

- K-Area bounding isotopic (non-pit) mix
- weapons-grade isotopic mix.

The consequences analyzed in this SPDP EIS were updated using the most recent dose coefficients provided in the supplement to FGR 13 (EPA 2002). The unit doses and the FGR 13 PuE values were based on an absorption class of moderate (M) for all the plutonium and americium isotopes in the given mix based on recommendations in International Commission on Radiological Protection Report 71 (ICRP 1995). For the same MAR, this resulted in a reduction of the dose.

Table D-2. Isotopic Mixes and PuE Factors

Isotope	KBI (Non-Pit) Plutonium Mix[a] Weight Fraction	Weapons-Grade (Pit) Plutonium[b] Weight Fraction
Plutonium-238	4.00×10^{-4}	1.00×10^{-4}
Plutonium-239	8.78×10^{-1}	9.45×10^{-1}
Plutonium-240	1.15×10^{-1}	6.00×10^{-2}
Plutonium-241	3.70×10^{-3}	8.2×10^{-4}
Plutonium-242	2.60×10^{-3}	3.1×10^{-4}
Americium-241	6.25×10^{-2}	5.64×10^{-3}
Total:	**1.06**	**1.01**
FGR 13 PuE factor[c]	**4.37**	**1.47**

FGR = Federal Guidance Report; KBI = K-Area bounding isotopic; PuE = plutonium-239 equivalency.

(a) Source: SRNS 2019.

(b) Source: LANL 2023|Section 2.15.1.2.4|.

(c) FGR 13 PuE factors were developed using the dose coefficients from EPA 2002. For FGR 13 PuE, an absorption class of "M" was assumed for plutonium and americium-241 isotopes. PuE conversion factors were determined using methodology from Wen 2011.

D.2 Radiological Impacts of Facility Accidents

Table D-3 through Table D-10 provide the potential impacts of the accidents and associated source terms. These tables update the consequence analysis results based on changes in methodology described in Section D.1. A description of the accidents identified in these tables is found in LANL TA-55 DSA (LANL 2021) and SRS KAC DSA (SRNS 2021).

Table D-3. LANL Accident Impacts for the Preferred Alternative: Base Approach Sub-Alternative

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Criticality	NA[g]	Extremely Unlikely	7.0×10^{-1}	4×10^{-4}	1.0×10^{-1}	6×10^{-5}	$4.3\times10^{+0}$	0 (3×10^{-3})
Oxide spill in ARIES (or oxidation)	$1.3\times10^{+2}$	Extremely Unlikely	$8.0\times10^{+1}$	1×10^{-1}	$7.5\times10^{+0}$	4×10^{-3}	$3.8\times10^{+2}$	0 (2×10^{-1})
Glovebox fire in the pyrochemical metal preparation	$1.7\times10^{+0}$	Extremely Unlikely	$1.0\times10^{+0}$	6×10^{-4}	9.4×10^{-2}	6×10^{-5}	$4.8\times10^{+0}$	0 (3×10^{-3})
Fire in the vault	$9.1\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	6.7×10^{-1}	4×10^{-4}	3.3×10^{-1}	2×10^{-4}	$1.6\times10^{+2}$	0 (1×10^{-1})
Steam explosion in the DMO furnace	6.9×10^{-1}	Extremely Unlikely	4.2×10^{-1}	2×10^{-4}	3.9×10^{-2}	2×10^{-5}	$2.0\times10^{+0}$	0 (1×10^{-3})
Design-basis earthquake (SPDP inventory)	$7.9\times10^{+1}$	Extremely Unlikely	$4.7\times10^{+1}$	6×10^{-2}	$4.4\times10^{+0}$	3×10^{-3}	$2.3\times10^{+2}$	0 (1×10^{-1})
Design-basis earthquake with fire (SPDP inventory)	$1.2\times10^{+2}$	Extremely Unlikely	$7.1\times10^{+1}$	8×10^{-2}	$6.6\times10^{+0}$	4×10^{-3}	$3.4\times10^{+2}$	0 (2×10^{-1})
Beyond-design-basis earthquake-induced collapse with fire (SPDP inventory)	$8.0\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	$4.8\times10^{+1}$	6×10^{-2}	$4.5\times10^{+0}$	3×10^{-3}	$2.3\times10^{+2}$	0 (1×10^{-1})
Beyond-design-basis earthquake-induced collapse with fire (facility inventory)	$2.4\times10^{+3}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.4\times10^{+3}$	1 ($1.7\times10^{+0}$)	$1.33\times10^{+2}$	2×10^{-1}	$6.8\times10^{+3}$	4 ($4.1\times10^{+0}$)

ARIES = Advanced Recovery and Integrated Extraction System; DMO = Direct Metal Oxidation; FGR = Federal Guidance Report; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; PuE = plutonium-239 dose equivalent; SPDP = Surplus Plutonium Disposition Program; TA-55 = Technical Area 55.

(a) Except for criticality, source terms are PuE grams normalized to FGR 13 PuE values assuming the most conservative isotopic mix given in Table D-2.

(b) The distance to the nearest site boundary was assumed to be 0.68 mi.

(c) The LCF is calculated by using a risk estimator of 0.0006 fatal cancers per rem or person-rem. For estimated individual doses equal to or greater than 20 rem, the risk estimated was doubled. The estimated risk is NOT doubled for population doses.

(d) The rounded LCF value is provided, followed by the calculated value in parentheses.

(e) If the dose is >400 rem it is assumed to result in a fatality (LCF = 1), otherwise it is the estimate of an LCF.

(f) The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

(g) The source term consists of the iodine and noble gas radioisotopes generated by a criticality excursion involving $1\times10^{+19}$ fissions from Table 6-9 of DOE 1994/2013.

Table D-4. SRS Accident Impacts for the Preferred Alternative: Base Approach Sub-Alternative

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on Noninvolved Worker Dose (rem)	Impacts on Noninvolved Worker LCF Risk[c][d][e]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][e]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Criticality	NA[f]	Extremely unlikely	6.2×10^{-2}	4×10^{-5}	2.3×10^{-3}	1×10^{-6}	7.2×10^{-1}	0 (4×10^{-4})
Fire in the vault with 3013 can rupture at 1,000 psig	$4.7\times10^{+1}$	Extremely unlikely to beyond extremely unlikely	$1.8\times10^{+0}$	1×10^{-3}	6.3×10^{-2}	4×10^{-5}	$5.0\times10^{+1}$	0 (3×10^{-2})
Explosion (deflagration of 3013 can during cutting)	$6.6\times10^{+0}$	Extremely unlikely to beyond extremely unlikely	2.4×10^{-1}	1×10^{-4}	8.8×10^{-3}	5×10^{-6}	$6.9\times10^{+0}$	0 (4×10^{-3})
Design-basis earthquake (SPDP material only)	$1.1\times10^{+2}$	Unlikely	4.0×10^{-1}	2×10^{-4}	1.4×10^{-2}	9×10^{-6}	$1.1\times10^{+1}$	0 (7×10^{-3})
Design-basis earthquake with fire (SPDP material only)	$7.8\times10^{+2}$	Extremely unlikely	$2.9\times10^{+0}$	2×10^{-3}	1.1×10^{-1}	6×10^{-5}	$8.3\times10^{+1}$	0 (5×10^{-2})
Beyond-design-basis earthquake -induced collapse with fire (SPDP material only)	$2.1\times10^{+3}$	Extremely unlikely to beyond extremely unlikely	$1.0\times10^{+2}$	1×10^{-1}	$2.8\times10^{+0}$	2×10^{-3}	$2.2\times10^{+3}$	1 ($1.3\times10^{+0}$)
Beyond-design-basis earthquake-induced collapse with fire (total building inventory)	$5.9\times10^{+3}$	Extremely unlikely to beyond extremely unlikely	$2.9\times10^{+2}$	3×10^{-1}	$8.0\times10^{+0}$	5×10^{-3}	$6.2\times10^{+3}$	4 ($3.7\times10^{+0}$)
Seismic with subsequent Fire in the storage facility (SPDP material only)	$5.5\times10^{+0}$	Unlikely	2.7×10^{-1}	2×10^{-4}	7.5×10^{-3}	4×10^{-6}	$5.8\times10^{+0}$	0 (3×10^{-3})
Seismic with subsequent Fire in the storage facility (total inventory)	$3.5\times10^{+1}$	Unlikely	$1.7\times10^{+0}$	1×10^{-3}	4.7×10^{-2}	3×10^{-5}	$3.7\times10^{+1}$	0 (2×10^{-2})

FGR = Federal Guidance Report; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; PuE = plutonium-239 dose equivalent; SPDP = Surplus Plutonium Disposition Program; SRS = Savannah River Site.

(a) Except for criticality, source terms are PuE grams normalized to FGR 13 PuE values assuming the most conservative isotopic mix given in Table D-2.

(b) The distance to the nearest site boundary from KAC was assumed to be 5.5 mi.

(c) The LCF is calculated by using a risk estimator of 0.0006 fatal cancers per rem or person-rem. For estimated individual doses equal to or greater than 20 rem, the risk estimated was doubled. The estimated risk is NOT doubled for population doses.

(d) The rounded LCF value is provided, followed by the calculated value in parentheses.

(e) The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

(f) The source term consists of the iodine and noble gas radioisotopes generated by a criticality excursion involving $1\times10^{+19}$ fissions from Table 6-9 of DOE 1994/2013.

Table D-5. LANL Accident Impacts for the Preferred Alternative: SRS NPMP Sub-Alternative

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Criticality	NA[g]	Extremely Unlikely	7.0×10^{-1}	4×10^{-4}	1.0×10^{-1}	6×10^{-5}	$4.3\times10^{+0}$	0 (3×10^{-3})
Oxide spill in ARIES (or oxidation)	$4.5\times10^{+1}$	Extremely Unlikely	$2.7\times10^{+1}$	3×10^{-2}	$2.5\times10^{+0}$	2×10^{-3}	$1.3\times10^{+2}$	0 (8×10^{-2})
Glovebox fire in the pyrochemical metal preparation	$1.7\times10^{+0}$	Extremely Unlikely	$1.0\times10^{+0}$	6×10^{-4}	9.4×10^{-2}	6×10^{-5}	$4.8\times10^{+0}$	0 (3×10^{-3})
Fire in the vault	$3.1\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	2.2×10^{-1}	1×10^{-4}	1.1×10^{-1}	7×10^{-5}	$5.4\times10^{+1}$	0 (3×10^{-2})
Steam explosion in the DMO furnace	6.9×10^{-1}	Extremely Unlikely	4.2×10^{-1}	2×10^{-4}	3.9×10^{-2}	2×10^{-5}	$2.0\times10^{+0}$	0 (1×10^{-3})
Design-basis earthquake	$5.6\times10^{+1}$	Extremely Unlikely	$3.4\times10^{+1}$	4×10^{-2}	$3.2\times10^{+0}$	2×10^{-3}	$1.6\times10^{+2}$	0 (1×10^{-1})
Design-basis earthquake with fire	$8.4\times10^{+1}$	Extremely Unlikely	$5.1\times10^{+1}$	6×10^{-2}	$4.8\times10^{+0}$	3×10^{-3}	$2.4\times10^{+2}$	0 (1×10^{-1})
Beyond-design-basis earthquake-induced collapse with fire (SPDP inventory)	$5.8\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	$3.5\times10^{+1}$	4×10^{-2}	$3.2\times10^{+0}$	2×10^{-3}	$1.7\times10^{+2}$	0 (1×10^{-1})
Beyond-design-basis earthquake-induced collapse with fire (facility inventory)	$8.0\times10^{+2}$	Beyond Extremely Unlikely	$4.8\times10^{+2}$	6×10^{-1}	$4.5\times10^{+1}$	5×10^{-2}	$2.3\times10^{+3}$	1 ($1.4\times10^{+0}$)

ARIES = Advanced Recovery and Integrated Extraction System; DMO = direct metal oxidation; FGR = Federal Guidance Report; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; NPMP = non-pit metal processing; PuE = plutonium-239 dose equivalent; SPDP = Surplus Plutonium Disposition Program; SRS = Savannah River Site; TA-55 = Technical Area 55.

(a) Except for criticality, source terms are PuE grams from Appendix D of DOE 2015. Plutonium releases have been normalized to FGR 13 PuE values assuming the most conservative isotopic mix given in Table D-2.

(b) The distance to the nearest site boundary was assumed to be 0.68 mi.

(c) The LCF is calculated by using a risk estimator of 0.0006 fatal cancers per rem or person-rem. For estimated individual doses equal to or greater than 20 rem, the risk estimated was doubled. The estimated risk is NOT doubled for population doses.

(d) The rounded LCF value is provided, followed by the calculated value in parentheses.

(e) If the dose is >400 rem, it is assumed to result in a fatality, otherwise it is an LCF.

(f) The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

(g) The source term consists of the iodine and noble gas radioisotopes generated by a criticality excursion involving $1\times10^{+19}$ fissions from Table 6-9 of DOE 1994/2013.

