US Exhibit 1

Supplemental Analysis

DOE/EIS-0236-S4-SA-01

July 2018

Supplement Analysis for the Removal of One Metric Ton of Plutonium from the State of South Carolina to Nevada, Texas, and New Mexico

National Nuclear Security Administration

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EXECUTIVE SUMMARY

On December 20, 2017, the United States District Court for the District of South Carolina, Aiken Division, issued a court Order of Injunctive Relief requiring the Department of Energy (DOE)/National Nuclear Security Administration (NNSA) to remove one metric ton of plutonium from the State of South Carolina within two years of issuance of the Order (or by January 1, 2020 at the latest). In response to and to comply with the injunction, DOE/NNSA proposes to move one metric ton of plutonium out of the State of South Carolina. DOE/NNSA would repackage one metric ton of plutonium at Savannah River Site in South Carolina and transport the repackaged plutonium to the NNSA Production Office (hereafter referred to as Pantex Plant or Pantex) located near Amarillo, Texas and/or Nevada National Security Site for staging until transporting it to Los Alamos National Laboratory in New Mexico for use in pit production. Shipments between Pantex and Nevada National Security Site may occur if needed in the implementation of this proposed action.

DOE/NNSA has prepared this supplement analysis to determine whether (a) an existing environmental impact statement should be supplemented, (b) a new National Environmental Policy Act (NEPA) document should be prepared, or (c) that no further NEPA documentation is required as the proposed action has been adequately analyzed in existing NEPA documents and record of decisions. In preparation of this supplement analysis, DOE/NNSA reviewed various environmental impact statements, supplement analyses, environmental assessments, and other technical documents. Based upon this review, DOE/NNSA concluded that there are no substantial changes in the proposed action that are relevant to environmental concerns or significant new circumstances or information relevant to environmental concerns that would supplement or require a new environmental analysis. Accordingly, upon review and consideration of the information and analysis within this supplement analysis, DOE/NNSA has determined that the proposed action does not constitute a substantial change from actions previously analyzed in the *Final Complex Transformation Supplemental Programmatic Environmental Impact Statement* (DOE/EIS-0236-S4) and other documents used to support this supplement analysis the *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (DOE/EIS-0283-S2), the *Surplus Plutonium Disposition Final Environmental Impact Statement* (DOE/EIS-0283), the *Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components*, (DOE/EIS-0225), the *Final Site-wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and the Off-Site Locations in the state of Nevada* (DOE/EIS-0426), and the *Site-Wide Environmental Impact for Continued Operations at Los Alamos National Laboratory* (DOE/EIS-0380) and that no further NEPA documentation is required.

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ACRONYMS AND TERMS

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNPC	Consolidated Nuclear Production Center
dBA	A-weighted decibels
DoD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
EIS	environmental impact statement
LANL	Los Alamos National Laboratory
LLW	low-level waste
MFFF	mixed-oxide fuel fabrication facility
NEPA	National Environmental Policy Act, 1969
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
PDCF	Pit Disassembly and Conversion Facility
PF-4	Plutonium Facility Building 4 (TA-55)
SEIS	supplemental environmental impact statement
SPEIS	supplemental programmatic environmental impact statement
SRS	Savannah River Site
SWEIS	Site-Wide Environmental Impact Statement
TA	Technical Area

1.0 INTRODUCTION

This supplement analysis was prepared in accordance with the Department of Energy (DOE) regulations implementing NEPA that require that "[when] it is unclear whether or not an EIS supplement is required, DOE shall prepare a Supplement Analysis [that] shall discuss the circumstances that are pertinent to deciding whether to prepare a supplemental EIS pursuant to 40 CFR 1502.9(c)" (10 CFR 1021.314).

1.1 Purpose and Need

In response to a December 20, 2017 injunction from the United States District Court for the District of South Carolina, Aiken Division, DOE proposes to move one metric ton of plutonium out of the State of South Carolina by January 1, 2020 at the latest.

1.2 Proposed Action

The DOE/NNSA proposed action is to meet the Order by transporting one metric ton of plutonium out of South Carolina. The plutonium would be transported to National Nuclear Security Administration (NNSA) Production Office (hereafter, referred to as Pantex Plant or Pantex) and/or Nevada National Security Site (NNSS) for staging and then to the Los Alamos National Laboratory (LANL) for use in pit production, serving a national security mission. Shipments between Pantex and NNSS may occur if needed in the implementation of this proposed action.

This proposed action is the responsibility of the DOE's NNSA a semi-autonomous agency within the DOE. NNSA is responsible for enhancing national security through the military application of nuclear science, and maintains and enhances the safety, security, and effectiveness of the United States nuclear weapons stockpile.

1.3 Scope of this Document

This supplement analysis evaluates potential impacts from the repackaging and transportation of one metric ton of plutonium in containers at Savannah River Site (SRS), staging and repackaging of the plutonium in containers at Pantex and/or NNSS, and storage of the plutonium for pit production at LANL. Transportation between the sites and onsite is also evaluated. The mission activities at each site are described below.

1.3.1 Savannah River Site

SRS, located in the State of South Carolina (Figure 1-1), has unique capabilities for the stabilization and disposition of special nuclear materials. The K-Area facility is responsible for the receipt, storage, processing, packaging, and shipping of nuclear materials (e.g., plutonium). Operations at SRS that support removing one metric ton of plutonium (i.e., packaging and shipping) are routinely performed in the K-Area facility.

1.3.2 Pantex

The Pantex Plant (Figure 1-2) located in Texas is the only DOE/NNSA site authorized to assemble or disassemble nuclear weapons. As a collaborative partner with DOE national security laboratories, the site conducts nuclear material accountability, storage, protection, and handling, including pit surveillance and packaging, as part of the site's capabilities for assembly and disassembly of weapons components and storage of pits and weapons (DOE 2017).

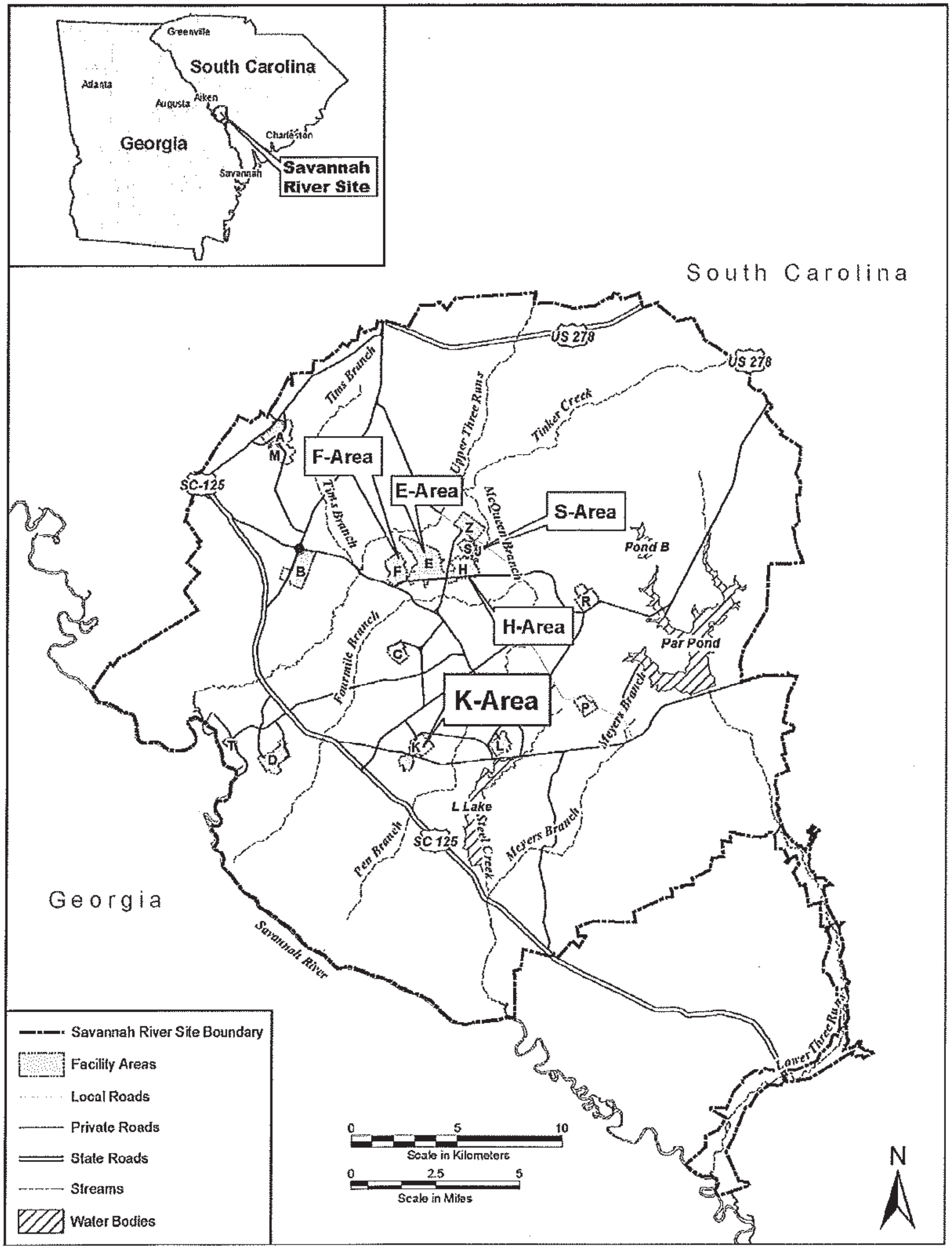

Figure 1-1. Savannah River Site in South Carolina.

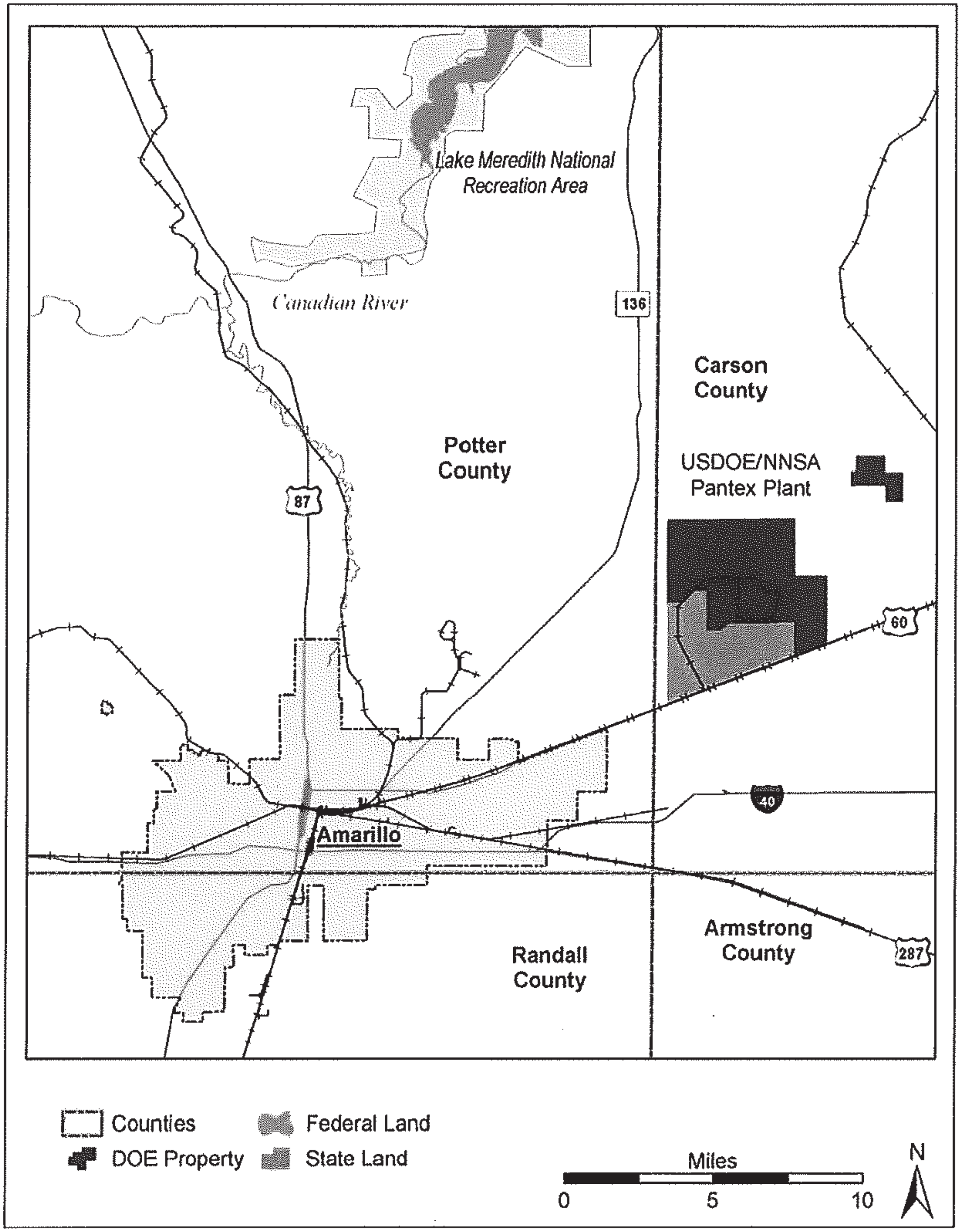

Figure 1-2. Pantex Plant near Amarillo, Texas.

1.3.3 Nevada National Security Site

Nevada National Security Site (Figure 1-3) located in Nevada is the primary location within the DOE/NNSA complex where high-hazard experiments with radiological and other high-hazard materials are conducted. The Device Assembly Facility located at the site supports nuclear stockpile experimental capabilities and is one of the facilities in the nuclear security enterprise that permits staging of large quantities of special nuclear material to support various missions (DOE 2017).

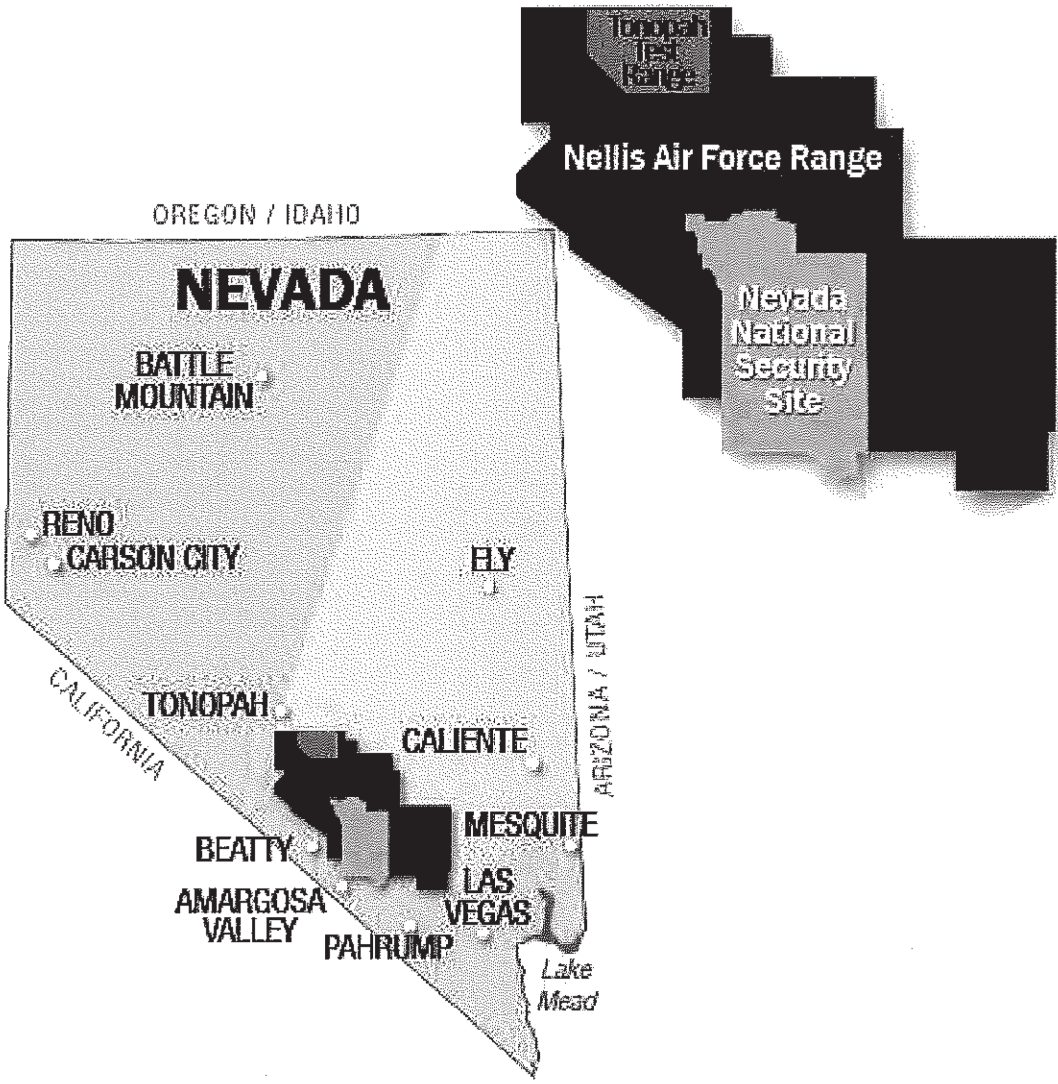

Figure 1-3. Nevada National Security Site near Las Vegas, Nevada.

1.3.4 Los Alamos National Laboratory

LANL (Figure 1-4) in New Mexico serves as the Center of Excellence for Plutonium for the DOE/NNSA and provides pit production capabilities for the DOE complex. LANL is a nuclear design and physics laboratory that operates several facilities that includes the Plutonium Facility Complex (Technical Area 55) (DOE 2017) where plutonium is staged for pit production.

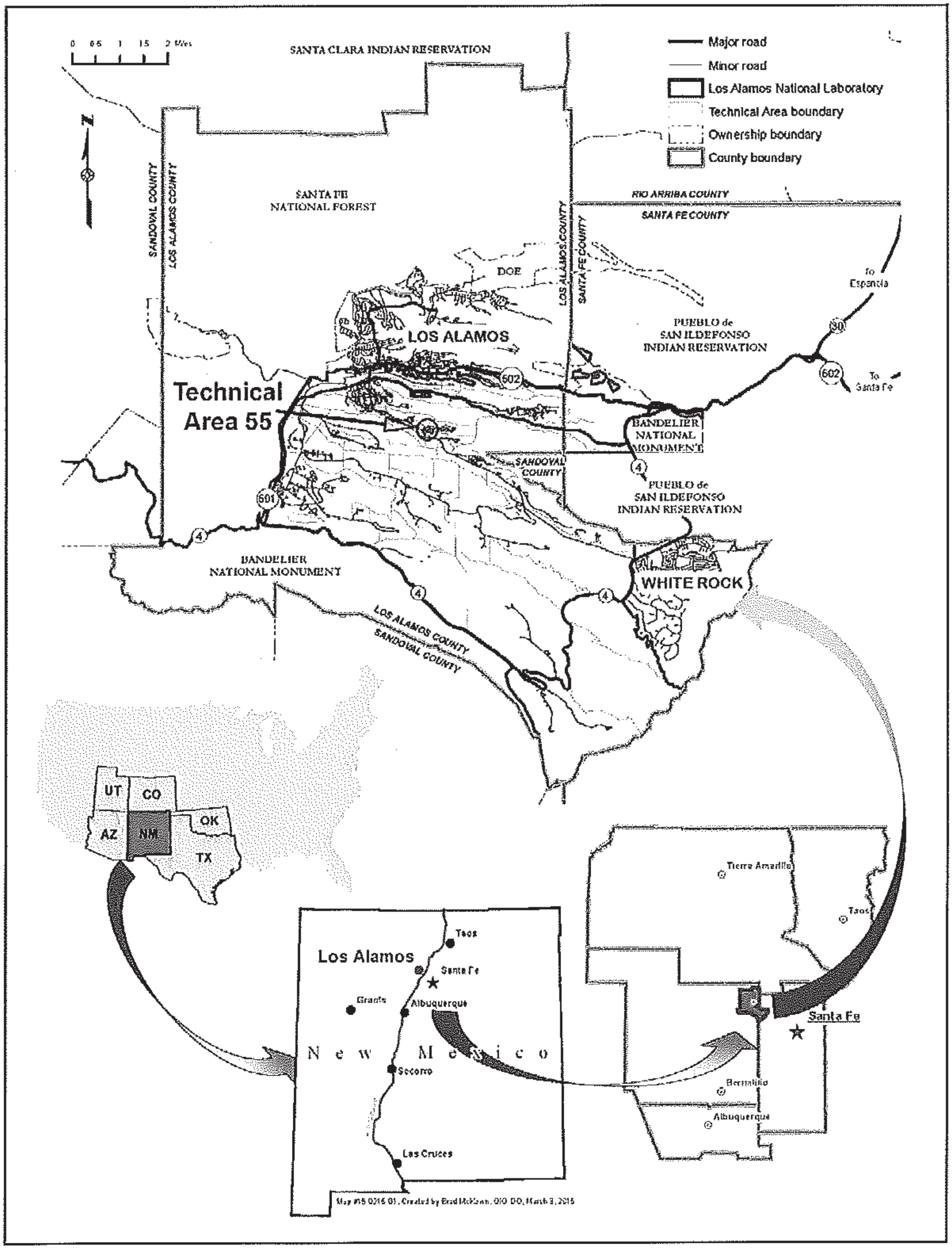

Figure 1-4. Los Alamos National Laboratory in New Mexico.