Table D-6. SRS Accident Impacts for the Preferred Alternative: SRS NPMP Sub-Alternative

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Criticality	NA[g]	Extremely unlikely	6.2×10^{-2}	4×10^{-5}	2.3×10^{-3}	1×10^{-6}	7.2×10^{-1}	0 (4×10^{-4})
Fire in the Vault with 3013 rupture at 1,000 psig	$4.7\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.8\times10^{+0}$	1×10^{-3}	6.3×10^{-2}	4×10^{-5}	$5.0\times10^{+1}$	0 (3×10^{-2})
Explosion (deflagration of 3013 during cutting)	$6.6\times10^{+0}$	Extremely Unlikely to Beyond Extremely Unlikely	2.4×10^{-1}	1×10^{-4}	8.8×10^{-3}	5×10^{-6}	$6.9\times10^{+0}$	0 (4×10^{-3})
Oxide Spill in glovebox (or oxidation)	$1.3\times10^{+2}$	Extremely Unlikely	$6.6\times10^{+0}$	4×10^{-3}	1.8×10^{-1}	1×10^{-4}	$1.4\times10^{+2}$	0 (8×10^{-2})
Glovebox Fire in the pyrochemical metal preparation	$4.9\times10^{+0}$	Extremely Unlikely	2.4×10^{-1}	1×10^{-4}	6.7×10^{-3}	4×10^{-6}	$5.2\times10^{+0}$	0 (3×10^{-3})
Steam explosion in the DMO furnace	$2.1\times10^{+0}$	Extremely Unlikely	1.0×10^{-1}	6×10^{-5}	2.8×10^{-3}	2×10^{-6}	$2.2\times10^{+0}$	0 (1×10^{-3})
Fire in the vault	$1.1\times10^{+2}$	Extremely Unlikely	$5.7\times10^{+0}$	3×10^{-3}	1.6×10^{-1}	9×10^{-5}	$1.2\times10^{+2}$	0 (7×10^{-2})
Design-basis earthquake (SPDP inventory)	$9.3\times10^{+1}$	Extremely Unlikely	$4.6\times10^{+0}$	3×10^{-3}	1.3×10^{-1}	8×10^{-5}	$9.7\times10^{+1}$	0 (6×10^{-2})
Design-basis earthquake with fire (SPDP inventory)	$1.4\times10^{+2}$	Extremely Unlikely	$6.8\times10^{+0}$	4×10^{-3}	1.9×10^{-1}	1×10^{-4}	$1.5\times10^{+2}$	0 (9×10^{-2})
Beyond-design-basis earthquake-induced collapse with fire (SPDP inventory)	$2.1\times10^{+3}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.0\times10^{+2}$	$1.\times10^{-1}$	$2.8\times10^{+0}$	2×10^{-3}	$2.2\times10^{+3}$	1 ($1.3\times10^{+0}$)
Beyond-design-basis earthquake-induced collapse with fire (facility inventory)	$5.9\times10^{+3}$	Extremely Unlikely to Beyond Extremely Unlikely	$2.9\times10^{+2}$	3×10^{-1}	$8.0\times10^{+0}$	5×10^{-3}	$6.2\times10^{+3}$	4 ($3.7\times10^{+0}$)
Seismic with subsequent fire in the storage facility (SPDP inventory)	$2.4\times10^{+0}$	Unlikely	1.2×10^{-1}	7×10^{-5}	3.3×10^{-3}	2×10^{-6}	$2.5\times10^{+0}$	0 (2×10^{-3})
Seismic with subsequent fire in the storage facility (total inventory)	$3.5\times10^{+1}$	Unlikely	$1.7\times10^{+0}$	1×10^{-3}	4.7×10^{-2}	3×10^{-5}	$3.7\times10^{+1}$	0 (2×10^{-2})
Modular - Glovebox fire in the pyrochemical metal preparation	3.6×10^{-1}	Extremely Unlikely	1.8×10^{-2}	1×10^{-5}	4.9×10^{-4}	3×10^{-7}	3.8×10^{-1}	0 (2×10^{-4})
Modular - over pressurization of oxide storage cans	$4.6\times10^{+2}$	Extremely Unlikely	$2.3\times10^{+1}$	3×10^{-2}	6.2×10^{-1}	4×10^{-4}	$4.8\times10^{+2}$	0 (3×10^{-1})

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Modular - Design Basis Earthquake (SPDP inventory)	$5.1\times10^{+1}$	Extremely Unlikely	$2.5\times10^{+0}$	2×10^{-3}	6.9×10^{-2}	4×10^{-5}	$5.4\times10^{+1}$	0 (3×10^{-2})
Design-basis earthquake with fire (SPDP inventory)	$7.6\times10^{+1}$	Extremely Unlikely	$3.8\times10^{+0}$	2×10^{-3}	1.0×10^{-1}	6×10^{-5}	$8.0\times10^{+1}$	0 (5×10^{-2})
Combined Design-basis earthquake with fire for K-Area dilution and Modular (SPDP inventory)	$9.5\times10^{+1}$	Extremely Unlikely	$4.7\times10^{+0}$	3×10^{-3}	1.3×10^{-1}	8×10^{-5}	$1.0\times10^{+2}$	0 (6×10^{-2})

DMO = direct metal oxidation; FGR = Federal Guidance Report; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; NPMP = non-pit metal processing; PuE = plutonium-239 dose equivalent; SPDP= Surplus Plutonium Disposition Program; SRS = Savannah River Site.

(a) Except for criticality, source terms are PuE grams normalized to FGR 13 PuE values assuming the most conservative isotopic mix given in Table D-2.

(b) The distance to the nearest site boundary from KAC was assumed to be 5.5 mi.

(c) The LCF is calculated by using a risk estimator of 0.0006 fatal cancers per rem or person-rem. For estimated individual doses equal to or greater than 20 rem, the risk estimated was doubled. The estimated risk is NOT doubled for population doses.

(d) The rounded LCF value is provided, followed by the calculated value in parentheses.

(e) If the dose is >400 rem, it is assumed to result in a fatality, otherwise it is an LCF.

(f) The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

(g) The source term consists of the iodine and noble gas radioisotopes generated by a criticality excursion involving $1\times10^{+19}$ fissions from Table 6-9 of DOE 1994/2013.

Table D-7. LANL Accident Impacts for the Preferred Alternative: All LANL Sub-Alternative

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Criticality	NA[g]	Extremely Unlikely	7.0×10^{-1}	4×10^{-4}	1.0×10^{-1}	6×10^{-5}	$4.3\times10^{+0}$	0 (3×10^{-3})
Fire in the Vault with 3013 rupture at 1000 psig	$4.7\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	$2.8\times10^{+1}$	3×10^{-2}	$2.7\times10^{+0}$	2×10^{-3}	$1.4\times10^{+2}$	0 (8×10^{-2})
Explosion (deflagration of 3013 during cutting)	$6.6\times10^{+0}$	Extremely Unlikely to Beyond Extremely Unlikely	$3.9\times10^{+0}$	2×10^{-3}	3.7×10^{-1}	2×10^{-4}	$1.9\times10^{+1}$	0 (1×10^{-2})
Oxide spill in glovebox (or oxidation)	$1.3\times10^{+2}$	Extremely Unlikely	$8.0\times10^{+1}$	1×10^{-1}	$7.5\times10^{+0}$	4×10^{-3}	$3.8\times10^{+2}$	0 (2×10^{-1})
Glovebox fire in the pyrochemical metal preparation	$1.7\times10^{+0}$	Extremely Unlikely	$1.0\times10^{+0}$	6×10^{-4}	9.4×10^{-2}	6×10^{-5}	$4.8\times10^{+0}$	0 (3×10^{-3})
Fire in the vault	$9.1\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	6.7×10^{-1}	4×10^{-4}	3.3×10^{-1}	2×10^{-4}	$1.6\times10^{+2}$	0 (1×10^{-1})
Steam explosion in the DMO furnace	6.9×10^{-1}	Extremely Unlikely	4.2×10^{-1}	2×10^{-4}	3.9×10^{-2}	2×10^{-5}	$2.0\times10^{+0}$	0 (1×10^{-3})
Design-basis earthquake	$7.9\times10^{+1}$	Extremely Unlikely	$4.7\times10^{+1}$	6×10^{-2}	$4.4\times10^{+0}$	3×10^{-3}	$2.3\times10^{+2}$	0 (1×10^{-1})
Design-basis earthquake with fire	$1.2\times10^{+2}$	Extremely Unlikely	$7.1\times10^{+1}$	8×10^{-2}	$6.6\times10^{+0}$	4×10^{-3}	$3.4\times10^{+2}$	0 (2×10^{-1})
Beyond-design-basis earthquake-induced collapse with fire (SPDP inventory)	$8.0\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	$4.8\times10^{+1}$	6×10^{-2}	$4.5\times10^{+0}$	3×10^{-3}	$2.3\times10^{+2}$	0 (1×10^{-1})
Beyond-design-basis earthquake-induced collapse with fire (facility inventory)	$2.4\times10^{+3}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.4\times10^{+3}$	1 ($1.7\times10^{+0}$)	$1.3\times10^{+2}$	2×10^{-1}	$6.8\times10^{+3}$	4 ($4.1\times10^{+0}$)
Design-basis seismic with subsequent Fire in the storage facility (SPDP inventory only)	$2.1\times10^{+0}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.2\times10^{+0}$	7×10^{-4}	1.2×10^{-1}	7×10^{-5}	$5.9\times10^{+0}$	0 (4×10^{-3})

DMO = direct metal oxidation; FGR = Federal Guidance Report; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; PuE = plutonium-239 dose equivalent; SPDP = Surplus Plutonium Disposition Program.

(a) Except for criticality, source terms are PuE grams from Appendix D of DOE 2015. Plutonium releases have been normalized to FGR 13 PuE values assuming the most conservative isotopic mix given in Table D-2.

(b) The distance to the nearest site boundary was assumed to be 0.68 mi.

(c) The LCF is calculated by using a risk estimator of 0.0006 fatal cancers per rem or person-rem. For estimated individual doses equal to or greater than 20 rem, the risk estimated was doubled. The estimated risk is NOT doubled for population doses.

(d) The rounded LCF value is provided, followed by the calculated value in parentheses.

(e) If the dose is >400 rem, it is assumed to result in a fatality, otherwise it is an LCF.

(f) The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

(g) The source term consists of the iodine and noble gas radioisotopes generated by a criticality excursion involving $1\times10^{+19}$ fissions from Table 6-9 of DOE 1994/2013.

Table D-8. SRS Accident Impacts for the Preferred Alternative: All SRS Sub-Alternative

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Criticality K-Area	NA[g]	Extremely Unlikely	6.2×10^{-2}	4×10^{-5}	2.3×10^{-3}	1×10^{-6}	7.2×10^{-1}	0 (4×10^{-4})
Criticality F-Area	NA[g]	Extremely Unlikely	3.2×10^{-2}	2×10^{-5}	2.7×10^{-3}	2×10^{-6}	$1.1\times10^{+0}$	0 (7×10^{-4})
K-Area - Fire in the Vault with 3013 rupture at 1,000 psig[h]	$4.7\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.8\times10^{+0}$	1×10^{-3}	6.3×10^{-2}	4×10^{-5}	$5.0\times10^{+1}$	0 (3×10^{-2})
K-Area – Explosion (deflagration of 3013 during cutting)[h]	$6.6\times10^{+0}$	Extremely Unlikely to Beyond Extremely Unlikely	2.4×10^{-1}	1×10^{-4}	8.8×10^{-3}	5×10^{-6}	$6.9\times10^{+0}$	0 (4×10^{-3})
K-Area - Oxide spill in glovebox (or oxidation)	$1.3\times10^{+2}$	Extremely Unlikely	$6.6\times10^{+0}$	4×10^{-3}	1.8×10^{-1}	1×10^{-4}	$1.4\times10^{+2}$	0 (8×10^{-2})
K-Area - Glovebox fire in the pyrochemical metal preparation	$4.9\times10^{+0}$	Extremely Unlikely	2.4×10^{-1}	1×10^{-4}	6.7×10^{-3}	4×10^{-6}	$5.2\times10^{+0}$	0 (3×10^{-3})
K-Area - Steam explosion in the DMO furnace	$2.1\times10^{+0}$	Extremely Unlikely	1.0×10^{-1}	6×10^{-5}	2.8×10^{-3}	2×10^{-6}	$2.2\times10^{+0}$	0 (1×10^{-3})
K-Area - Fire in the vault	$1.1\times10^{+2}$	Extremely Unlikely	$5.7\times10^{+0}$	3×10^{-3}	1.6×10^{-1}	9×10^{-5}	$1.2\times10^{+2}$	0 (7×10^{-2})
K-Area - Design-basis earthquake	$9.3\times10^{+1}$	Unlikely	$4.6\times10^{+0}$	3×10^{-3}	1.3×10^{-1}	8×10^{-5}	$9.7\times10^{+1}$	0 (6×10^{-2})
K-Area - Design-basis earthquake with fire	$1.4\times10^{+2}$	Extremely Unlikely	$6.8\times10^{+0}$	4×10^{-3}	1.9×10^{-1}	1×10^{-4}	$1.5\times10^{+2}$	0 (9×10^{-2})
K-Area - Beyond-design-basis earthquake-induced collapse with fire (SPDP inventory)	$2.1\times10^{+3}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.0\times10^{+2}$	1×10^{-1}	$2.8\times10^{+0}$	2×10^{-3}	$2.2\times10^{+3}$	1 ($1.3\times10^{+0}$)
K-Area - Beyond-design-basis earthquake-induced collapse with fire (total inventory)	$5.9\times10^{+3}$	Extremely Unlikely to Beyond Extremely Unlikely	$2.9\times10^{+2}$	3×10^{-1}	$8.0\times10^{+0}$	5×10^{-3}	$6.2\times10^{+3}$	4 ($3.7\times10^{+0}$)
K-Area - Seismic with subsequent fire in the storage facility (SPDP inventory)	$2.4\times10^{+0}$	Unlikely	1.2×10^{-1}	7×10^{-5}	3.3×10^{-3}	2×10^{-6}	$2.5\times10^{+0}$	0 (2×10^{-3})