1.4 Strategy of this Supplement Analysis

1.4.1 Relevant Documents

For this supplement analysis, DOE/NNSA uses incorporation by reference and tiers from previous DOE NEPA and non-NEPA documents to succinctly present the analysis. The following documents are incorporated by reference and/or tiered from where applicable:

Programmatic NEPA Documents

The Final Complex Transformation Supplemental Programmatic Environmental Impact Statement (SPEIS) (DOE 2008a) analyzed the environmental impacts of alternatives for transforming the nuclear weapons complex into a smaller, more efficient enterprise that could respond to changing national security challenges and ensure the long-term safety, security, and reliability of the nuclear weapons stockpile. Programmatic alternatives considered in the Complex Transformation SPEIS specifically addressed facilities that use or store significant quantities of special nuclear material. In the 2008 Record of Decision (DOE 2008c), DOE/NNSA announced its decision to transform the plutonium and uranium manufacturing aspects of the complex into smaller and more efficient operations while maintaining the capabilities DOE/NNSA needs to perform its national security missions. The Record of Decision also stated that manufacturing, research, and development involving plutonium would remain at LANL. The Final Complex Transformation SPEIS analyzed the DOE/NNSA plutonium mission for the complex as a whole and identifies LANL as the site responsible for plutonium pit production (DOE 2008c), which was reaffirmed by the Fiscal Year 2018 Stockpile Stewardship Management Plan (DOE 2017) and Nuclear Posture Review (DoD 2018).

The Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement (SEIS) (DOE 2015) analyzed the potential environmental impacts of alternatives for the disposition of 14.4 tons (13.1 metric tons) of surplus plutonium for which a disposition path was not assigned, including 7.8 tons (7.1 metric tons) of weapons-usable plutonium from pits and 6.6 tons (six metric tons) of non-pit plutonium. A record of decision for non-pit plutonium was issued in 2016 (DOE 2016); however, no record of decision has been issued for any of the other proposed actions considered in the Final SPD Supplemental EIS. The Final Surplus Plutonium Disposition SEIS considered moving plutonium between three sites that are included in this proposed action; SRS, Pantex, and LANL.

The Surplus Plutonium Disposition Final Environmental Impact Statement (DOE 1999) analyzed the environmental impacts of alternatives for disposition of up to 50 metric tons of surplus plutonium using both immobilization and mixed oxide fuel technologies. In the 2000 Record of Decision (DOE 2000), DOE/NNSA announced its decision to construct and operate three new facilities at SRS. These facilities include the capabilities for pit disassembly, conversion of plutonium to mixed oxide, and storing plutonium on site. Other alternatives considered plutonium disposition at Pantex, NNSS, and LANL.

Site-Wide NEPA Documents

Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components (DOE 1996). The 1996 Pantex EIS analyzed the potential environmental impacts of ongoing and future operations and activities at

Pantex. In the Record of Decision (DOE 1997), DOE decided to (1) continue assembly and disassembly of nuclear weapons; (2) implement facility projects, including upgrades and construction consistent with conducting these operations; and (3) continue providing interim pit staging and increasing the staging capacity from 12,000 to 20,000 pits. The Pantex EIS provides information about site operations, baseline environmental conditions, and ongoing environmental impacts relevant to this supplement analysis, as supplemented by the four supplement analyses that have been prepared since the record of decision was issued in 1997 (DOE 1997, DOE 2003, DOE 2008d, DOE 2012a, DOE 2018a).

Supplement Analyses for the Final Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components (DOE 2003, DOE 2008d, DOE 2012a, and DOE 2018a). These four supplement analyses evaluated changes since the issuance of the Pantex EIS to determine if the EIS should be supplemented or if a new Pantex EIS was needed. These analyses indicate that the identified and projected resource area impacts, including cumulative impacts, were not substantially changed from those identified in the Pantex EIS, nor did they represent significant, new circumstances or information relative to environmental concerns.

The Final Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (NNSS SWEIS) (DOE 2013) was issued on February 14, 2013. The NNSS SWEIS discusses ongoing and reasonably foreseeable future operations and activities for support of the NNSA mission. In the 2014 Record of Decision, DOE/NNSA announced its decision to implement a hybrid alternative chosen from three analyzed alternatives, and composed of mission-supporting programs, capabilities, projects, and activities that are based upon current and projected mission needs. The 2014 Record of Decision includes the capability to transfer special nuclear material to and from other locations within the DOE/NNSA complex for staging at NNSS.

Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (LANL SWEIS) (DOE 2008b) was issued May 16, 2008. In the September 2008 Record of Decision (DOE 2008e), DOE/NNSA selected the No Action Alternative to continue operation of the Laboratory. This decision included the receipt and storage of special nuclear material and production of up to 20 pits per year (DOE 2008b; Table 3-18).

Supplement Analysis of the 2008 Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory (DOE 2018b) was issued in March 2018. In this supplement analysis, DOE/NNSA evaluated projects and impacts of activities conducted since publication of the LANL SWEIS and projects being proposed from 2018 through 2022. DOE/NNSA determined that ongoing operations and new and modified projects and modifications in site operations at LANL do not constitute a substantial change in the actions previously analyzed in the 2008 SWEIS. DOE/NNSA reaffirmed the earlier record of decisions for pit production.

Other Relevant Documents

Fiscal Year 2018 Stockpile Stewardship and Management Plan, a Report to Congress (DOE 2017) describes the DOE/NNSA mission to carry out national security responsibilities by maintaining a safe, secure, and effective nuclear deterrent; preventing, countering, and responding to the threats of nuclear proliferation and terrorism worldwide; and providing naval nuclear propulsion (DOE 2017).

2018 Nuclear Posture Review (DoD 2018) was issued in February 2018 by the Office of the Secretary of Defense. The 2018 Nuclear Posture Review assessed previous nuclear policies and requirements that were established and focused on identifying the nuclear policies, strategy, and corresponding capabilities needed to protect the Nation in the deteriorating threat environment that confronts the United States, its allies and partners. The Nuclear Posture Review provided guidance for the nuclear force posture and policy requirements needed now and in the future (DoD 2018).

Joint Statement from Ellen M. Lord and Lisa E. Gordon-Hagerty on the recapitalization of plutonium pit production (DOE 2018c) was issued on May 10, 2018 by the Department of Defense Under Secretary of Defense for Acquisition and Sustainment, Ellen M. Lord, and the Under Secretary for Nuclear Security and Administrator of the NNSA, Lisa Gordon-Hagerty. This joint statement included a decision that LANL would remain the Nation's Plutonium Center of Excellence for research and development (DOE 2018c).

1.4.2 Approach for NEPA in this Supplement Analysis

This supplement analysis analyzes the proposed action through an integrated and holistic review of analyses for the DOE complex by utilizing the above described documents. These documents analyze activities and decisions directly or indirectly related to, or similar to, activities discussed in the proposed action. Included are the abilities to transport and stage special nuclear material, including plutonium, as analyzed in the Final Surplus Plutonium Disposition SEIS (DOE 2015), the Surplus Plutonium Disposition Final EIS (DOE 1999), the Final Complex Transformation SPEIS (DOE 2008a), the Pantex EIS (DOE 1996), the NNSS SWEIS (DOE 2013), and the LANL SWEIS (DOE 2008b).

This supplement analysis draws analyses from each of these above-mentioned documents. Analyses relevant to activities in this supplement analysis include:

- Proposed transformation of the DOE/NNSA complex to meet mission requirements (DOE 2008a)
- Staging up to 20,000 pits at Zone-4 at Pantex (DOE 1996)
- Staging of plutonium at the Device Assembly Facility at NNSS (DOE 2013)
- Producing up to 20 pits per year at LANL and staging plutonium for pit production (DOE 2008b)

These documents provide the basis for this supplement analysis. The actions of repackaging and transportation of one metric ton of plutonium from SRS to Pantex and/or NNSS, the staging and repackaging of plutonium at these sites and shipments between these sites, and transportation of plutonium to LANL for staging and future production of pits have been analyzed in these relevant NEPA documents. Some of these analyses are directly related to activities in the proposed supplement analysis action. Others are consistent with the proposed action allowing comparison in this supplement analysis.

1.5 Availability of Supplement Analysis

DOE requires that each supplement analysis and the resulting determination be made available to the public [10 CFR 1021.314(c)]. Copies are available to the public on the DOE NEPA website (http://energy.gov/nepa/nepa-documents).

2.0 PROPOSED ACTION

On December 20, 2017, the United States District Court for the District of South Carolina, Aiken Division, ordered DOE/NNSA to remove one metric ton of plutonium from SRS within two years of issuance of the Order (or at the latest by January 1, 2020).[1] The DOE/NNSA proposed action meets the Order by transporting one metric ton of plutonium out of South Carolina. The plutonium would be transported to Pantex and/or NNSS for staging then to LANL for use in national security missions. Shipments between Pantex and NNSS may occur, if needed, in the implementation of this proposed action. A no action alternative would be in violation of the Order of Injunctive Relief and would result in the Agency facing contempt of court proceedings.

This section includes a discussion of the proposed action and related activities at four DOE sites (Figure 2-1). Section 2.1 identifies specific activities related to the proposed action at SRS, Pantex, NNSS, and LANL.