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
K-Area - Seismic with subsequent fire in the storage facility (total inventory)	$3.5\times10^{+1}$	Unlikely	$1.7\times10^{+0}$	1×10^{-3}	4.7×10^{-2}	3×10^{-5}	$3.7\times10^{+1}$	0 (2×10^{-2})
F-Area - Oxide spill in glovebox (or oxidation)	$1.3\times10^{+2}$	Extremely Unlikely	$5.8\times10^{+0}$	3×10^{-3}	2.4×10^{-1}	1×10^{-4}	$2.0\times10^{+2}$	0 (1×10^{-1})
F-Area - Glovebox fire in the pyrochemical metal preparation	$4.9\times10^{+0}$	Extremely Unlikely	2.2×10^{-1}	1×10^{-4}	8.8×10^{-3}	5×10^{-6}	$7.3\times10^{+0}$	0 (4×10^{-3})
F-Area - Steam explosion in the DMO furnace	$2.1\times10^{+0}$	Extremely Unlikely	9.0×10^{-2}	5×10^{-5}	3.7×10^{-3}	2×10^{-6}	$3.0\times10^{+0}$	0 (2×10^{-3})
F-Area - Fire in the vault	$1.1\times10^{+2}$	Extremely Unlikely	$5.0\times10^{+0}$	3×10^{-3}	2.0×10^{-1}	1×10^{-4}	$1.7\times10^{+2}$	0 (1×10^{-1})
F-Area - Design-basis earthquake	$9.3\times10^{+1}$	Extremely Unlikely	$4.0\times10^{+0}$	2×10^{-3}	1.7×10^{-1}	1×10^{-4}	$1.4\times10^{+2}$	0 (8×10^{-2})
F-Area - Design-basis earthquake with fire	$1.4\times10^{+2}$	Extremely Unlikely	$6.0\times10^{+0}$	4×10^{-3}	2.5×10^{-1}	1×10^{-4}	$2.0\times10^{+2}$	0 (1×10^{-1})
F-Area - Beyond-design-basis earthquake-induced collapse with subsequent fire (SPDP inventory)	$1.7\times10^{+3}$	Extremely Unlikely	$7.2\times10^{+1}$	9×10^{-2}	$3.0\times10^{+0}$	2×10^{-3}	$2.4\times10^{+3}$	1 ($1.5\times10^{+0}$)
F-Area - Beyond-design-basis earthquake-induced collapse with subsequent fire (total inventory)	$6.1\times10^{+3}$	Extremely Unlikely	$2.7\times10^{+2}$	3×10^{-1}	$1.1\times10^{+1}$	7×10^{-3}	$9.0\times10^{+3}$	5 ($5.4\times10^{+0}$)

DMO = direct metal oxidation; FGR = Federal Guidance Report; LCF = latent cancer fatality; MEI = maximally exposed individual; PuE = plutonium-239 dose equivalent; SPDP = Surplus Plutonium Disposition Program; SRS = Savannah River Site.

(a) Except for criticality, source terms are PuE grams normalized to FGR 13 PuE values assuming the most conservative isotopic mix given in Table D-2.

(b) The distance to the nearest site boundary was assumed to be 5.5 mi for KAC and 5.8 mi for F-Area.

(c) The LCF is calculated by using a risk estimator of 0.0006 fatal cancers per rem or person-rem. For estimated individual doses equal to or greater than 20 rem, the risk estimated was doubled. The estimated risk is NOT doubled for population doses.

(d) The rounded LCF value is provided, followed by the calculated value in parentheses.

(e) If the dose is >400 rem, it is assumed to result in a fatality, otherwise it is an LCF.

(f) The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

(g) The source term consists of the iodine and noble gas radioisotopes generated by a criticality excursion involving $1\times10^{+19}$ fissions from Table 6-9 of DOE 1994/2013.

(h) These events are associated with the Dilution and Characterization and Packaging activities that would occur at K-Area under the F-Area PDP Option.

Table D-9. LANL Accident Impacts for the No Action Alternative

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Criticality	NA[g]	Extremely Unlikely	7.0×10^{-1}	4×10^{-4}	1.0×10^{-1}	6×10^{-5}	$4.3\times10^{+0}$	0 (3×10^{-3})
Oxide spill in glovebox (or processing or dilution)	$1.3\times10^{+2}$	Extremely Unlikely	$8.0\times10^{+1}$	1×10^{-1}	$7.5\times10^{+0}$	4×10^{-3}	$3.8\times10^{+2}$	0 (2×10^{-1})
Glovebox fire in the pyrochemical metal preparation	$2.5\times10^{+0}$	Extremely Unlikely	$1.5\times10^{+0}$	9×10^{-4}	1.4×10^{-1}	8×10^{-5}	$7.1\times10^{+0}$	0 (4×10^{-3})
Fire in the vault	$1.8\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	1.3×10^{-1}	8×10^{-5}	6.5×10^{-2}	4×10^{-5}	$3.2\times10^{+1}$	0 (2×10^{-2})
Steam explosion in the DMO furnace	$2.1\times10^{+0}$	Extremely Unlikely	$1.2\times10^{+0}$	7×10^{-4}	1.2×10^{-1}	7×10^{-5}	$5.9\times10^{+0}$	0 (4×10^{-3})
Design-basis earthquake	$3.3\times10^{+1}$	Extremely Unlikely	$2.0\times10^{+1}$	2×10^{-2}	$1.9\times10^{+0}$	1×10^{-3}	$9.6\times10^{+1}$	0 (6×10^{-2})
Design-basis earthquake with fire	$5.0\times10^{+1}$	Extremely Unlikely	$3.0\times10^{+1}$	4×10^{-2}	$2.8\times10^{+0}$	2×10^{-3}	$1.4\times10^{+2}$	0 (9×10^{-2})
Beyond-design-basis earthquake induced collapse with fire (SPDP inventory)	$3.4\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	$2.0\times10^{+1}$	2×10^{-2}	$1.9\times10^{+0}$	1×10^{-3}	$9.8\times10^{+1}$	0 (6×10^{-2})
Beyond-design-basis earthquake-induced collapse with fire (facility inventory)	$2.4\times10^{+3}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.4\times10^{+3}$	1 ($1.7\times10^{+0}$)	$1.3\times10^{+2}$	2×10^{-1}	$6.8\times10^{+3}$	4 ($4.1\times10^{+0}$)

ARIES = Advanced Recovery and Integrated Extraction System; FGR = Federal Guidance Report; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; MEI = maximally exposed individual; NA = not applicable; PuE = plutonium-239 dose equivalent; SPDP = Surplus Plutonium Disposition Program.

(a) Except for criticality, source terms are PuE grams normalized to FGR 13 PuE values assuming the most conservative isotopic mix given in Table D-2.

(b) The distance to the nearest site boundary was assumed to be 0.68 mi.

(c) The LCF is calculated by using a risk estimator of 0.0006 fatal cancers per rem or person-rem. For estimated individual doses equal to or greater than 20 rem, the risk estimated was doubled. The estimated risk is NOT doubled for population doses.

(d) The rounded LCF value is provided, followed by the calculated value in parentheses.

(e) If the dose is >400 rem, it is assumed to result in a fatality, otherwise it is an LCF.

(f) The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

(g) The source term consists of the iodine and noble gas radioisotopes generated by a criticality excursion involving $1\times10^{+19}$ fissions from Table 6-9 of DOE 1994/2013.

Table D-10. SRS Accident Impacts for the No Action Alternative

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
Criticality	NA[g]	Extremely Unlikely	6.2×10^{-2}	4×10^{-5}	2.3×10^{-3}	1×10^{-6}	7.2×10^{-1}	0 (4×10^{-4})
Fire in the vault with 3013 rupture at 1,000 psig	$4.7\times10^{+1}$	Extremely Unlikely to Beyond Extremely Unlikely	$1.8\times10^{+0}$	1×10^{-3}	6.3×10^{-2}	4×10^{-5}	$5.0\times10^{+1}$	0 (3×10^{-2})
Explosion (deflagration of 3013 during cutting)	$6.6\times10^{+0}$	Extremely Unlikely to Beyond Extremely Unlikely	2.4×10^{-1}	1×10^{-4}	8.8×10^{-3}	5×10^{-6}	$6.9\times10^{+0}$	0 (4×10^{-3})
SPDP Dilution Inventory only - Design-basis earthquake with fire	$2.8\times10^{+1}$	Extremely Unlikely	$1.1\times10^{+0}$	6×10^{-4}	3.8×10^{-2}	2×10^{-5}	$3.0\times10^{+1}$	0 (2×10^{-2})
Oxide spill in glovebox (or oxidation)	$1.3\times10^{+2}$	Extremely Unlikely	$6.6\times10^{+0}$	4×10^{-3}	1.8×10^{-1}	1×10^{-4}	$1.4\times10^{+2}$	0 (8×10^{-2})
Glovebox fire in the pyrochemical metal preparation	$2.5\times10^{+0}$	Extremely Unlikely	1.2×10^{-1}	7×10^{-5}	3.4×10^{-3}	2×10^{-6}	$2.6\times10^{+0}$	0 (2×10^{-3})
Steam explosion in the DMO furnace	$2.1\times10^{+0}$	Extremely Unlikely	1.0×10^{-1}	6×10^{-5}	2.8×10^{-3}	2×10^{-6}	$2.2\times10^{+0}$	0 (1×10^{-3})
Fire in the vault	$1.8\times10^{+1}$	Extremely Unlikely	8.8×10^{-1}	5×10^{-4}	2.4×10^{-2}	1×10^{-5}	$1.9\times10^{+1}$	0 (1×10^{-2})
Design-basis earthquake	$3.3\times10^{+1}$	Extremely Unlikely	$1.7\times10^{+0}$	1×10^{-3}	4.6×10^{-2}	3×10^{-5}	$3.5\times10^{+1}$	0 (2×10^{-2})
Design-basis earthquake with fire	$5.0\times10^{+1}$	Extremely Unlikely	$2.5\times10^{+0}$	1×10^{-3}	6.8×10^{-2}	4×10^{-5}	$5.3\times10^{+1}$	0 (3×10^{-2})
Seismic with subsequent fire in the Storage Facility (SPDP inventory)	$1.4\times10^{+0}$	Unlikely	7.0×10^{-2}	4×10^{-5}	1.9×10^{-3}	1×10^{-6}	$1.5\times10^{+0}$	0 (9×10^{-4})
Seismic with subsequent fire in the Storage Facility (total inventory)	$3.5\times10^{+1}$	Unlikely	$1.7\times10^{+0}$	1×10^{-3}	4.7×10^{-2}	3×10^{-5}	$3.7\times10^{+1}$	0 (2×10^{-2})
Beyond-design-basis earthquake-induced	$7.5\times10^{+2}$	Extremely Unlikely to Beyond Extremely Unlikely	$3.7\times10^{+1}$	4×10^{-2}	$1.0\times10^{+0}$	6×10^{-4}	$7.8\times10^{+2}$	1 (5×10^{-1})

Accident	Source Term (PuE g)[a]	Frequency (per year)	Impacts on a Noninvolved Worker Dose (rem)	Impacts on a Noninvolved Worker LCF Risk[c][d][e][f]	Impacts on an MEI at the Site Boundary[b] Dose (rem)	Impacts on an MEI at the Site Boundary[b] LCF Risk[c][d][f]	Impacts on Population within 50 Miles Dose (person-rem)	Impacts on Population within 50 Miles LCF[c][d]
collapse with fire (SPDP inventory)								
Beyond-design-basis earthquake-induced collapse with fire (total inventory)	$5.9\times10^{+3}$	Extremely Unlikely to Beyond Extremely Unlikely	$2.9\times10^{+2}$	3×10^{-1}	$8.0\times10^{+0}$	5×10^{-3}	$6.2\times10^{+3}$	4 ($3.7\times10^{+0}$)

ARIES = Advanced Recovery and Integrated Extraction System; CCO= Criticality Controlled Overpack; DMO = direct metal oxidation; FGR = Federal Guidance Report; KAC= K-Area Complex; LCF = latent cancer fatality; MEI = maximally exposed individual; PuE = plutonium-239 dose equivalent; SPDP = Surplus Plutonium Disposition Program; SRS = Savannah River Site

(a) Except for criticality, source terms are PuE grams normalized to FGR 13 PuE values assuming the most conservative isotopic mix given in Table D-2.