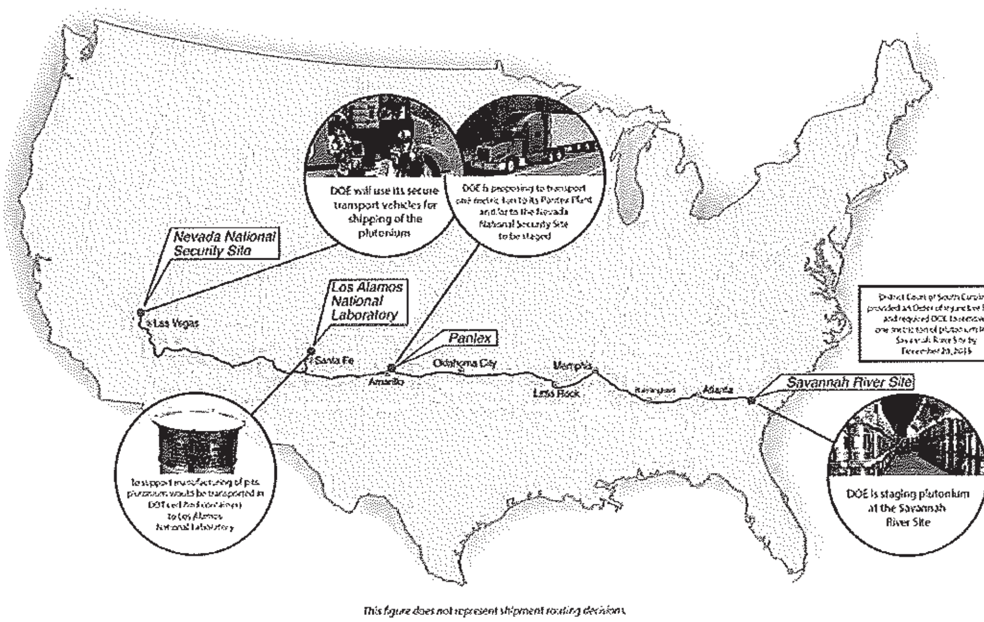

Figure 2-1. Flow chart of transportation and staging of one metric ton of plutonium.

2.1 Specific Activities Related to the Proposed Action

DOE/NNSA proposes to repackage one metric ton of plutonium at SRS and transport the repackaged plutonium to Pantex and/or NNSS for staging until it is transported to LANL for pit production. Shipments between Pantex and NNSS may also occur. This proposed action does not involve new construction or ground disturbing activities. These proposed activities at SRS,

[1] Order of injunctive relief ("Order"), Civil Action No.: 1:16-cv-00391-JMC. Filed December 20, 2017.

Pantex, NNSS, and LANL are part of the ongoing DOE complex-wide mission (DOE 2017). The activities would occur in existing facilities where the potential impacts have been analyzed and bounded in various NEPA documents as discussed in Sections 1 and 3. The DOE/NNSA Office of Secure Transportation would transport the one metric ton of plutonium between the DOE sites.

Proposed activities at SRS would be complete by January 1, 2020 at the latest. The duration of staging at Pantex and NNSS is currently undefined, but will likely take place for a period of years. This length of time is to allow for shipments of plutonium to LANL to occur for pit production materials. Table 2-1 summarizes operations of the four sites and their role in the proposed action.

Table 2-1. DOE Sites Included in the Proposed Action

Site	Facility	Function in Proposed Action
SRS	K-Area Facility	Nuclear materials storage facility. Current location of the one metric ton of plutonium. Supports repackaging of plutonium materials into containers. Area used for loading Department of Transportation (DOT)-certified shipping containers, or equivalent, into trucks for transport to Pantex and/or NNSS.
Pantex	Zone-4 West, Material Access Area	Nuclear material staging area. Surveillance of plutonium containers.
	Zone 12 South	Area used for repackaging, unloading shipments from SRS and loading DOT-certified shipping containers, or equivalent, into trucks for transport to LANL. Shipments between Pantex and NNSS may occur.
NNSS	Device Assembly Facility	Nuclear material staging area. Surveillance and repackaging of plutonium containers. Area used for unloading shipments from SRS and loading DOT-certified shipping containers, or equivalent, into trucks for transport to LANL. Shipments between Pantex and NNSS may occur.
LANL	Plutonium Facility Building 4 (PF-4)	Area used for unloading shipments from Pantex and/or the NNSS into the vault used for interim staging of plutonium. Used for the production of plutonium pits.

2.1.1 Savannah River Site

The K-Area facility at SRS is responsible for the receipt, storage, processing, packaging, and shipping of nuclear materials (e.g., plutonium). Operations at SRS that support removing one metric ton of plutonium (i.e., packaging and shipping) are routinely performed in the K-Area facility. The plutonium materials identified for use in future pit production at LANL are packaged in 3013 containers in accordance with DOE-STD-3013, *Stabilization, Packaging and Storage of Plutonium-Bearing Materials* (DOE 2012b), and stored in K-Area using model 9975 Type B shipping packages. Storage of nuclear materials at SRS requires use of a Type B packaging to address requirements for safe storage of nuclear materials. Prior to shipping these materials to Pantex and/or NNSS, selected items are retrieved from the storage array and the 3013 containers would be repackaged into model 9975-96 shipping packages, or equivalent, with current annual maintenance. Shipments must conform to the packaging criteria defined in the current Safety Analysis Report for Packaging Model 9975, S-SARP-G-00003 (or most current version), or similar documentation for other approved packaging.

For operations associated with moving one metric ton of plutonium from the State of South Carolina, DOT-certified model 9975-96 shipping packages (Figure 2-2), or equivalent, will be used for shipping and staging plutonium packaged in 3013 containers. The model 9975-96 package consists of an outer 35-gallon stainless-steel drum, fiber-board insulation, lead radiation shielding, and nested containment vessels (primary and secondary) fabricated from seamless schedule-40 stainless-steel pipe. The containment vessels have double o-ring seals to provide a leak-tight seal. The 3013-container's design consist of nested, welded stainless-steel cans that are certified for 50-year storage of plutonium-bearing materials. These 3013 containers undergo routine surveillance at SRS to ensure packaging and storage conditions do not impact containment of nuclear materials. The 3013 containers as illustrated in Figure 2-3 will not be opened until received at LANL.

The repackaged DOT-certified shipping containers, or equivalent, would be transported from SRS to Pantex and/or NNSS for staging. Low-level waste (LLW) generated during repackaging would be disposed of onsite at SRS in E-Area or transported offsite to the NNSS or another commercial facility for disposal (DOE 2015: Section 3.1.10.4).

2.1.2 Pantex

Receipt, staging, assembly and disassembly, and transport of plutonium are part of the ongoing Pantex mission. Management of nuclear materials at Pantex includes production and surveillance functions required to certify the current nuclear weapons stockpile, requalification efforts supporting life extension activities, and onsite staging and off-site transportation of nuclear material and components, including plutonium (DOE 1996: Section 1.2).

Up to one metric ton of plutonium could be transported from SRS to Pantex, and staged in multiple magazines located in Zone-4 West Material Access Area (Figure 2-4). The DOT-certified shipping containers, or equivalent, would remain in staging until repackaged at Zone 12 for transport to LANL or NNSS. Surveillance procedures would be followed to ensure that the containers are in a safe condition.

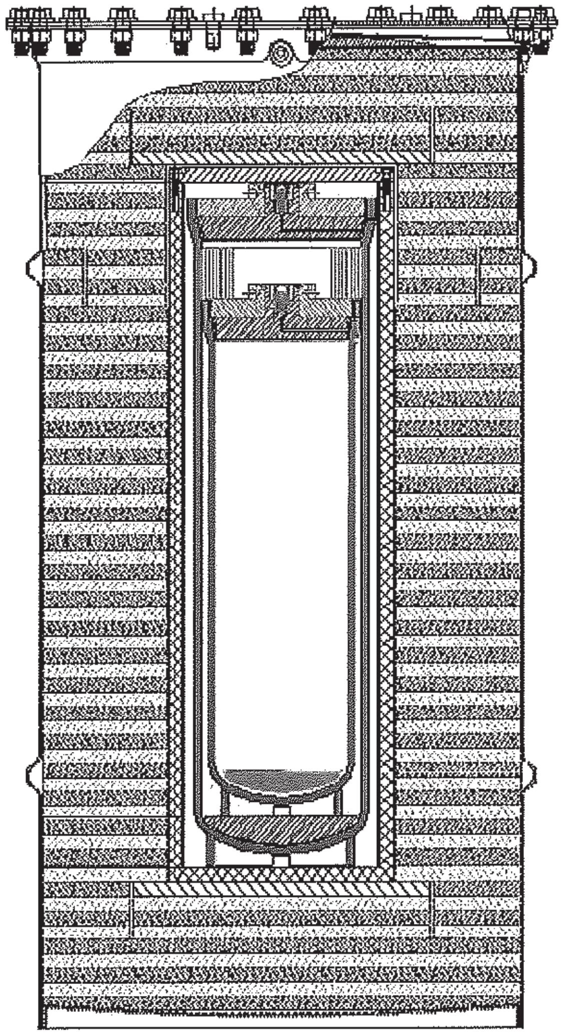

Figure 2-2. Conceptual cross-section of a 35-gallon DOT-certified shipping container.

2.1.3 Nevada National Security Site

The Device Assembly Facility (Figure 2-5) at NNSS is a multi-structure facility where special nuclear material and high explosives are assembled, disassembled, modified, and staged before transport to an experiment site. The Device Assembly Facility supports the United States Stockpile Stewardship Program by providing a modern, safe, and secure facility for staging, handling, packaging, transport and receiving, and measurement and accountability of special nuclear materials. Up to one metric ton of plutonium would be transported from SRS to the Device Assembly Facility in DOT-certified shipping containers, or equivalent. These containers would be placed into a vault for staging. The plutonium would be staged until

Figure 2-3. Example DOE-STD-3013 container used to store plutonium-bearing materials.