(b) The distance to the nearest site boundary from KAC was assumed to be 5.5 mi.

(c) The LCF is calculated by using a risk estimator of 0.0006 fatal cancers per rem or person-rem. For estimated individual doses equal to or greater than 20 rem, the risk estimated was doubled. The estimated risk is NOT doubled for population doses.

(d) The rounded LCF value is provided, followed by the calculated value in parentheses.

(e) If the dose is >400 rem, it is assumed to result in a fatality, otherwise it is an LCF.

(f) The MEI and the noninvolved worker scenarios each assume that one person was exposed. If more than one person was exposed in either of these scenarios, then that scenario's dose would be per person and the fatalities would be multiplied by the number of persons exposed.

(g) The source term consists of the iodine and noble gas radioisotopes generated by a criticality excursion involving $1\times10^{+19}$ fissions from Table 6-9 of DOE 1994/2013.

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APPENDIX E

EVALUATION OF HUMAN HEALTH EFFECTS FROM TRANSPORTATION

Transportation involves a risk to transportation crew members and members of the public, resulting directly from transportation-related accidents, regardless of the cargo. In addition, the transport of certain materials, such as hazardous or radioactive waste, can pose further risk due to the nature of the material itself. This appendix details the potential human health risks associated with the transportation of radioactive materials and wastes, as well as nonradioactive hazardous waste, on public highways for the alternatives in this *Surplus Plutonium Disposition Program Environmental Impact Statement* (SPDP EIS).

E.1 Scope of Assessment

The scope of the transportation human health risk assessment includes incident-free and accident impacts, and radiological and nonradiological impacts. Section E.2 of the *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (2015 SPD Supplemental EIS or 2015 SPD SEIS; DOE 2015) provides generic background information regarding transportation assessments, transportation-related activities, radiological impacts, nonradiological impacts, transportation modes, and receptors. The referencing to 2015 SPD SEIS also provides background rules and requirements related to transportation. A description of the analysis completed in this SPDP EIS is found in Section E.4 of this appendix and the impacts of increased transportation levels on local traffic flow or infrastructure are addressed in Sections 4.1.2.9.3 and 4.1.3.9.3 of this SPDP EIS for Los Alamos National Laboratory (LANL) and Savannah River Site (SRS), respectively.

E.2 Packaging and Transportation Regulations

The United States (U.S.) Department of Transportation and the U.S. Nuclear Regulatory Commission have primary responsibility for developing and implementing Federal Regulations that govern radioactive materials transportation. In addition, the U.S. Department of Energy (DOE) works with the U.S. Department of Transportation and U.S. Nuclear Regulatory Commission in developing requirements and standards for radioactive materials transportation. DOE, including its National Nuclear Security Administration, has broad authority under the Atomic Energy Act of 1954, as amended (42 U.S.C. § 2011 et seq.), to regulate all aspects of activities involving radioactive materials that are undertaken by DOE or on its behalf, including the transportation of radioactive materials.

Section E.3 in the 2015 SPD SEIS (DOE 2015) contains more information about packaging and transportation regulations.

E.3 Emergency Response

The U.S. Department of Homeland Security is responsible for establishing policies for, and coordinating, civil emergency management, planning, and interaction with Federal Executive agencies that have emergency response functions in the event of a transportation incident. If a transportation incident involving nuclear material occurs, guidelines for response actions are outlined in the *National Response Framework* (DHS 2019).

Section E.4 in the 2015 SPD SEIS (DOE 2015) contains more information about emergency response.

E.4 Methodology

The transportation risk assessment is based on the alternatives described in Section 2 of this SPDP EIS. Figure E-1 depicts the transportation risk assessment methodology (DOE 2015|Figure E-1|). After the alternatives were identified and the requirements of the shipping campaign were understood, data were collected about material characteristics, transportation routes, and accident parameters.

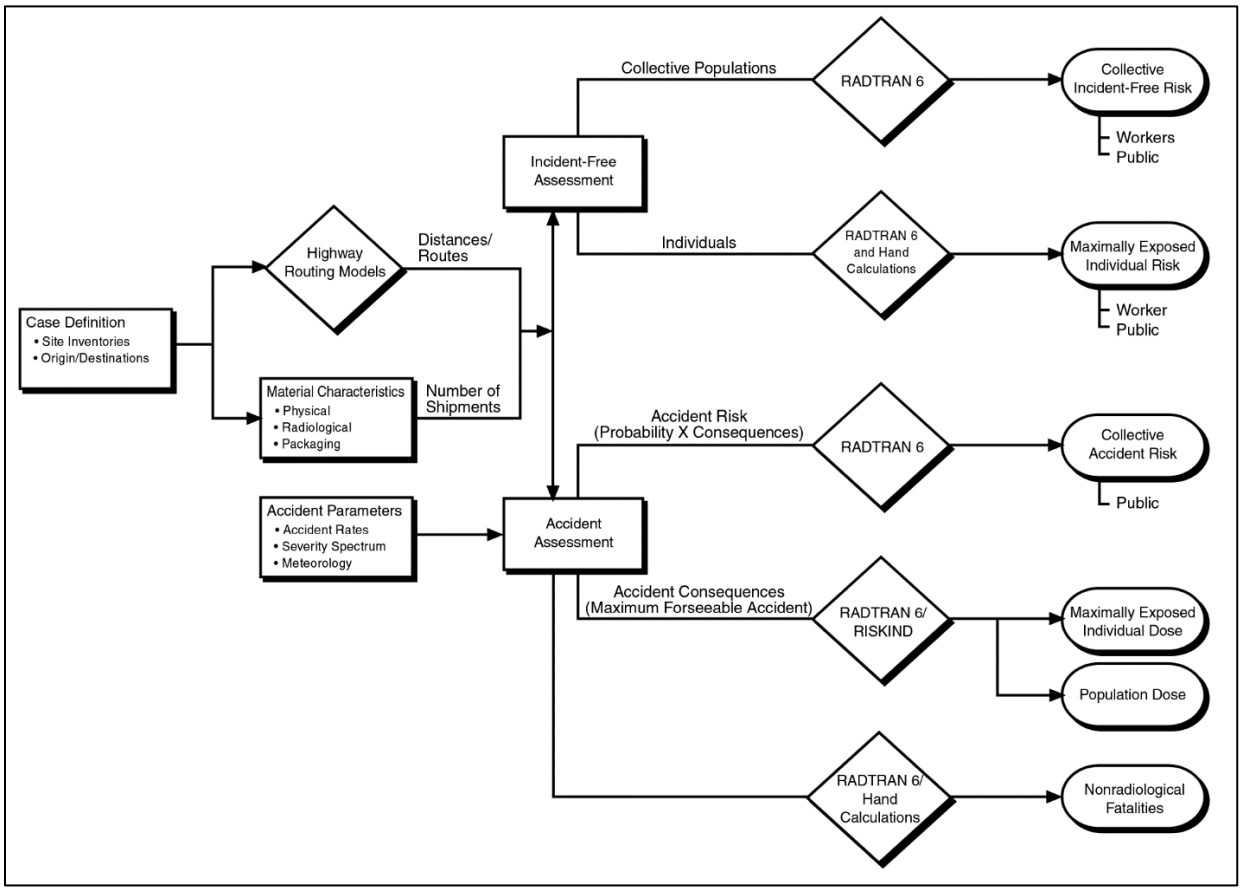

Figure E-1. Transportation Risk Assessment Methodology

Transportation impacts calculated for this SPDP EIS are presented in two parts: impacts from incident-free or routine transportation and impacts from transportation accidents. Impacts of transportation accidents are further divided into nonradiological and radiological impacts. Nonradiological impacts could result from transportation accidents and are quantified in terms of traffic fatalities. Radiological impacts of incident-free transportation include impacts on members of the public and crew from radiation emanating from materials (plutonium, uranium, or radioactive wastes) in the shipment. Radiological impacts from accident conditions consider all foreseeable scenarios that could damage transportation packages, including releases of radioactive materials to the environment.

The impact of transportation accidents is expressed in terms of probabilistic risk, which is the probability of an accident multiplied by the consequences of that accident and summed over a range of accidents. Hypothetical transportation accident conditions ranging from low-speed “fender-bender” collisions to high-speed collisions with or without fires were analyzed.

Transportation impacts were estimated using the Web Transportation Routing Analysis Geographic Information System (WebTRAGIS) computer program (Peterson 2018), the Radioactive Material Transportation Risk Assessment 6.02 computer code (Weiner et al. 2013, Weiner et al. 2014), and the Risks and Consequences of Radioactive Material Transport computer code (Yuan et al. 1995). Section E.5 in the 2015 SPD SEIS (DOE 2015) contains more information about the methodology used to estimate transportation impacts.

E.4.1 Transportation Routes

To assess incident-free and transportation accident impacts, route characteristics were determined for the following offsite shipments that would occur as part of routine operations:

- pits and associated materials shipped from the Pantex Plant (Pantex) in Texas to LANL in New Mexico or to SRS in South Carolina
- HEU oxide shipped from LANL or SRS to the Y-12 National Security Complex in Tennessee
- byproduct material from SRS to LANL
- plutonium oxide and non-pit surplus plutonium shipped from LANL to SRS, or from SRS to LANL
- contact-handled transuranic (CH-TRU) waste shipped from SRS and LANL to the Waste Isolation Pilot Plant (WIPP) facility in New Mexico
- low-level and mixed low-level radioactive waste (LLW and MLLW) shipped from LANL to offsite Federal or commercial disposal facilities; for purposes of analysis in this SPDP EIS the offsite facility was assumed to be the Nevada National Security Site near Las Vegas.[7]
- adulterant from a commercial vendor assumed to be located 3,000 mi (4,800 km) from either LANL or SRS
- construction materials shipped to SRS or LANL
- hazardous waste shipped from SRS and LANL to an offsite treatment, storage, and disposal facility (nonradiological impacts only).

These routes and material types represent the majority of shipments that would be transported under the Preferred and No Action Alternatives. Transport of material to consolidated storage at Pantex or SRS was previously evaluated (DOE 1996).[8]

For offsite transport, highway routes were determined using the routing computer program WebTRAGIS (Peterson 2018). The features in WebTRAGIS allow users to determine routes for shipment of radioactive materials that conform to U.S. Department of Transportation regulations as specified in Title 49 of the *Code of Federal Regulations* Part 397 (49 CFR Part 397). The population densities along each route that are built into WebTRAGIS were derived from 2010 Census Bureau data (Peterson 2018). Changes in State-level U.S. Census Bureau data between 2010 (USCB 2018) and 2000 Census Bureau data were used to project population densities out to 2040. Over this time period, the overall U.S. population was projected to increase by a factor of 1.30. Projected population changes for individual States ranged from 0.985 (i.e., the population was projected to decrease) to 2.32.

[7] A very small quantity of MLLW is expected to be generated at SRS for the All SRS Sub-Alternative. For the purposes of analysis, NNSA assumes it would be transported to the Nevada National Security site.

[8] The impacts of transporting and consolidating the storage of surplus non-pit plutonium were evaluated in the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE 1996).

E.4.1.1 Offsite Route Characteristics

Important route characteristics for this analysis include the total shipment distance and population distribution along the route. The specific route selected determines both the total potentially exposed population and the expected frequency of transportation-related accidents. Route characteristics analyzed in this SPDP EIS are summarized in Table E-1. Rural, suburban, and urban areas are characterized according to the following breakdown (Peterson 2018):

- Rural population densities range from 0 to 54 persons/km^2.
- Suburban population densities range from 55 to 1,284 persons/km^2.
- Urban population densities include all population densities greater than 1,284 persons/km^2.

Table E-1. Route Characteristics for Routes Analyzed in this SPDP EIS

Origin	Destination	Nominal Distance (km)	Distance Traveled in Zones (km)			Population Density in Zone[(a)] (number/km^2)			Number of Affected Persons[(b)]
			Rural	Suburban	Urban	Rural	Suburban	Urban	
Pantex, TX	LANL	573	493	71	9	25	347	2,867	101,987
Pantex, TX	SRS	2,074	1,479	573	22	19	542	2,209	618,962
LANL	Y-12	2,319	1,797	480	41	22	475	2,409	586,846
SRS	Y-12	569	321	229	19	34	430	2,223	243,320
SRS/LANL[(c)]	LANL/SRS[(c)]	2,722	1,980	652	90	22	574	2,689	1,056,121
SRS	WIPP facility	2,332	1,583	720	29	22	500	2,347	742,118
LANL	WIPP facility	586	525	61	0	21	311	0	47,803
SRS[(d)]	NNSS	3,890	3,015	760	115	17	588	2,714	1,294,041
LANL	NNSS	1,398	1,205	170	23	12	518	2,676	264,392

EIS = environmental impact statement; LANL = Los Alamos National Laboratory; NNSS = Nevada National Security Site; Pantex = Pantex Plant; SPDP = Surplus Plutonium Disposition Program; SRS = Savannah River Site; TX = Texas; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Complex.

(a) Population densities have been projected to 2040 using State-level data from the 2010 Census (USCB 2018) and assuming State population growth rates from 2000 to 2010 continue to 2040.

(b) For offsite shipments, the estimated number of persons residing within 800 m along the transportation route; projected to 2040.