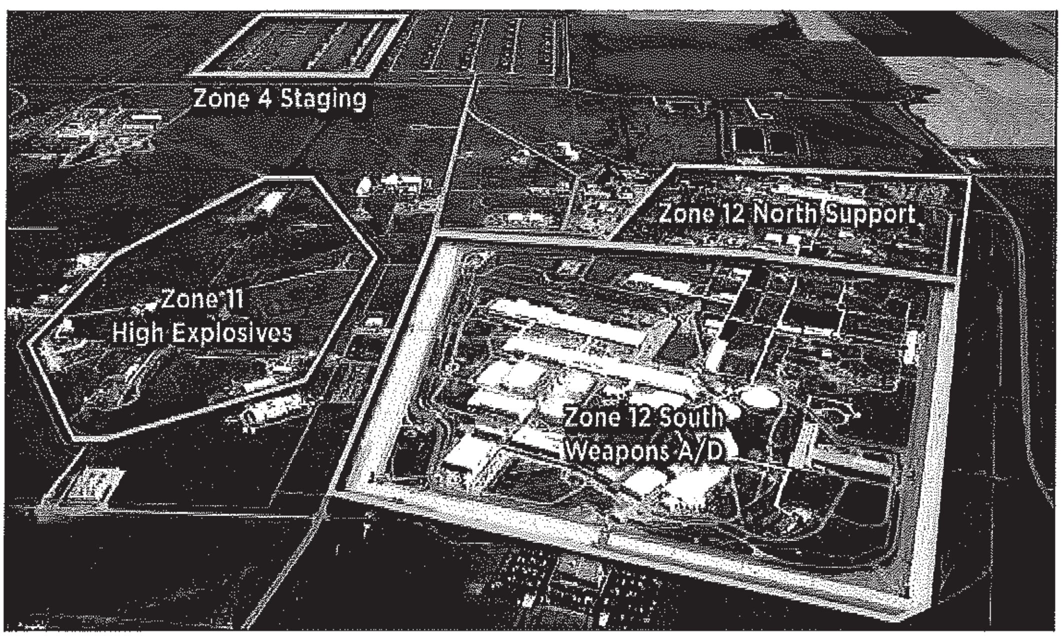

Figure 2-4. Major Operating Areas at Pantex.

transported to LANL for pit production. Prior to transport to LANL, these containers would be opened and assessed for integrity and material accountability. After the containers are assessed, each would be repackaged into a certified shipping container. After repackaging, the DOT-certified shipping containers, or equivalent, would be transported from NNSS to LANL over a period of years. LLW generated during repackaging would be disposed of onsite at NNSS's Radioactive Waste Management Site at Area 5.

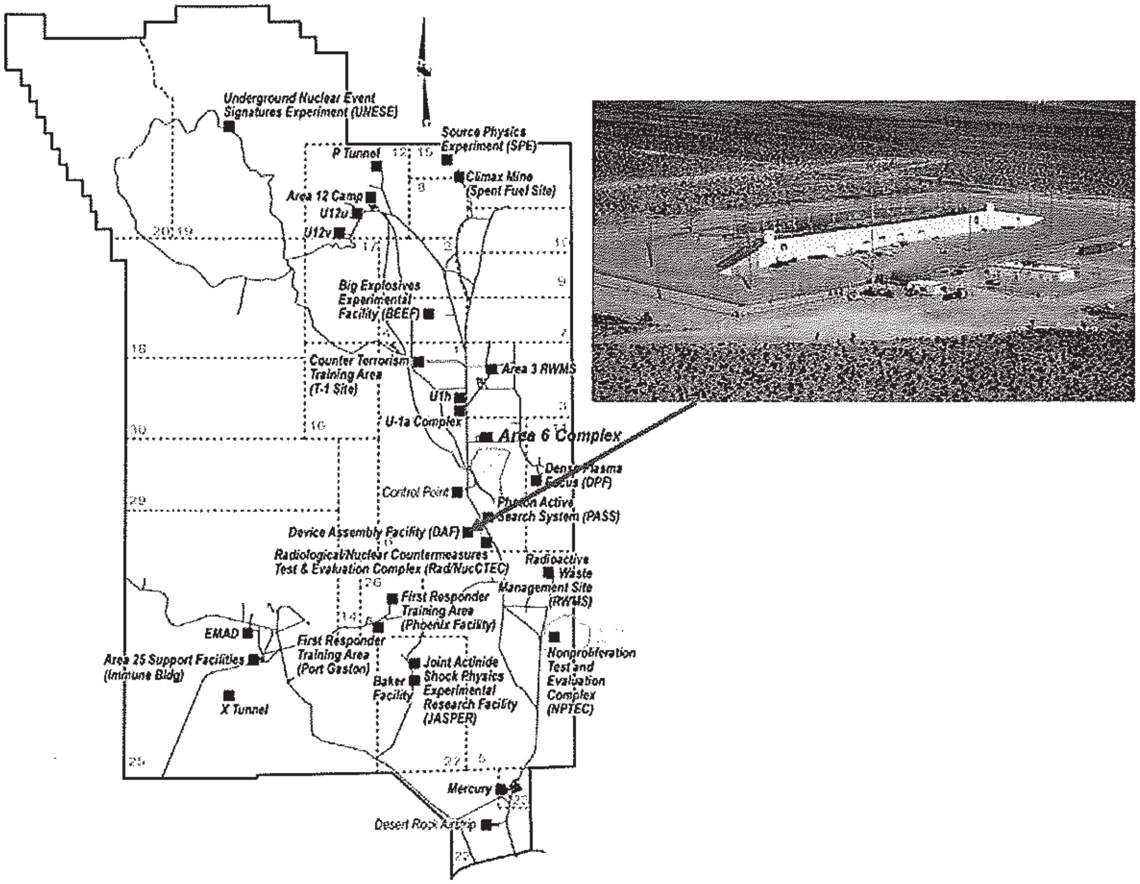

Figure 2-5. Device Assembly Facility at NNSS.

2.1.4 Los Alamos National Laboratory

LANL's primary mission is to ensure the safety, reliability, and performance of the nation's nuclear weapons stockpile (DOE 2008b). The primary capabilities at the LANL include the plutonium facility complex where pit production operations are conducted (Figure 2-6) (DOE 2008b, DOE 2018c, DoD 2018). The primary building for conducting plutonium operations is Plutonium Facility Building 4 (PF-4) in Technical Area 55. The working inventory of plutonium is staged in the interim staging vault in PF-4. Containers from Pantex and/or NNSS would be received at PF-4 and put into the interim staging vault until it is needed for pit production (DOE 2008b).

The one metric ton of plutonium would used to support DOE's national security mission after it is placed in the interim staging vault. This plutonium would be used for the pit production mission. The mission to produce plutonium pits was evaluated in the Complex Transformation

(DOE 2008a) and in the 2008 LANL SWEIS (DOE 2008b). Thus, further NEPA analysis is not required in this document after the plutonium is placed in the vault.

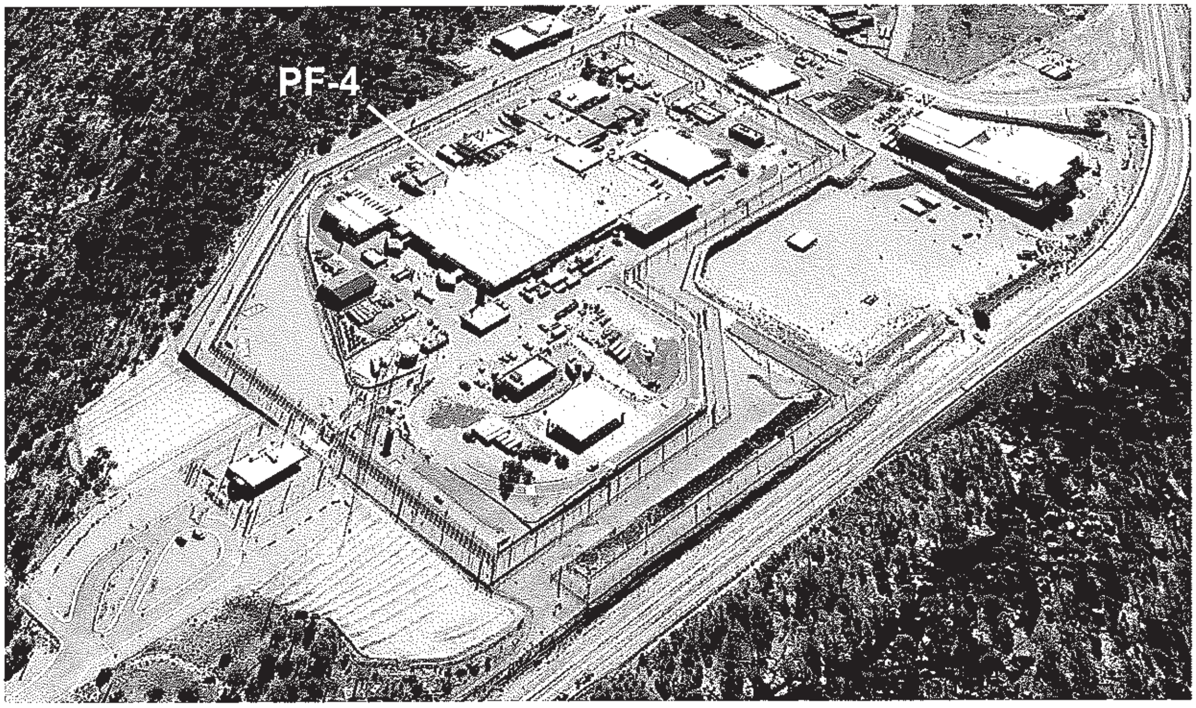

Figure 2-6. PF-4 at Technical Area 55 at LANL.

2.1.5 Transportation

The DOE/NNSA Office of Secure Transportation is responsible for the Secure Transportation Asset Program. The Program complies with DOE Order 461.1C, *Packaging and Transportation for Offsite Materials of National Security Interest*, which requires that packaging and transportation of all nuclear material must be conducted in accordance with Department of Transportation and Nuclear Regulatory Commission regulations, except where an alternative course of action is identified in the DOE Order. This program provides safe, secure transport of the Nation's nuclear weapons, weapon components, and nuclear material. The Secure Transportation Asset Program maintains vehicles for transportation that meet mission security and safety requirements. The components of the Program includes specialized vehicles, secure trailers, and highly trained Federal agents. The one metric ton of plutonium would be transported in highly modified secure tractor-trailers and escorted by Federal agents, who would provide security and national incident command system response in the event of emergencies.

3.0 AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS TO RESOURCE AREAS

3.1 Overview of the Affected Environment

The affected environment for the proposed action encompasses resource areas for the four sites and along transportation routes. Resource areas considered in this supplement analysis include: land use and viewshed, geology and soils, environmental justice, water resources, radiological air quality, socioeconomics, cultural resources, ecological resources, environmental remediation, chemical impacts to public and worker health, infrastructure, noise, nonradiological air emissions, radiological impacts to public and worker health, waste management, facility accidents and intentionally destructive acts, and greenhouse gases. Construction is not required to implement the proposed action. Potential impacts are primarily from transportation and staging.