(c) Shipments of non-pit or pit plutonium would be made from SRS to LANL and from LANL to SRS, depending on the sub-alternative under the alternatives.

(d) Only mixed low-level radioactive wastes would be transported to NNSS from SRS.

Note: Values are rounded to the nearest kilometer.

The affected population for route characterization and incident-free dose calculation includes all persons living within 800 m of each side of the transportation route.

Analyzed truck routes for offsite shipments of radioactive waste and materials to and from LANL are shown in Figure E-2; analyzed truck routes to and from SRS are shown in Figure E-3. As shown in these figures, the majority of the transportation analyzed in the SPDP EIS occurs on interstate highways that do not have at-grade railroad crossings.

Figure E-2. Analyzed National and Regional Truck Routes from LANL

Figure E-3. Analyzed National and Regional Truck Routes from SRS

E.4.2 Radioactive Material and Waste Shipments

Transportation of all material and waste types is assumed to occur in certified packaging on exclusive-use vehicles. Use of legal-weight heavy combination trucks is assumed for highway transportation. Type A packages are transported on common flatbed or covered trailers; Type B packages are generally shipped on trailers specifically designed for the packaging being used (see Section E.3.1 of the 2015 SPD SEIS [DOE 2015]). For transportation by truck, the maximum payload weight is considered to be about 22,000 kg, based on the Federal gross vehicle weight limit of 36,288 kg (23 CFR 658.17).

The various wastes that would be transported under the alternatives in this SPDP EIS include LLW and MLLW waste, CH-TRU waste[9] (including CH-TRU job control waste and diluted plutonium oxide CH-TRU waste), demolition and construction debris, and hazardous waste. Table E-2 lists the types of containers assumed for the analysis along with their volumes and the number of containers in a shipment. A shipment is defined as the amount of waste transported on a single truck.

In general, the number of shipping containers per shipment was estimated on the basis of the dimensions and weight of the shipping containers; the Transport Index,[10] which is the dose rate at 1 m from the container; and the transport vehicle dimensions and weight limits. The various materials and wastes were assumed to be transported on standard truck semi-trailers in a single stack.

Special nuclear material would be transported using an appropriate NNSA's Office of Secure Transportation (OST) transporter, and would include plutonium pits, plutonium oxides and metal, and HEU. The number of shipments associated with the transport of pits, plutonium oxide, and HEU were determined using up-to-date information about the types of transport packages to be used and the forecasted generation rates. These materials would be transported in Type B packages. While it is assumed that a specific Type B package would be used for each type of nuclear material being transported for purposes of analysis, more than one particular package design could be used. Use of different Type B packages that are applicable to a particular cargo would not significantly change the impacts presented in this analysis because the designs and shipping configurations of the Type B packages are similar.

Table E-2. Material or Waste Type and Associated Container Characteristics[(a)]

Material or Waste Type	Container	Container Volume (m^3)[(b)]	Container Mass (kg)[(c)]	Shipment Description
Mixed low-level radioactive waste or low-level radioactive waste	208 L drum (Type A Package)	0.2	399	80 per truck
Low-level radioactive waste	B-25 box (Type A Package)	2.55	4,536	5 per truck

[9] The WIPP facility is authorized to accept TRU waste that was generated from atomic energy defense activities. All CH-TRU wastes described in this SPDP EIS are defense-related wastes. Throughout this SPDP EIS, the defense-related TRU wastes described as shipped from LANL or SRS to WIPP are referred to as CH-TRU waste.

[10] The Transport Index is a dimensionless number (rounded up to the next tenth) placed on the label of a package to designate the degree of control to be exercised by the carrier. Its value is equivalent to the maximum radiation level in millirem per hour at 1 m from the package (10 CFR 71.4; 49 CFR 173.403).

Material or Waste Type	Container	Container Volume (m^3)[(b)]	Container Mass (kg)[(c)]	Shipment Description
CH-TRU waste (job control from operation and maintenance)	208 L drum	0.2	142[(d)]	14 per TRUPACT-II (Type B package) 3 TRUPACT-II per truck
CH-TRU waste (job control in pipe overpack)	Pipe overpack container[(e)]	0.2	142[(d)]	14 per TRUPACT-II (Type B package) 3 TRUPACT-II per truck
Special nuclear material	Type B package	0.13–0.30	183–318	1 to 30 per OST transporter
CH-TRU waste (diluted plutonium oxide)	Criticality control container[(f)]	0.2	142[(d)]	14 per TRUPACT-II (Type B package) 3 TRUPACT-II per truck
Construction/demolition debris	Roll-on/roll-off	15.30	NA	1 per truck
Hazardous waste	208 L drum	0.2	399	40 per truck

CH-TRU = contact-handled transuranic; NA = not applicable; OST = Office of Secure Transportation; TRUPACT-II = Transuranic Package Transporter Model-II.

(a) Containers and transport packages identified in this table were used to determine the transportation impacts for purposes of analysis. Specific Type B packages, while not identified in this table, were assumed for specific material or waste types to conduct the analysis. Other containers and transportation packages may be used in addition to, or in lieu of, those shown and those assumed for specific materials or waste types.

(b) Container exterior volume. To convert from cubic meters to cubic feet, multiply by 35.315.

(c) Filled container maximum mass. Container mass includes the mass of the container shell, its internal packaging, and the materials within the container. To convert from kilograms to pounds, multiply by 2.2046.

(d) For the 14 drums per TRUPACT-II and three TRUPACT-IIs per shipment, the average weight of the drum is limited to 142 kg.

(e) Pipe overpack containers containing CH-TRU job control waste would be packaged in 208 L drums.

(f) Diluted plutonium oxide CH-TRU waste would be packaged in the criticality control containers, which would be the same size as a 208 L drum.

Sources: DOE 2015; LANL 2023; SRNS 2023.

For radioactive waste to be transported to a radioactive waste disposal site, it was assumed that the wastes would meet the disposal facility's waste acceptance criteria. For purposes of analysis, it was assumed that the LLW generated at SRS would be disposed onsite at SRS. In addition, it was assumed that all LLW and MLLW generated at LANL and small amounts of MLLW generated at SRS for the All SRS Sub-Alternative would be transported to Nevada National Security Site.

CH-TRU waste would be transported to the WIPP facility for disposal. CH-TRU waste would consist of job control waste resulting from processing activities and diluted plutonium oxide CH-TRU waste under the No Action Alternative and the Preferred Alternative. The CH-TRU job control waste would be packaged in drums or in pipe overpack containers as appropriate. The diluted plutonium oxide CH-TRU waste would be packaged in criticality control overpacks at a higher concentration of plutonium. These shipments could consist of up to 42 containers per shipment.

E.4.3 Radionuclide Inventories

Radionuclide inventories are used to determine the accident risks associated with a release of the radioactive or contaminated cargo. Table E-3 provides the container radionuclide inventory concentration assumed for LLW and MLLW. It is assumed that these two waste types would have the same radionuclide composition, and that the MLLW would have a hazardous component. The list of radionuclides in these tables is limited to those that would be expected from disassembly and conversion operations. The composition of the waste is the average curie concentration per radioisotope as measured in the year 2010 and received at E-Area at SRS. This composition is assumed to be representative of the LLW and MLLW streams generated by surplus plutonium disposition activities.

Table E-3. Low-Level and Mixed Low-Level Radioactive Waste Radionuclide Concentrations[(a)]

Nuclide	Curies per Cubic Meter
Americium-241	0.000050
Plutonium-238	0.00038
Plutonium-239	0.00011
Plutonium-240	0.000049
Plutonium-241	0.00048
Technetium-99	0.0000052

SRS = Savannah River Site.

(a) These are the primary radionuclides expected in offsite shipments of low-level and mixed low-level radioactive waste. The concentrations are representative of what historically has been generated at SRS.

Source: DOE 2015|Table E-3|.

For transport of pits from Pantex to LANL, plutonium oxide from LANL to SRS (or from SRS to LANL), and HEU oxide from LANL or SRS to Y-12 National Security Complex, it was assumed that the contents of one Type B package would be released in the event of an accident (DOE 2015).

Under the No Action Alternative and the Preferred Alternative (for which plutonium would be disassembled, oxidized, diluted, and repackaged and sent to the WIPP facility for disposal), it was assumed there would be 150 g of pit plutonium per pipe overpack container. The criticality control overpacks (CCOs) used for transport of diluted plutonium oxide to the WIPP facility for disposal can contain up to 380 plutonium-239 fissile gram equivalent (FGE) each (NRC 2022). The determination of the Pu-239 FGE is driven by the fissile isotopes' contents within the pit and non-pit plutonium, and the use of the maximum allowed Pu-239 FGE per container is conditional on the measurement accuracy of its content. To allow sufficient margin for the potential measurement and composition uncertainties, the analysis in this SPDP EIS assumed each criticality control overpack (CCO) would contain 300 g of plutonium (SRNS 2023; LANL 2023). A shipment would consist of three Transuranic Package Transporter Model-II packages, each containing 14 containers.

Thus, the analysis provided in this SPDP EIS using the 300 g of plutonium in a CCO provides a conservatively high estimate of the impacts. If consideration of uncertainties allows for a higher level of plutonium (greater than 300 g) to be present in each CCO, then it would result in fewer shipments of diluted plutonium oxides, which in turn would lead to a lower number of traffic fatalities and greenhouse gas emissions. The use of a greater amount of plutonium in a CCO would result in a higher expected external dose rate to the transportation crew (drivers) and public, but because the number of shipments is lower, the overall radiological risks of transporting diluted plutonium oxides to WIPP would slightly be lower than those evaluated and cited in this Appendix for a 300 g of plutonium per CCO.

For CH-TRU job control waste generated from processing surplus pit plutonium, it was assumed there would be 20 g of plutonium per drum. For CH-TRU job control waste generated from processing non-pit surplus plutonium, it was assumed there would be 10 g of plutonium per drum[12] (DOE 2015; DOE 2012).

[12] The plutonium contaminations per drum assignments for the CH-TRU job control waste generated from the processing of surplus pit and non-pit plutonium are based on the potential decay heat limit as determined in the 2012 NEPA source document (DOE 2012), which is driven by the isotopic mix in surplus pit and non-pit plutonium.

A shipment of CH-TRU waste for either of these two cases would consist of three Transuranic Package Transporter Model-II packages, each containing 14 containers (DOE 2015).

E.5 Incident-free Transportation Risks

During the transportation of radioactive materials, incident-free radiological impacts may occur for workers and members of the public. Section E.6 in the 2015 SPD SEIS (DOE 2015) contains more information about incident-free transportation risks.

E.6 Transportation Accident Risks

During the transportation of radioactive materials, transportation accidents may also occur, resulting in radiological and nonradiological impacts. Section A.3 in the 2015 SPD SEIS (DOE 2015) contains more information about transportation accident risks. Section A.3 also discusses acts of sabotage and terrorism.

E.7 Risk Analysis Results

The activities at LANL and SRS analyzed in this SPDP EIS occur within four sub-alternatives of the Preferred Alternative and the No Action Alternative, as indicated in Table E-4. For example, under the Base Approach Sub-Alternative of the Preferred Alternative, the pit disassembly and processing (PDP) and the non-pit metal processing would occur at LANL, and dilution and disposition would occur at SRS. Under the All LANL Sub-Alternative, all pit and non-pit processing, dilution, and disposition activities would occur at LANL. Under the All SRS Sub-Alternative, all activities would occur at SRS.

Table E-4. Roadmap for Interpreting Transportation Impact Tables Displaying Alternative/Sub-Alternative Capabilities Conducted at LANL and at SRS

Capability	Preferred Alternative Base Approach Sub-Alternative	Preferred Alternative SRS NPMP Sub-Alternative	Preferred Alternative All LANL Sub-Alternative	Preferred Alternative All SRS Sub-Alternative	No Action Alternative
PDP	LANL	LANL	LANL	SRS	No PDP
NPMP	LANL	SRS	LANL	SRS	LANL/SRS[(a)]
Dilution	SRS	SRS	LANL	SRS	SRS
C&P	SRS	SRS	LANL	SRS	SRS

C&P = characterization and packaging; LANL = Los Alamos National Laboratory; NPMP = non-pit metal processing; PDP = pit disassembly and processing; SRS = Savannah River Site.

(a) Under the No Action Alternative, NPMP could occur at either LANL or SRS.

Per-shipment risk factors have been calculated for the collective populations of exposed persons and for the crew for all anticipated routes and shipment configurations. Radiological risks are presented in doses per shipment for each unique route, material, and container combination. Radiological risk factors per shipment for incident-free transportation and accident conditions are presented in Table E-5 (DOE 2002). These factors have been adjusted to reflect the projected population in 2040. For incident-free transportation, both dose and latent cancer fatality (LCF) risk factors are provided for the crew and exposed population, including the off-link public (people living along the route), on-link public (pedestrian and car occupants along the route), and public at rest and fuel stops.

For transportation accidents, the risk factors are given for both radiological impacts, in terms of the potential LCFs in the exposed population, and nonradiological impacts, in terms of the number of traffic fatalities. Under accident conditions, the population would be exposed to radiation from released radioactivity if the package were damaged and would receive a direct dose if the package were unbreached. For accidents that involve no release, the analysis conservatively assumed that it would take about 12 hours to remove the package and/or commercial vehicle from the accident area (DOE 2002); 6 hours was assumed for OST transporter shipments. The nonradiological risk factors are nonoccupational traffic fatalities resulting from transportation accidents.

Table E-6 and Table E-7. show the risks of transporting radioactive materials and wastes under the Preferred Alternative and the No Action Alternative, respectively. Under the Preferred Alternative, the indicated risks for each sub-alternative are for processing and transporting 34 metric tons (MTs) of surplus pit plutonium and up to 7.1 MT of non-pit surplus plutonium. However, overall processing and transportation would not exceed 34 MT for the Preferred Alternative. Under the No Action Alternative, the indicated risks are for processing and transporting 7.1 MT of non-pit surplus plutonium. The risks are calculated by multiplying the previously given per-shipment factors by the number of shipments over the duration of the program and, for radiological doses, by the health risk conversion factors. The risks are for the entire period under each alternative and include both construction and operations. The number of shipments for the different waste types was estimated using data from Savannah River Nuclear Solutions and LANL (SRNS 2023; LANL 2023), the 2015 SPD SEIS (DOE 2015), and the waste container and shipment characteristics provided in Section E.4.2 and Table E-2.

Comparison of Table E-6 and Table E-7. indicates that the No Action Alternative would have the lowest overall transportation risks, with no expected fatalities. The Preferred Alternative would also lead to no expected fatalities from transporting radioactive material and waste.

Nonradiological accident risks (the potential for fatalities as a direct result of traffic accidents) present the greatest risks, with an estimate of up to one fatality (0.6) for the Preferred Alternative. Considering that the transportation activities analyzed in this SPDP EIS would occur over about 30 years and that the average number of traffic fatalities in the United States is about 34,860 per year for the 10-year period 2010 through 2019 (DOT 2021), the traffic fatality risk under both alternatives would be very small.

Table E-5. Radiological and Nonradiological Risk Factors per Shipment of Radioactive Material and Waste

Material or Waste Type	Shipments Between		Incident-Free Crew Dose (person-rem)	Incident-Free Crew Risk (LCF)	Incident-Free Population Dose (person-rem)	Incident-Free Population Risk (LCF)	Accident Rad. Risk (LCF)	Accident Nonrad. Risk (traffic fatalities)
Pits[a][b]	Pantex	LANL	0.013	0 (7.9×10^{-6})	0.026	0 (1.6×10^{-5})	0 (2.9×10^{-10})	0 (0.000017)
Pits[a][b]	Pantex	SRS	0.049	0 (2.9×10^{-5})	0.10	0 (6.0×10^{-5})	0 (1.4×10^{-9})	0 (0.000055)
HEU[a][b]	LANL	Y-12	0.013	0 (7.9×10^{-6})	0.039	0 (2.3×10^{-5})	0 (1.6×10^{-10})	0 (0.000081)
HEU[a][b]	SRS	Y-12	0.0033	0 (2.0×10^{-6})	0.010	0 (6.2×10^{-6})	0 (6.3×10^{-11})	0 (0.000016)
Byproduct material	SRS	LANL	0.014	0 (8.1×10^{-6})	0.049	0 (2.9×10^{-5})	0 (1.2×10^{-9})	0 (0.000075)
Undiluted plutonium oxide[a][b][c]	LANL	SRS	0.034	0 (2.0×10^{-5})	0.12	0 (7.3×10^{-5})	0 (9.2×10^{-8} [pit]) 0 (2.3×10^{-7} [non-pit])	0 (0.000075)
Diluted plutonium oxide CH-TRU waste in CCOs[d]	SRS	WIPP facility	0.090	0 (5.4×10^{-5})	0.075	0 (4.5×10^{-5})	0 (2.1×10^{-8} [pit]) 0 (5.0×10^{-8} [non-pit])	0 (0.00014)
CH-TRU waste in POCs[d]	SRS	WIPP facility	0.090	0 (5.4×10^{-5})	0.075	0 (4.5×10^{-5})	0 (1.1×10^{-8} [pit]) 0 (2.6×10^{-8} [non-pit])	0 (0.00014)
CH-TRU waste with 10 g non-pit surplus plutonium per drum[d]	SRS	WIPP facility	0.090	0 (5.4×10^{-5})	0.075	0 (4.5×10^{-5})	0 (2.7×10^{-9})	0 (0.00014)
CH-TRU waste with 20 g pit plutonium per drum[d]	SRS	WIPP facility	0.090	0 (5.4×10^{-5})	0.075	0 (4.5×10^{-5})	0 (2.4×10^{-9})	0 (0.00014)
Diluted plutonium oxide CH-TRU waste in CCOs[d]	LANL	WIPP facility	0.022	0 (1.3×10^{-5})	0.017	0 (1.0×10^{-5})	0 (2.4×10^{-10} [pit]) 0 (5.8×10^{-10} [non-pit])	0 (0.000020)
CH-TRU waste in POCs[d]	LANL	WIPP facility	0.022	0 (1.3×10^{-5})	0.017	0 (1.0×10^{-5})	0 (1.3×10^{-10} [pit]) 0 (3.0×10^{-10} [non-pit])	0 (0.000020)
CH-TRU waste with 10 g non-pit surplus plutonium per drum[d]	LANL	WIPP facility	0.022	0 (1.3×10^{-5})	0.017	0 (1.0×10^{-5})	0 (3.9×10^{-11})	0 (0.000020)
CH-TRU waste with 20 g pit plutonium per drum[d]	LANL	WIPP facility	0.022	0 (1.3×10^{-5})	0.017	0 (1.0×10^{-5})	0 (3.5×10^{-11})	0 (0.000020)
LLW[e]	LANL	NNSS	0.028	0 (1.7×10^{-5})	0.018	0 (1.1×10^{-5})	0 (3.8×10^{-11})	0 (0.000041)
LLW and MLLW[f]	LANL	NNSS	0.033	0 (2.0×10^{-5})	0.035	0 (2.1×10^{-5})	0 (7.3×10^{-11})	0 (0.000041)
MLLW[f]	SRS	NNSS	0.094	0 (5.6×10^{-5})	0.10	0 (6.2×10^{-5})	0 (7.8×10^{-10})	0 (0.00018)

CCO = criticality control overpack; CH-TRU = contact-handled transuranic; HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NNSS = Nevada National Security Site; nonrad. = nonradiological; OST = Office of Secure Transportation; Pantex = Pantex Plant; POC = pipe overpack container; rad. = radiological; SRS = Savannah River Site; TRUPACT-II = Transuranic Package Transporter Model-II; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Complex.

(a) Transported in Type B packages.

(b) Transported by OST transporters.

(c) The radiological risks associated with shipments of powder bound the radiological risks associated with shipments of metal.

(d) Transported in 208 L (55 gal) drums in 3 TRUPACT-IIs per shipment. CCOs are the same size as a 208-L (55 gal) drum.

(e) Transported in Type A B-25 boxes.

(f) Transported in Type A 208 L (55 gal) drums.

Table E-6. Radiological and Nonradiological Risks of Transporting Radioactive Material and Waste – Preferred Alternative

Preferred Alternative	Route (Material or Waste Type)	Transport Mode	Number of Shipments	One-Way Kilometers Traveled (million)	Incident-Free Crew Dose (person-rem)[a]	Incident-Free Crew LCFs[b]	Incident-Free Population Dose (person-rem)	Incident-Free Population LCFs[b]	Accident Radiological LCFs[b]	Accident Non-radiological Risk (Traffic Fatalities)[b]
Base Approach Sub-Alternative:	All OST Transporter Routes (pits, HEU, undiluted PuO_2)[c]	OST Transporter	1,800	2.2	33	0 (0.02)	89	0 (0.05)	0 (4×10^{-5})	0 (0.06)
PDP at LANL and Dilution at SRS	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	591	0.81	26	0 (0.02)	23	0 (0.01)	0 (4×10^{-7})	0 (0.03)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	3,172	8.6	240	0 (0.1)	200	0 (0.1)	0 (6×10^{-5})	1 (0.5)
	Total		**5,563**	**12**	**300**	**0 (0.2)**	**320**	**0 (0.2)**	**0 (0.0001)**	**1 (0.6)**
NPMP at LANL and Dilution at SRS	All OST Transporter Routes (undiluted Pu and PuO_2)[c]	OST Transporter	178	0.48	6.0	0 (0.004)	22	0 (0.01)	0 (4×10^{-5})	0 (0.01)
	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	303	0.42	11	0 (0.007)	11	0 (0.007)	0 (1×10^{-7})	0 (0.01)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	663	1.8	51	0 (0.03)	42	0 (0.03)	0 (3×10^{-5})	0 (0.1)
	Total		**1,144**	**2.7**	**68**	**0 (0.04)**	**75**	**0 (0.05)**	**0 (7×10^{-5})**	**0 (0.1)**
SRS NPMP Sub-Alternative:	All OST Transporter Routes (pits, HEU, undiluted PuO_2)[c]	OST Transporter	1,800	2.2	33	0 (0.02)	89	0 (0.05)	0 (4×10^{-5})	0 (0.06)
PDP at LANL and Dilution at SRS	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	591	0.81	26	0 (0.02)	23	0 (0.01)	0 (4×10^{-7})	0 (0.03)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	3,172	8.6	240	0 (0.1)	200	0 (0.1)	0 (6×10^{-5})	1 (0.5)
	Total	**Truck**	**5,563**	**12**	**300**	**0 (0.2)**	**320**	**0 (0.2)**	**0 (0.0001)**	**1 (0.6)**

Preferred Alternative	Route (Material or Waste Type)	Transport Mode	Number of Shipments	One-Way Kilometers Traveled (million)	Incident-Free Crew Dose (person-rem)[a]	Incident-Free Crew LCFs[b]	Incident-Free Population Dose (person-rem)	Incident-Free Population LCFs[b]	Accident Radiological LCFs[b]	Accident Non-radiological Risk (Traffic Fatalities)[b]
NPMP at SRS and Dilution at SRS	All OST Transporter Routes (undiluted Pu and PuO_2)[c]	OST Transporter	89	0.24	3.0	0 (0.002)	11	0 (0.006)	0 (2×10^{-5})	0 (0.007)
	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	62	0.14	5.6	0 (0.003)	4.7	0 (0.003)	0 (2×10^{-7})	0 (0.009)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	663	1.8	51	0 (0.03)	42	0 (0.03)	0 (3×10^{-5})	0 (0.1)
	Total		**814**	**2.2**	**59**	**0 (0.04)**	**58**	**0 (0.03)**	**0 (5×10^{-5})**	**0 (0.1)**
All LANL Sub-Alternative: *PDP and Dilution at LANL*	All OST Transporter Routes (pits and HEU)[c]	OST Transporter	1,375	1.0	18	0 (0.01)	38	0 (0.02)	0 (4×10^{-7})	0 (0.03)
	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	1,636	2.0	51	0 (0.03)	52	0 (0.03)	0 (1×10^{-7})	0 (0.06)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	3,172	3.9	60	0 (0.04)	46	0 (0.03)	0 (7×10^{-7})	0 (0.2)
	Total		**6,183**	**6.9**	**130**	**0 (0.08)**	**140**	**0 (0.08)**	**0 (1×10^{-6})**	**0 (0.3)**
NPMP and Dilution at LANL	All OST Transporter Routes (undiluted Pu)[c]	OST Transporter	89	0.24	3.0	0 (0.002)	11	0 (0.006)	0 (2×10^{-5})	0 (0.007)
	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	517	0.67	17	0 (0.01)	17	0 (0.01)	0 (4×10^{-8})	0 (0.02)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	663	0.81	13	0 (0.008)	9.7	0 (0.006)	0 (3×10^{-7})	0 (0.03)
	Total		**1,269**	**1.7**	**32**	**0 (0.02)**	**38**	**0 (0.02)**	**0 (2×10^{-5})**	**0 (0.06)**

Preferred Alternative	Route (Material or Waste Type)	Transport Mode	Number of Shipments	One-Way Kilometers Traveled (million)	Incident-Free Crew Dose (person-rem)[a]	Incident-Free Crew LCFs[b]	Incident-Free Population Dose (person-rem)	Incident-Free Population LCFs[b]	Accident Radiological LCFs[b]	Accident Non-radiological Risk (Traffic Fatalities)[b]
All SRS Sub-Alternative: *PDP and Dilution at SRS*[f]	All OST Transporter Routes (pits, HEU, and byproduct material)[c]	OST Transporter	1,415	2.8	62	0 (0.04)	130	0 (0.08)	0 (2×10^{-6})	0 (0.07)
	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	313	0.72	28	0 (0.02)	24	0 (0.01)	0 (2×10^{-6})	0 (0.05)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	3,172	8.6	240	0 (0.1)	200	0 (0.1)	0 (6×10^{-5})	1 (0.5)
	Total		**4,900**	**12**	**330**	**0 (0.2)**	**350**	**0 (0.2)**	**0 (6×10^{-5})**	**1 (0.6)**
NPMP and Dilution at SRS	All OST Transporter Routes[c]	OST Transporter	89	0.24	3.0	0 (0.002)	11	0 (0.006)	0 (2×10^{-5})	0 (0.007)
	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	62	0.14	5.6	0 (0.003)	4.7	0 (0.003)	0 (2×10^{-7})	0 (0.009)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	663	1.8	51	0 (0.03)	42	0 (0.03)	0 (3×10^{-5})	0 (0.1)
	Total		**814**	**2.2**	**59**	**0 (0.04)**	**58**	**0 (0.03)**	**0 (5×10^{-5})**	**0 (0.1)**

C&P = characterization and packaging; CH-TRU = contact-handled transuranic; HEU = highly enriched uranium; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; LLW = low-level radioactive waste; NNSS = Nevada National Security Site; NPMP = non-pit metal processing; OST = Office of Secure Transportation; Pantex = Pantex Plant; PDP = pit disassembly and processing; Pu = plutonium; PuO_2 = plutonium oxide; SRS = Savannah River Site; WIPP = Waste Isolation Pilot Plant.