3.1.1 Potential Impacts to Resource Areas

Table 3-1 identifies the resource areas that will result in no change to impacts and explains why they were considered to have no impacts. Subsequently, these resources will not be further discussed in this supplement analysis. The environmental factors that would exhibit no impacts from the proposed action include land use and viewshed, geology and soils, water resources, radiological air quality, socioeconomics, environmental remediation, cultural resources, ecological resources, and chemical impacts to public and worker health (Table 3-1). Table 3-2 identifies the resource areas that required assessment of previous analyses for bounding conditions. These resources are infrastructure, noise, nonradiological air emissions, radiological impacts to public and worker health, waste management, facility accidents, transportation, greenhouse gases, and environmental justice.

None of the resource areas analyzed in this supplement analysis were considered to have significant impacts from the proposed action. Potential environmental impacts for resource areas are compared with impacts analyzed in the previous NEPA documents summarized in Section 1.

Typically, impacts from transportation are presented as a separate resource area and analyzed for an action under consideration. Given that transportation is central to this proposed action, the potential transportation impacts to each resource area are presented as they are for each site in Tables 3-1 and 3-2.

3.1.2 Assumptions Used in Analysis of Resource Areas

Potential impacts of the proposed action analyzed in this supplement analysis rely on the following assumptions. The supplement analysis assumes up to ten shipments between SRS and Pantex, SRS and NNSS, then Pantex and NNSS to LANL to allow for conservative bounding comparisons. Rather than analyzing one metric ton of plutonium as having been split between Pantex and NNSS, to maximize impacts at a site it is assumed that each site receives the full amount. In addition, ten shipments between Pantex and NNSS, shipments that could potentially occur, if needed, in the implementation of this proposed action were also analyzed. No new construction is associated with the proposed action and all proposed operations are routine activities at the four sites.

Table 3-1. Resource Areas Considered with No Significant Impacts

Resource Areas	SRS	Pantex	NNSS	LANL	Transportation
Land Use and Viewshed	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts No changes to land use or visual
Geology and Soils	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts Using existing roadways
Water Resources (surface / groundwater)	No impacts No effluents from actions	No impacts No effluents from actions	No impacts No effluents from actions	No impacts No effluents from actions	No impacts No effluents from actions
Radiological Air Quality (routine operations)	No impacts No radiological air emissions	No impacts No radiological air emissions	No impacts No radiological air emissions	No impacts No radiological air emissions	No impacts No radiological air emissions
Socioeconomics	No impacts Temporary use of onsite labor	No impacts Temporary use of onsite labor	No impacts Temporary use of onsite labor	No impacts Temporary use of onsite labor	No impacts Temporary use of transportation crews
Cultural Resources (archaeological / historical)	No impacts Using existing facilities	No impacts Using existing facilities	No impacts Using existing facilities	No impacts Using existing facilities	No impacts Using existing facilities
Ecological Resources (plants and animals)	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities	No impacts No changes conducted in existing facilities
Environmental Remediation	No impacts No changes in building decontamination and demolition schedules No new contamination Conducted in existing facilities	No impacts No changes in building decontamination and demolition schedules No new contamination Conducted in existing facilities	No impacts No changes in building decontamination and demolition schedules No new contamination Conducted in existing facilities	No impacts No changes in building decontamination and demolition schedules No new contamination Conducted in existing facilities	No impacts Conducted along existing transportation infrastructure No changes
Chemical Impacts to Public and Worker Health	No impacts No chemicals involved	No impacts No chemicals involved	No impacts No chemicals involved	No impacts No chemicals involved	No impacts No chemicals involved

Table 3-1. Resource Areas Considered with Negligible or Minor Impacts.

Resource Areas	SRS	Pantex	NNSS	LANL	Transportation
Infrastructure	Negligible No discernable changes in power, water, fuels	Negligible No discernable changes in power, water, fuels	Negligible No discernable changes in power, water, fuels	Negligible No discernable changes in power, water, fuels	No impacts No changes to transportation infrastructure
Noise	Negligible Associated with transportation	Negligible Associated with transportation	Negligible Associated with transportation	Negligible Associated with transportation	Negligible Associated with transportation
Nonradiological Air Emissions	Negligible impacts from onsite transportation	Minor impacts from onsite transportation	Minor impacts from onsite transportation	Negligible impacts from onsite transportation	Minor impacts from trucks
Radiological Impacts to Public and Worker Health	Impacts from repackaging and inspections	Impacts from repackaging and inspections	Impacts from repackaging and inspections	Impacts from unpacking and inspections	Impacts from proximity to transport vehicle
Waste Management	Negligible Very small volumes of LLW from repackaging	Negligible Very small volumes of LLW from repackaging	Negligible Very small volumes of LLW from repackaging	Negligible Very small volumes of LLW from repackaging	No impacts No waste generated during transportation operations
Facility Accidents, including Intentionally Destructive Acts	Within bounding conditions of previous analysis	Within bounding conditions of previous analysis	Within bounding conditions of previous analysis	Within bounding conditions of previous analysis	Within bounding conditions of previous analysis
Greenhouse Gases	Negligible impacts from truck transport	Negligible impacts from truck transport	Negligible impacts from truck transport	Negligible impacts from truck transport	Negligible impacts from truck transport
Environmental Justice	Impacts bounded by existing NEPA analyses	Impacts bounded by existing NEPA analyses	Impacts bounded by existing NEPA analyses	Impacts bounded by existing NEPA analyses	Impacts bounded by existing NEPA analyses

Given that transportation is a common nexus for this proposed action, the potential transportation impacts are presented at the same level as a 'site' in Section 3 so impacts from transportation on all resource areas are also evaluated. Intentionally destructive acts were analyzed in the following NEPA documents: Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes (NRC 1977), the Final Complex Transformation SPEIS (DOE 2008a), the LANL SWEIS (DOE 2008b), the NNSS SWEIS (DOE 2013), and the Final Surplus Plutonium Disposition SEIS (DOE 2015). Intentionally destructive acts are discussed in Section 3, Facility Accidents and Intentionally Destructive Acts.

3.2 Affected Environment with Potential Impacts

The resource areas analyzed for potential impacts from the proposed action include: infrastructure, noise, nonradiological air emissions, radiological impacts to public and worker health, waste management, facility accidents including intentional destructive acts, and greenhouse gases.

3.2.1 Infrastructure

This discussion of infrastructure analyzes potential utility needs (electricity, water, and fuel) for each of the four DOE sites for cooling of facilities where the storage of one metric ton of plutonium would take place. No new facility construction or modification at the four sites is needed, therefore no significant additional utility needs are identified. This section also analyzes utility needs for the transportation of one metric ton of plutonium onsite and between the four DOE sites.

SRS

Utility consumption for the proposed action at SRS is related to temperature control for plutonium storage and repackaging into DOT-certified shipping containers, or equivalent. Impacts for energy consumption are negligible and considered to be within levels of routine operations at SRS that include storage and repackaging operations at the K-Area. The Final Surplus Plutonium Disposition SEIS analyzed utility consumption for the Surplus Plutonium Disposition Program at SRS (which includes the K-Area facilities where the one metric ton of plutonium currently resides) (DOE 2015). Electricity was estimated to be 270,000 megawatt-hours per year, water used was estimated to be 41,000,000 gallons per year, and fuel consumption was estimated to be 320,000 gallons per year (DOE 2015: Table 4-35).

The energy consumption related to temperature control for plutonium staging and repackaging into DOT-certified shipping containers, or equivalent, at SRS is well below and bounded by the analysis in the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table 4-35).

Pantex

Utility consumption for the proposed action at Pantex is related to temperature control for plutonium staging and repackaging into DOT-certified shipping containers, or equivalent. Impacts for utility consumption are negligible and considered to be within levels of routine operations at Pantex that include staging operations at Zone-4. The Final Complex Transformation SPEIS analyzed energy consumption at Pantex for its current operations (DOE 2008a). Electricity was estimated to be 81,850 megawatt-hours per year, water used was estimated to be 130,000,000 gallons per year, and fuel oil consumption was estimated to be 15,830 gallons per year (DOE 2008a: Section 4.5.3).

The utility consumption, if any, related to temperature control for plutonium staging and repackaging into DOT-certified shipping containers, or equivalent, at Pantex represents a minimal increase from the analysis in the Final Complex Transformation SPEIS (DOE 2008a: Section 4.5.3).

NNSS

Utility consumption for the proposed action at NNSS is related to temperature control for plutonium staging and repackaging into DOT-certified shipping containers, or equivalent. Impacts for utility consumption are negligible and considered to be within levels of routine operations at NNSS that include staging operations at the Device Assembly Facility. The NNSS SWEIS analyzed utility consumption at the site, which includes storage of plutonium at the Device Assembly Facility (DOE 2013). Electricity was estimated to be 105,700 megawatt-hours per year (DOE 2013: Section 5.1.2.2.2) and water used was estimated to be approximately 281,000,000 gallons per year (DOE 2013: Section 5.1.6.2.2)[2]. Fuel oil consumption was estimated to be 83,000 gallons per year (DOE 2013: Table 5-7).

Utility consumption related to temperature control for plutonium staging and repackaging into DOT-certified shipping containers, or equivalent, at NNSS represents a minimal increase from the analysis in the NNSS SWEIS (DOE 2013: Section 5.1.2.1.2, Section 5.1.2.2.2, Table 5-7).

LANL

LANL's PF-4 vault is not temperature controlled so impacts are expected to be negligible. Impacts for utility consumption are considered to be within levels of routine operations at LANL. The LANL SWEIS analyzed utility consumption at the site (DOE 2008b). Electricity was estimated to be 495,000 megawatt hours per year, water used was estimated to be approximately 380 million gallons per year, and fuel consumption was estimated to be 1,197,000 gallons per year (DOE 2008b: Table 5-34).

The utility consumption related to temperature control for plutonium staging at LANL represents a minimal increase from the analysis in the LANL SWEIS (DOE 2008b: Table 5-34).