(a) Crew doses are for the truck drivers, assumed to be two drivers per transport.

(b) Risk is expressed in terms of latent cancer fatalities, except for the nonradiological risk, where it refers to the number of traffic accident fatalities. Both are the expected fatalities based on the statistical data (e.g., LCFs per unit dose absorbed, and the traffic fatalities per 100 million kilometers traveled). Radiological risk is calculated for one-way travel while nonradiological risk is calculated for two-way travel. Accident dose risk can be calculated by dividing the risk values by 0.0006 (DOE 2003). The values are rounded to one non-zero digit.

(c) OST transporter routes include routes from Pantex to LANL and SRS, LANL and SRS to Y-12, LANL to SRS, and SRS to LANL. Shipments on these routes would be made in OST transporters.

(d) Job Control Waste routes include routes from LANL and SRS to the WIPP facility and LANL to NNSS.

(e) Includes impacts from adulterant shipments from an assumed distance of 4,800 km to LANL or SRS.
(f) For PDP at SRS, there would be an additional four shipments of mixed low-level radioactive waste to NNSS.

Notes:

- A roadmap is provided in Table E-4 to orient readers to the activities that would occur at LANL or SRS for each of the sub-alternatives of the Preferred Alternative as well as the No Action Alternative. The Base Approach Sub-Alternative at LANL only includes PDP and NPMP activities (dilution and C&P would occur at SRS). The SRS NPMP Sub-Alternative at LANL only includes PDP (all other activities would occur at SRS). The All LANL Sub-Alternative includes all four activities: PDP, NPMP, dilution, and C&P. The All SRS Sub-Alternative includes all four activities: PDP, NPMP, dilution, and C&P.
- Columns may not sum to totals due to rounding of individual values and totals.

Table E-7. Risks of Transporting Radioactive Material and Waste – No Action Alternative

No Action Alternative	Route (Material or Waste Type)	Transport Mode	Number of Shipments	One-Way Kilometers Traveled (million)	Incident-Free Crew Dose (person-rem)	Incident-Free Crew LCFs[a]	Incident-Free Population Dose (person-rem)	Incident-Free Population LCFs[a]	Accident Radiological LCFs[a]	Accident Non-radiological Risk[a]
NPMP at LANL and Dilution at SRS	All OST Transporter Routes (undiluted Pu and PuO_2)[b][c]	OST Transporter	89 – 178	0.24 – 0.48	3.0 – 6.0	0 (0.002) – 0 (0.004)	0.002 – 0.004	0 (0.006) – 0 (0.01)	0 (2×10^{-5}) – 0 (4×10^{-5})	0 (0.007 – 0.01)
	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	303	0.42	11	0 (0.007)	11	0 (0.007)	0 (1×10^{-7})	0 (0.01)
	All Diluted PuO_2 CH-TRU Waste[c] Shipments to the WIPP Facility	Truck	663	1.8	51	0 (0.03)	42	0 (0.03)	0 (3×10^{-5})	0 (0.1)
	Total[c]		**1,055 – 1,144**	**2.5 – 2.7**	**65 – 68**	**0 (0.04)**	**64 – 75**	**0 (0.04) – 0 (0.05)**	**0 (5×10^{-5}) – 0 (7×10^{-5})**	**0 (0.1)**
NPMP and Dilution at SRS	All OST Transporter Routes (undiluted Pu and PuO_2)[b][c]	OST Transporter	0 – 89	0 – 0.24	0 – 3.0	0 – 0 (0.002)	0 – 11	0 – 0 (0.006)	0 – 0 (2×10^{-5})	0 (0 – 0.007)
	All Job Control Waste Routes (CH-TRU and LLW)[d]	Truck	78	0.18	7.0	0 (0.004)	5.9	0 (0.004)	0 (2×10^{-7})	0 (0.01)
	All Diluted PuO_2 CH-TRU Waste Shipments[e] to the WIPP Facility	Truck	663	1.8	51	0 (0.03)	42	0 (0.03)	0 (3×10^{-5})	0 (0.1)
	Total[c]		**741 – 830**	**2 – 2.2**	**58 – 61**	**0 (0.03) – 0 (0.04)**	**48 – 59**	**0 (0.03) – 0 (0.04)**	**0 (3×10^{-5}) – 0 (5×10^{-5})**	**0 (0.1)**

CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; LLW = low-level radioactive waste; NNSS = Nevada National Security Site; NPMP = non-pit metal processing; OST = Office of Secure Transportation; Pu = plutonium; PuO_2 = plutonium oxide; SRS = Savannah River Site; WIPP = Waste Isolation Pilot Plant.

(a) Risk is expressed in terms of latent cancer fatalities, except for the nonradiological risk, where it refers to the number of traffic accident fatalities. Both are the expected fatalities based on the statistical data (e.g., LCFs per unit dose absorbed, and the traffic fatalities per 100 million kilometers traveled). Radiological risk is calculated for one-way travel, while nonradiological risk is calculated for two-way travel. Accident dose risk can be calculated by dividing the risk values by 0.0006 (DOE 2003). The values are rounded to one non-zero digit.
(b) OST transporter routes include routes from LANL to SRS and SRS to LANL. Shipments on these routes would be made in OST transporters.
(c) Range in the number of shipments, one-way kilometers traveled, and incident-free and accident impacts is due to the assumed origin of the non-pit surplus plutonium.
(d) Job Control Waste routes include routes from LANL and SRS to the WIPP facility and LANL to NNSS.
(e) Includes impacts from adulterant shipments from an assumed distance of 4,800 km to SRS or LANL.

Notes:

- A roadmap is provided in Table E-4 to orient readers to the activities that would occur at LANL or SRS for the No Action Alternative. Under the No Action Alternative, NPMP could occur at either LANL or at SRS. The analysis also considers the non-pit surplus plutonium origin could be either SRS or LANL (see footnote c).
- The cited total values may differ from the sum of the individual values because of rounding of individual values and totals.
- Crew doses are for truck drivers, assuming to be two drivers per transport.

The risks to various exposed individuals under incident-free transportation conditions have been estimated and are presented in Table E-8, considering all shipment types. Doses are presented on a per-event basis (person-rem per event, per exposure, or per shipment), because it is generally unlikely that the same person would be exposed to multiple events. For individuals who could have multiple exposures, the cumulative dose could be calculated. For example, a member of the public residing along the route would likely receive multiple exposures from passing shipments. The maximum dose to a crew member is based on the assumption that the same individual is responsible for driving every shipment for the duration of the campaign. Note that the potential exists for larger individual exposures under one-time events of a longer duration. For example, the maximum dose to a person stuck in traffic next to a shipment of LLW for 1 hour is calculated to be 0.0081 rem (8.1 mrem). This is generally considered a one-time event for that individual, although the individual may encounter another exposure of a similar or longer duration in their lifetime. An inspector inspecting the conveyance and its cargo would be exposed to a maximum dose rate of 0.019 rem (or 19 mrem) per hour if the inspector stood within 1 m of the cargo for the duration of the inspection.

Table E-8. Estimated Dose to Maximally Exposed Individuals under Incident-free Transportation Conditions

Receptor	Dose to Maximally Exposed Individual
Workers	
Crew member (truck driver)	2 rem per year[(a)]
Inspector	0.019 rem per event per hour of inspection
Public	
Resident (along the truck route)	2.6×10^{-7} rem per event
Person in traffic congestion	0.0081 rem per event per one hour stop
Person at a rest stop/gas station	0.00024 rem per event per hour of stop
Gas station attendant	0.00053 rem per event

DOT = U.S. Department of Transportation; DOE = U.S. Department of Energy.

(a) In addition to complying with DOT requirements, a DOE employee would also need to comply with 10 CFR Part 835, which limits worker radiation doses to 5 rem/yr; however, DOE's goal is to maintain radiological exposure as low as reasonably achievable. DOE has therefore established the Administrative Control Level of 2 rem/yr (DOE 2017). Based on the number of commercial shipments and the total crew dose to two drivers in Table E-6 and Table E-7., a commercial driver dose would not exceed this administrative control limit; therefore, the administrative control limit is reflected in this table for the maximally exposed truck crew member.

Source: Table E-11 in DOE 2015.

The cumulative dose to a member of the public along the route was calculated by assuming all shipments pass their home. The cumulative dose was calculated assuming that the resident is present for every shipment and is unshielded at a distance of 30 m from the route. Therefore, the cumulative dose depends on the number of shipments passing a particular point and is independent of the actual route being considered. If one assumes the maximum resident dose provided in Table E-7. for all waste transport types, then the maximum dose to this resident, if all the materials and wastes were shipped via this route, would be about 1.6 mrem, and the expected risk of developing an LCF would be 1×10^{-6}, or essentially no expected LCF. This dose corresponds to that for truck shipments under the Preferred Alternative, which includes an estimated 6,183 shipments over about a 27-year period.

The accident risk assessment and the impacts shown in Table E-6 and Table E-7. consider the entire spectrum of postulated accidents, from a fender-bender to an extremely severe accident. To provide

additional insight into the severity of accidents in terms of the potential dose to the maximally exposed individual and the public, an accident consequence assessment was performed for a maximum reasonably foreseeable hypothetical transportation accident with a likelihood of occurrence greater than 1 in 10 million per year.

The following assumptions were used to estimate the consequences of maximum reasonably foreseeable offsite transportation accidents:

- The accident is the most severe and has the highest release fraction (high-impact and high-temperature fire accident [highest severity category]).
- The individual is 100 m downwind from a ground release accident.
- The individual is exposed to airborne contamination for 2 hrs with no interdiction or cleanup. A stable weather condition (Pasquill Stability Class F)[13] with a wind speed of 1 m/s is assumed.
- The population is assumed to have a uniform density within a radius of 80 km and to be exposed to the entire plume passage and 7 days of ground exposure without interdiction and cleanup. A neutral weather condition (Pasquill Stability Class D) with a wind speed of 4 m/s is assumed. Because the consequence is proportional to the population density, the accident is assumed to occur in an urban[14] area that has the highest density (see Table E-9).
- The type and number of containers involved in the accident are listed in Table E-2. When multiple Type B or shielded Type A shipping casks are transported in a shipment, a single cask is assumed to have failed in the accident. It is unlikely that a severe accident would breach multiple casks.

Table E-9 provides the estimated dose and potential LCFs that could result for an individual and population from a maximum foreseeable truck transportation accident that has the highest consequences under each alternative. (Only accidents with a probability greater than 1×10^{-7} per year are analyzed.) The accident is assumed to involve a severe impact (collision) in conjunction with a long fire duration. The highest consequences for the maximum foreseeable accident based on population dose are from accidents occurring in a suburban area involving the transport of plutonium oxide powder from LANL to SRS.

[13] Section 3.3.1 in Yuan et al. 1995 describes the atmospheric transport model implemented in Risks and Consequences of Radioactive Material Transport including the Pasquill stability classes.

[14] If the likelihood of an accident is equal to or greater than 1 in 10 million per year for both suburban and urban population zones, then the consequences are provided for the urban population zone.

Table E-9. Estimated Dose to the Population and to Maximally Exposed Individuals under the Maximum Reasonably Foreseeable Accident

Transport Mode	Material or Waste in the Accident	Applicable Alternatives	Range of Likelihood of the Accident (per year)[a]	Population Zone[a]	Population[b] Dose (person-rem)	Population[b] LCF	MEI[c] Dose (rem)	MEI[c] LCF
OST transporter from Pantex	Pits	Preferred[d]	1.0×10^{-6}	Suburban	110 (pit)	0 (0.07) (pit)	0.066 (pit)	0.00004 (pit)
OST transporter from SRS to LANL or LANL to SRS	Plutonium metal or oxide in Type B package[e]	Preferred[f]	2.0×10^{-7}	Suburban	7,900 (pit)	5 (pit)	4.4 (pit)	0.003 (pit)
		No Action and Preferred	1.2×10^{-6} to 2.4×10^{-6}	Rural	820 (non-pit)	0.5 (non-pit)	12 (non-pit)	0.007 (non-pit)
Truck transport to the WIPP facility	Diluted plutonium oxide CH-TRU waste in criticality control containers in TRUPACT-II	Preferred[g]	2.3×10^{-7}	Urban	110 (pit)	0 (0.07) (pit)	0.015 (pit)	9×10^{-6} (pit)
		No Action and Preferred	1.2×10^{-6} to 2.4×10^{-6}	Suburban	63 (non-pit)	0 (0.04) (non-pit)	0.040 (non-pit)	2×10^{-5} (non-pit)
Truck transport to the WIPP facility	CH-TRU waste in pipe overpack containers in TRUPACT-II	Preferred	2.0×10^{-7}	Suburban	12 (pit)	0 (0.007) (pit)	0.0075 (pit)	5×10^{-6} (pit)
OST transporter from SRS or LANL to Y-12	HEU	Preferred[h]	2.7×10^{-7} to 1.5×10^{-6}	Rural	0.19	0 (0.0001)	0.00026	2×10^{-7}
Truck transport to the WIPP facility	CH-TRU waste in drums in TRUPACT-II	Preferred	2.9×10^{-7} to 4.4×10^{-7}	Suburban	1.6 (pit)	0 (0.0009) (pit)	0.0010 (pit)	6×10^{-7} (pit)
		No Action	1.2×10^{-7} to 3.4×10^{-7}	Suburban	2.1 (non-pit)	0 (0.001) (non-pit)	0.0013 (non-pit)	8×10^{-7} (non-pit)
Truck transport to NNSS	LLW or MLLW in drums	Preferred	3.4×10^{-6}	Rural	0.00054	0 (3×10^{-7})	0.000016	9×10^{-9}
		No Action	1.3×10^{-7}	Suburban	0.023	0 (0.00001)	0.000016	9×10^{-9}

CH-TRU = contact-handled transuranic; LANL = Los Alamos National Laboratory; HEU = highly-enriched uranium; LCF = latent cancer fatality; LLW = low-level radioactive waste; MEI = maximally exposed individual; MLLW = mixed low-level radioactive waste; NNSS = Nevada National Security Site; OST = Office of Secure Transportation; Pantex = Pantex Plant; SRS = Savannah River Site; TRUPACT-II = Transuranic Package Transporter Model-II; WIPP = Waste Isolation Pilot Plant; Y-12 = Y-12 National Security Complex.

(a) The likelihood shown is the range of likelihood estimated among the alternatives given the number of shipments over a specific time period. The population zones listed are those that have the likelihood of an accident occurring equal to or greater than 1 in 10 million per year. If the likelihood of an accident is equal to or greater than 1 in 10 million per year for both suburban and urban population zones, then the consequences are provided for the urban population zone.

(b) Population extends at a uniform density to a radius of 80 km. The weather condition was assumed to be Pasquill Stability Class D with a wind speed of 4 m/s (Yuan et al. 1995).

(c) The MEI is assumed to be 100 m downwind from the accident and exposed to the entire plume of the radioactive release. The weather condition is assumed to be Pasquill Stability Class F with a wind speed of 1 m/s.

(d) This accident characteristics is applicable to the All SRS Sub-Alternative, which considers the pit disassembly and processing would occur over 13 years at F-Area, or 15 years at K-Area. For all other sub-alternatives, pits are transported to LANL for processing over 27 years, with the likelihood of an accident occurring being 4.1×10^{-6} per year in a rural area and a population dose of 5.2 person-rem.

(e) Doses are based on plutonium oxide.

(f) The 7,900 person-rem is applicable to the Base Approach and the SRS NPMP Sub-Alternative. Plutonium pit metal or oxide in Type B packages is not shipped between LANL and SRS or SRS and LANL for the All LANL Sub-Alternative and All SRS Sub-Alternative.

(g) The 110 person-rem and 2.3×10^{-7} frequency is not applicable to the All LANL Sub-Alternative. The impacts for the All LANL Sub-Alternative would be 15 person-rem and 1.1×10^{-7} per year frequency.

(h) The 0.19 person-rem is applicable for the All SRS Sub-Alternative; the frequency for this sub-alternative is 2.7×10^{-7} per year. For all other Preferred Alternative sub-alternatives, including the All LANL Sub-Alternative, the frequency and the public dose are 1.5×10^{-6} per year and 0.12 person-rem, respectively.

E.8 Impact of Hazardous Waste and Construction and Operational Material Transport

This section evaluates the impacts of transporting hazardous wastes, as well as materials required to construct new facilities. Section E.9 of the 2015 SPD SEIS (DOE 2015) evaluated the potential impacts of transporting construction materials and the hazardous wastes. For construction materials, it was assumed that these materials would be transported 50 km one way (DOE 2015). Hazardous wastes were assumed to be transported about 2,000 km (DOE 2015). The truck accident and fatality rates that were assumed for construction materials were 7.69 accidents per 10 million truck-kilometers traveled and 4.08 fatalities per 100 million truck-kilometers traveled (Saricks and Tompkins 1999; Blower and Matteson 2003), which is representative of transportation in South Carolina. The truck accident and fatality rates that were assumed for transport of hazardous materials were 5.77 accidents per 10 million truck-kilometers traveled and 2.34 fatalities per 100 million truck-kilometers traveled (Saricks and Tompkins 1999; Blower and Matteson 2003), which is representative of the national mean.

A comparison of the identified construction materials (SRNS 2023; LANL 2023) to those used in the 2015 SPD SEIS (DOE 2015) shows that the volumes of the materials in the 2015 SPD SEIS are larger than those identified for this SPDP EIS. Therefore, the impacts of construction in the 2015 SPD SEIS are incorporated by reference here. The 2015 SPD SEIS (DOE 2015) identified hazardous materials for use under the No Action Alternative. The estimated impacts for the hazardous waste transport of these materials are incorporated by reference here.

Therefore, the estimated impacts of construction material transport related to the pit disassembly and conversion project in Table E-13 of the 2015 SPD SEIS (DOE 2015) are considered to be the maximum impacts for the construction material transport impacts in this SPDP EIS. For hazardous waste, the estimate provided in Table E-14 of the 2015 SPD SEIS (DOE 2015) for the pit disassembly and conversion project is also considered to be the maximum impact in this SPDP EIS. This is because the analyses in the 2015 SPD SEIS (DOE 2015) is based on the construction of a new pit disassembly and processing (PDP) facility at the SRS F-Area, or K-Area, and in this SPDP EIS the PDP facility may use portions of the existing infrastructures, thereby leading to a smaller impact.

Table E-10 summarizes the impacts in terms of total number of kilometers, accidents, and fatalities for all Preferred Alternative sub-alternatives.

Table E-10. Estimated Impacts of Construction Material and Hazardous Waste Transport

Material	Number of Shipments	Total Distance Traveled (two-way kilometers)	Number of Accidents	Traffic Fatality Risk
Construction Materials	43,000	4,300,000	3.3	0.2
Hazardous Waste	450	1,800,000	1.0	0.04

SEIS = supplemental environmental impact statement; SPD = surplus plutonium disposition; SPDP EIS = Surplus Plutonium Disposition Program Environmental Impact Statement; WIPP = Waste Isolation Pilot Plant.
Source: DOE 2015|Section E.9, Tables E-13, E-14|. The cited values represent the maximum impacts for the 2015 SPD SEIS WIPP Alternative, where surplus plutonium would be diluted and disposed at the WIPP facility. These impacts were used as the maximum impacts for the Preferred Alternative in this SPDP EIS.

E.9 Onsite Transports

Onsite shipment of radioactive materials and wastes would occur at both LANL and SRS. At LANL, the onsite shipments of transuranic (TRU) waste to the TRU waste facility are currently conducted as part of

site operations. At SRS, onsite shipment of radioactive materials and wastes would also occur as part of site operations. In general, these shipments would not affect any members of the public because roads between processing areas are closed to the public; therefore, shipments would only affect onsite workers. Shipments of TRU waste, LLW, and MLLW to E-Area at SRS are currently conducted as part of site operations with no discernable impact on noninvolved workers. The transport of radioactive materials and wastes under the alternatives is not expected to significantly increase the risk to these workers.

As shown in this appendix, the risks from incident-free transport of radioactive waste and materials offsite over long distances (hundreds to thousands of kilometers) are very small; therefore, the risks from transporting radioactive waste and materials onsite, where distances would be less than 20 km (12 mi) and sometimes less than 5 km (3 mi), would be even smaller. For OST shipments, onsite transport activities are coordinated to occur during non-peak traffic periods, further limiting the risk of noninvolved worker exposure. All involved workers (drivers and escorts) are monitored, and the maximum annual dose to a transportation worker would be administratively limited to 2 rem (10 CFR Part 835 [10 CFR Part 835], DOE-STD-1098-2017 [DOE 2017]). Impacts associated with accidents during onsite transport of radioactive materials and wastes would be less than the impacts assessed for the bounding accident analyses for the plutonium disposition facilities (see Sections 4.1.2.7.2 and 4.1.3.7.2 of the SPDP EIS), as well as the impacts for offsite transports, because of the much shorter distances traveled, onsite security measures, and lower onsite vehicle speeds. The onsite shipments in this SPDP EIS are bounded by those evaluated in Appendix E of the 2015 SPD SEIS (DOE 2015) and are incorporated by reference here.

E.10 Conclusions About Transportation Risks

Based on the results presented in the previous sections, the following conclusions have been reached (see Table E-6 and Table E-7.):

- For all alternatives, it is unlikely that the transportation of radioactive material and waste would cause an additional fatality as a result of radiation, either from incident-free operation or postulated transportation accidents.
- The highest risk to the public due to incident-free transportation would be under the Preferred Alternative, under which up to 6,183 truck shipments of radioactive materials and wastes would be transported (see Table E-6).
- The nonradiological accident risks (the potential for fatalities as a direct result of traffic accidents) present greater risks than the radiological accident risks.
- Up to one (0.6) traffic fatality would be expected over the duration of the activities (which exceeds 27 years for all the alternatives) evaluated in this SPDP EIS. For comparison, the average number of traffic fatalities in the United States is about 34,860 per year for the 10-year period 2010 through 2019 (DOT 2021). The incremental increase in risk to the general population from shipments associated with the program would therefore be very small and would not substantially contribute to cumulative impacts.

E.11 Uncertainty and Conservatism in Estimated Impacts

The sequence of analyses performed to generate the estimates of radiological risk for transportation includes the (1) determination of the inventory and characteristics, (2) estimation of shipment

requirements, (3) determination of route characteristics, (4) calculation of radiation doses to exposed individuals (including estimation of environmental transport and uptake of radionuclides), and (5) estimation of health effects. Uncertainties are associated with each of these steps. Uncertainties exist in the way that the physical systems being analyzed are represented by the computational models; in the data required to exercise the models (due to measurement errors, sampling errors, natural variability, or unknowns caused simply by the future nature of the actions being analyzed); and in the calculations themselves (e.g., approximate algorithms used in the computer codes).

Section E.14 in the 2015 SPD SEIS (DOE 2015) provides more information about the uncertainty and conservatism in the estimated transportation impacts.

E.12 References

10 CFR Part 71. *Code of Federal Regulations*, Title 10, *Energy*, Part 71, "Packaging and Transportation of Radioactive Material." U.S. Nuclear Regulatory Commission. Available online: https://www.ecfr.gov/current/title-10/chapter-I/part-71 (accessed January 5, 2022).

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49 CFR Part 397. *Code of Federal Regulations*, Title 49, *Transportation*, Part 397, "Transportation of Hazardous Materials; Driving and Parking Rules." U.S. Department of Transportation. Available online: https://www.ecfr.gov/current/title-49/subtitle-B/chapter-III/subchapter-B/part-397 (accessed December 20, 2021).

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APPENDIX F

CONFLICT OF INTEREST DISCLOSURE STATEMENTS

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE *SURPLUS PLUTONIUM DISPOSITION PROGRAM FINAL ENVIRONMENTAL IMPACT STATEMENT*

Council on Environmental Quality (CEQ) Regulations at 40 CFR 1506.5(c), which have been adopted by the DOE (10 CFR 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" for purposes of this disclosure is defined in the March 23, 1981 guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 8026-18038 at Question 17a and b.

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

In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows: (check either (a) or (b) to assure consideration of your proposal).

(a) X Offeror and any proposed subcontractor have no financial or other interest in the outcome of the project.

(b) _____ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

Financial or Other Interests

1.

2.

3.

Certified by

David R Judi Digitally signed by David R Judi
Date: 2023.08.30 09:23:48 -07'00'

Signature and Date

David Judi, Division Director, Earth Systems Science Division

Printed Name and Title

Battelle Memorial Institute, Operator of Pacific Northwest National Laboratory for the U.S. Department of Energy under Contract DE-AC05-76RL01830

Company

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE *SURPLUS PLUTONIUM DISPOSITION PROGRAM FINAL ENVIRONMENTAL IMPACT STATEMENT*

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In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows: (check either (a) or (b) to assure consideration of your proposal).

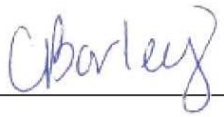
(a) X Offeror and any proposed subcontractor have no financial or other interest in the outcome of the project.

(b) _____ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

Financial or Other Interests

1.
2.
3.

Certified by



8/22/2023

Signature and Date

Christine Borley/Contracts Manager

Printed Name and Title

Leidos, Inc.

Company