Transportation

The proposed action requires up to ten shipments by truck between SRS and Pantex, SRS and NNSS, then Pantex and NNSS to LANL. In additional, ten shipments may be needed between the staging locations (Pantex and NNSS). Truck fuel consumption was analyzed in the Final Surplus Plutonium Disposition SEIS for up to 3,300 shipments of nuclear material, including plutonium, and waste (DOE 2015: Table 2-3). Truck fuel used for transportation of these shipments was estimated to be 9,500,000 gallons per year (DOE 2015: Table 4-52). The actual routes used for this proposed action may differ from the action analyzed in the Final Surplus

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[2] The Expanded Operations Alternative identified that water use would increase by approximately 25 perfect of the amount analyzed in the No Action Alternative (Section 5.1.6.2.1). Up to 225 million gallons + 56 million gallons = 281 million gallons.

Plutonium Disposition SEIS; however, fuel consumption for this proposed action would remain a minor impact.

Truck fuel consumption from transportation for the proposed action (for up to ten shipments between SRS and Pantex, SRS and NNSS, then Pantex and NNSS to LANL and ten shipments between Pantex and NNSS) is estimated to range from 18,000 gallons to 26,000 gallons. This range is well below and represent a minimal increase from the analysis in the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table 4-52).

Summary

Previous NEPA analyses addressed utility consumption for staging and transportation of plutonium. Potential impacts to utility consumption for plutonium staging, repackaging/unpacking of DOT-certified shipping containers (or equivalent), and transporting one metric ton of plutonium are anticipated to be well below and bounded by existing analyses in the Final Complex Transformation SPEIS (DOE 2008a), the LANL SWEIS (DOE 2008b), the NNSS SWEIS (DOE 2013), and the Final Plutonium Surplus Disposition SEIS (DOE 2015).

3.2.2 Noise

Noise is a routine impact for highway transportation using heavy-duty trucks. The proposed action involves up to ten shipments departing SRS to stage one metric ton of plutonium at Pantex and/or NNSS, and then up to ten shipments to transport one metric ton of plutonium to LANL for staging and pit production. In additional, ten shipments may be needed between the staging locations (Pantex and NNSS). Noise from heavy-duty trucks used for transportation depends on several factors pertaining to the design of the engine, transmission, cooling system, and factors such as truck speed, roughness of road surface, weight of load being transported, and tires (NCHRP 2009). Noise from heavy-duty trucks has been measured around 90 A-weighted decibels (dBA) at 50 feet, with some maximum noise levels in the low 90 dBAs (EPA 1976: Figure 3-2; NCHRP 2009). The Occupational Safety and Health Administration requires the use of engineered controls or personal protective equipment for noise exposures that meet or exceed 90 dBA, if exposure is more than eight hours per day [29 CFR 1910.95(b) (1)].

The DOE/NNSA facilities involved in this proposed action are generally far enough away from site boundaries that noise levels from onsite transportation will not impact public receptors or would not be distinguishable from background levels. Up to ten shipments could occur at each site for this proposed action, so workers would experience a minor increase in noise from onsite transportation. However, noise levels from the proposed action are anticipated to be indistinguishable from background noise from current heavy-duty truck traffic. On highways, there would be a negligible increase in traffic from trucks and noise impacts would be similar to the existing noise experienced by the public. This proposed action does not require construction, therefore no potential noise impacts are anticipated from construction.

SRS

Noise measurements recorded at SRS are discussed in the Final Surplus Plutonium Disposition EIS (DOE 1999). Measurements recorded along State Routes 19 and 125 indicated a maximum of 72 dBA from routine traffic and operations at SRS, including truck shipments of nuclear fuel (DOE 1999: Section 3.5.1.2.1). The traffic noise impacts analyzed in the Final Surplus

Plutonium Disposition SEIS at SRS are considered to be generally the same as previously measured in the Surplus Plutonium Disposition Final EIS (DOE 2015: Section 3.1.4.3).

Potential impacts from onsite transportation of one metric ton of plutonium would be negligible and represent a minimal increase from the analyses in the Surplus Plutonium Disposition Final EIS (DOE 1999: Section 3.5.1.2.1) and the Final Surplus Plutonium Disposition SEIS (DOE 2015: Section 3.1.4.3).

Pantex

Traffic at Pantex is identified as the primary source of noise at the site boundary. The Pantex EIS identified the highest vehicle-related noise level measured at 85 dBA (DOE 1996: Table 4.8.1.1-1). Heavy-duty truck traffic is common at Pantex and no increases in the level of noise impacts associated with the proposed action are anticipated. A supplement analysis to the Pantex EIS determined there have been no changes to vehicle-related noise at Pantex (DOE 2018a: Section 2.3.6).

Potential impacts from onsite transportation of one metric ton of plutonium would be negligible and represent a minimal increase from the analysis in the Pantex EIS (DOE 1996: Table 4.8.1.1-1) and its supplement analysis (DOE 2018a: Section 2.3.6).

NNSS

The Device Assembly Facility is approximately 26 miles from the nearest public highway. Because of NNSS's remote location, large size, access restrictions, and lack of nearby population, the general public has little or no exposure to noise generated within the site (DOE 2013: Section 4.1.12.7). Potential impacts from onsite transportation of one metric ton of plutonium would be negligible and represent a minimal increase from the previous analysis in the NNSS SWEIS (DOE 2013: Section 4.1.12.7).

LANL

The LANL SWEIS analyzed noise impacts in White Rock with a maximum level background noise of 51 dBA (DOE 2008b: Section 4.4.5.2)[3]. The White Rock area is relatively remote and the natural landscape of canyons and forests provide some sound attenuation. LANL uses a local truck route that diverts heavy-duty truck traffic away from the towns of Los Alamos and White Rock, which minimizes potential noise impacts.

Potential impacts from onsite transportation of one metric ton of plutonium would be negligible and represent a minimal increase from the analysis in the LANL SWEIS (DOE 2008b: Section 5.4.3.1).

Transportation

Noise generated by transportation for up to 28,212 shipments of nuclear material, including plutonium, and waste between all sites in the DOE complex was analyzed in the Final Complex

[3] DOE 1999, Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico, DOE/EIS-0238, Section 4.1.3.2. The 1999 SWEIS is incorporated into the 2008 SWEIS for LANL.

Transformation SPEIS (DOE 2008a). Potential impacts from noise caused by transportation of nuclear material along existing routes were considered negligible (DOE 2008a).

Noise generated by transportation of one metric ton of plutonium requiring up to 10 shipments between each site would be negligible and represent a minimal increase from the analysis in the Final Complex Transformation SPEIS (DOE 2008a).

Summary

Previous NEPA analyses addressed noise associated with transportation of nuclear material between sites. Potential impacts from noise related to the proposed action are anticipated to be negligible and represent a minimal increase from existing analyses in the Pantex EIS (DOE 1996), the Surplus Plutonium Disposition Final EIS (DOE 1999), the Final Complex Transformation SPEIS (DOE 2008a), the LANL SWEIS (DOE 2008b), the NNSS SWEIS (DOE 2013), the Final Plutonium Surplus Disposition SEIS (DOE 2015), and the supplement analysis to the Pantex EIS (DOE 2018a).

3.2.3 Nonradiological Air Emissions

Nonradiological air emissions are discussed for transportation of one metric ton of plutonium between the four DOE sites. Criteria pollutant emissions analyzed include carbon monoxide, nitrogen dioxide, particulate matter,[4] sulfur dioxide, and volatile organic compounds. Nonradiological air emissions are not expected from repackaging at any of the four DOE sites. Minor impacts from nonradiological air emissions are anticipated from transportation both within the boundaries of each site and offsite along existing routes and were calculated based on the assumption that up to ten shipments could be required between each site. In additional, ten shipments may be needed between the staging locations (Pantex and NNSS).The potential impacts under offsite are for the full segment, including onsite miles.

SRS

Minor nonradiological air emissions at SRS are anticipated from transportation in the proposed action, see Tables 3-3, 3-4, and 3-5. Projected air pollutants for all operational activities, including transportation, were evaluated in the Surplus Plutonium Disposition Final EIS (DOE 1999: Table G-59) and the Final Surplus Plutonium Disposition SEIS, Table 3-6 (DOE 2015: Table 4-2). Emissions of criteria pollutants from onsite and offsite transportation under the proposed action represent a minimal increase from the analyses in the Surplus Plutonium Disposition Final EIS (DOE 1999: Table G-59) and the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table 4-2).

Pantex

Nonradiological air emissions at Pantex are anticipated from transportation in the proposed action, see Tables 3-3 and 3-4. Projected air pollutants at Pantex were evaluated in the Pantex EIS for continued operations at the site, including transportation, Table 3-4 (DOE 1996: Table 4.7.2.1-3).

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[4] Particulate matter less than or equal to 10 microns in diameter (PM_{10}) and less than or equal to 2.5 microns in diameter ($PM_{2.5}$).

Emissions of criteria pollutants from onsite and offsite transportation under the proposed action represent a minimal increase from the analysis in the Pantex EIS (DOE 1996: Table 4.7.2.1-3).

Table 3-3. Onsite truck emissions for transport of one metric ton of plutonium.

Site	Distance Onsite (Miles)	Emissions (Metric Tons)[a, b]			
		Nitrous Oxide	Carbon Monoxide	Non-Methane Hydrocarbons	Particulate Matter
SRS	14	6.83×10^{-3}	0.52	4.75×10^{-3}	3.54×10^{-4}
Pantex	2	6.26×10^{-3}	0.48	4.38×10^{-3}	3.15×10^{-4}
NNSS	24	1.06×10^{-2}	0.82	7.39×10^{-3}	5.54×10^{-4}
LANL	6	6.54×10^{-3}	0.50	4.56×10^{-3}	3.32×10^{-4}

a – Source: LANL 2018a

b – Emissions assumed to occur in one year.

Table 3-4. Total truck emissions for offsite transport through Pantex.

Transportation Segment	Distance (Miles; DOE 2015, Table E-1)	Emissions (Metric Tons)[a, b]			
		Nitrous Oxide	Carbon Monoxide	Non-Methane Hydrocarbons	Particulate Matter
SRS/Pantex	1,357	0.08	5.77	0.05	5.30×10^{-3}
Pantex/LANL	357	6.59×10^{-3}	0.48	4.44×10^{-3}	3.95×10^{-4}
Pantex/NNSS	1,053	0.07	5.34	0.05	4.68×10^{-3}
Total[c]		0.157	11.59	0.104	0.01

a – Source: LANL 2018a

b – Emissions assumed to occur in one year.

c – Minor differences in total result from rounding. The total emissions assumption is that Pantex receives one metric ton.

Table 3-5. Total truck emissions for offsite transport through NNSS.

Transportation Segment	Distance (Miles; DOE 2015, Table E-1)	Emissions (Metric Tons)[a, b]			
		Nitrous Oxide	Carbon Monoxide	Non-Methane Hydrocarbons	Particulate Matter
SRS/NNSS	3,879	0.14	9.68	0.09	0.01
NNSS/LANL	1,250	0.01	0.84	0.01	7.24×10^{-4}
NNSS/Pantex	1,053	0.07	5.34	0.05	4.68×10^{-3}
Total[c]		0.22	15.86	0.15	0.015

a – Source: LANL 2018a

b – Emissions assumed to occur in one year.

c – Minor differences in total result from rounding. The total emissions assumption is that NNSS each receives one metric ton.

NNSS

Nonradiological air emissions at NNSS are anticipated from transportation in the proposed action, see Tables 3-3 and 3-5. Projected air pollutants at NNSS for all operations were evaluated in the NNSS SWEIS, which includes transportation, see Table 3-6 (DOE 2013: Section 5.1.8).

Emissions of criteria pollutants from onsite and offsite transportation under the proposed action represent a minimal increase from the analysis in the NNSS SWEIS (DOE 2013: Section 5.1.8).

Table 3-6. Nonradiological emissions from shipments from the four DOE sites.

	Emissions (Metric Tons)[a]			
	Nitrous Oxide	**Carbon Monoxide**	**Non-Methane Hydrocarbons**	**Particulate Matter**
Pantex[b]	246.4	567.2	61.5	n/a
NNSS[c]	9.4	37.1	0.64	0.86
SRS/Pantex/LANL[d]	170	50	8.0	5.0
SRS/Pantex/LANL[e]	11.5	39.6	5.3	40.5

a – Emissions assumed to occur in one year
b – DOE 1996, Table 4.7.2.1-3
c – DOE 2013, Table 5-38; "Government-Owned Vehicles" column used for comparison.
d – DOE 2015, Table 4-2; Using the No Action Alternative.
e – DOE 1999, Table G-59; Using "Vehicles" column and multiplying by 0.001 to convert kilograms to metric tons.

LANL

Nonradiological air emissions at LANL are anticipated from transportation in the proposed action, see Tables 3-3, 3-4 and 3-5. Projected air pollutants at LANL for all operations, which includes transportation, were evaluated in the LANL SWEIS (DOE 2008b: Section 4.4.2.2), and for shipping plutonium and waste for pit disassembly and conversion activities in the Final Surplus Plutonium Disposition SEIS, Table 3-6 (DOE 2015: Table 4-2).

Emissions of criteria pollutants from onsite and offsite transportation under the proposed action represent a minimal increase from the LANL SWEIS (DOE 2008b: Section 4.4.2.2) and the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table 4-2).

Summary

Previous NEPA analyses addressed criteria pollutants for onsite and offsite transportation. Potential nonradiological air emissions from transportation under the proposed action are anticipated to be minor and represent a minimal increase from existing analyses in the Pantex EIS (DOE 1996), the Surplus Plutonium Disposition Final EIS (DOE 1999), the LANL SWEIS (DOE 2008b), the NNSS SWEIS (DOE 2013), and the Final Plutonium Surplus Disposition SEIS (DOE 2015).

3.2.4 Radiological Impacts to Public and Worker Health

3.2.4.1 Radiological Impacts from Repackaging, Staging, and Shipment Preparation

Estimates for radiological impacts to the public and workers are based on one metric ton of plutonium that would be repackaged and prepared for shipment at SRS; staged, repackaged, and prepared for shipment at Pantex and/or NNSS; and transported to and unpacked and staged at LANL for use in pit production. For conservative calculation purposes, it is assumed that one metric ton of plutonium would be transported to Pantex and/or NNSS, and then to LANL under the proposed action.

The involved worker is an onsite worker directly or indirectly involved with operations at the facility. For individuals or population groups, estimates of potential latent cancer fatalities are made using a risk estimator of 0.0006 latent cancer fatalities per rem or person-rem (DOE 2015: Section 4.1.2).

Radiological impacts to worker health for the proposed action are based on operational experience at SRS (SRNS 2018). This operational data is scaled for one metric ton of plutonium to be repackaged/unpacking and staged at each of the four DOE sites. Radiological impacts to workers for repackaging, staging, and shipment preparation are estimated to be 558 millirem per year for individual worker dose. The collective worker dose is estimated to be 4.5 person-rem per year with a risk of latent cancer fatality[5] of 0.027 (LANL 2018b). Radiological impacts to workers were analyzed in the Final Surplus Plutonium Disposition SEIS for repackaging, staging, and shipment preparation at K-Area (DOE 2015: Table H-2). The individual dose to workers was estimated to be 1,000 millirem per year with a risk of latent cancer fatality of 6.0×10^{-4}. The collective dose to workers was estimated to be 34 person-rem per year with a risk of latent cancer fatality of 0.02 (DOE 2015: Table H-2). The potential impacts to workers from the proposed action represent a minimal increase from the analysis in the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table H-2).

The proposed action is not expected to result in radioactive emissions from repackaging, staging, and shipment preparation, so there would be no radiological impacts to the public from activities at the four sites.

3.2.4.2 Radiological Impacts from Shipments

Transportation

Impacts to public and worker health from transportation between the four DOE sites are compared to analyses in the Final Surplus Plutonium Disposition SEIS (DOE 2015) and the NNSS SWEIS (DOE 2013). The shipments between the four sites are in addition to shipments previously analyzed. The Final Surplus Plutonium Disposition SEIS analyzed 1,100 shipments of nuclear material across the DOE/NNSA complex, including plutonium (DOE 2015: Table E-6). Up to 10 shipments of plutonium between each site would be necessary for the proposed action. The Final Surplus Plutonium Disposition SEIS analyzed 320 LLW shipments from LANL and 430 LLW shipments from SRS for pit disassembly and conversion (DOE 2015: Table E-8). The

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[5] For individuals or population groups, estimates of potential latent cancer fatalities are made using a risk estimator of 0.0006 latent cancer fatalities per person-rem (DOE 2008b, Table 5-25, Section C.1.2).

NNSS SWEIS analyzed 7,800 shipments of LLW transported from the southwest region to NNSS, which includes Pantex (DOE 2013: Table E-13 Expanded Operations Alternative). Potential impacts to the crew and the public for the proposed action represent a minimal increase from the analysis in the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table E-8) and the NNSS SWEIS, Table 3-7 (DOE 2013: Table E-13).

Summary

Previous NEPA analyses addressed radiological impacts to the public and workers for the repackaging, staging, shipment preparation, and transportation of nuclear material, including plutonium and LLW. Potential radiological impacts represent a minimal increase from existing analyses in the NNSS SWEIS (DOE 2013) and the Final Plutonium Surplus Disposition SEIS (DOE 2015).

3.2.5 Waste Management

Potential impacts related to waste management and waste generations are evaluated for LLW generated by the proposed action. Potential waste generated under the proposed action would be a minor contribution of waste generated from ongoing operations at each site. LLW would be anticipated to be comprised of seals removed from the transportation container, personal protective equipment (gloves, coveralls, shoe covers, hood, and eye protection), and sampling swipes used during repackaging. No mixed LLW or transuranic waste is anticipated to be generated by the proposed action. It is anticipated that minor amounts of LLW would be created during repackaging of DOT-certified shipping containers, or equivalent.

Table 3-7. Radiological impacts to transportation crews and the public from shipments of nuclear material and LLW.

Site	Crew		Population	
	Collective Dose (person-rem per year)	Latent cancer fatality risk	Population Dose (person-rem per year)	Latent cancer fatality risk
Routes considered for nuclear material shipments[a]	28	0.02	47	0.03
LLW shipments from LANL to NNSS[a]	7.9	5.0×10^{-3}	3.3	2.0×10^{-3}
LLW shipments from SRS to NNSS[a]	34	0.02	13	8.0×10^{-3}
LLW shipments from Pantex to NNSS[b]	160	0.1	70	0.04

a – DOE 2015, Table E-8. For 1,700 shipments of nuclear material, including plutonium; 320 shipments of LLW originating from LANL; and 430 shipments originating from SRS.
b – DOE 2013, Table E-13. For 7,800 shipments in the southwest region, which includes LLW from Pantex.

SRS

Waste management capabilities and generation of LLW at SRS were evaluated in the Final Complex Transformation SPEIS (DOE 2008a) and the Final Surplus Plutonium SEIS (DOE 2015). SRS manages LLW and has an onsite disposition capability (E-Area). LLW that cannot be disposed of onsite would be transported to NNSS or a commercial disposal facility (DOE 2008a: Section 4.8.13.1).

LLW that would be generated at SRS from the proposed action is anticipated to be minor. LLW would be incorporated into LLW drums and is only expected to contribute a small number of LLW drums for disposal. The Final Surplus Plutonium Disposition SEIS analyzed estimated peak annual generation of LLW from pit disassembly and conversion, which was estimated to be 2,000 cubic meters per year (DOE 2015: Table 4-18).

The generation and disposal of LLW from the proposed action at SRS represents a minimal increase from the analysis in the Final Complex Transformation SPEIS (DOE 2008a: Section 4.8.13.1) and the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table 4-18).

Pantex

Waste management capabilities and generation of LLW at Pantex were evaluated in the Final Complex Transformation SPEIS (DOE 2008a) and the Surplus Plutonium Disposition Final EIS (DOE 1999). LLW generated at Pantex would be transported to NNSS or a commercial disposal facility for disposition (DOE 2008a: Section 4.5.13.1).

LLW that would be generated at Pantex from the proposed action would be minor. The Surplus Plutonium Disposition Final EIS analyzed annual generation of LLW at the site, which was estimated to be 139 cubic meters (DOE 1999: Table 3-28).

The generation of LLW from repackaging of one metric ton of plutonium at Pantex represents a minimal increase from the analyses in the Final Complex Transformation SPEIS (DOE 2008a: Section 4.5.13.1) and the Surplus Plutonium Disposition Final EIS (DOE 1999: Table 3-28).

NNSS

Waste management capabilities and generation of LLW at NNSS were analyzed in the NNSS SWEIS (DOE 2013). NNSS manages, accepts, and disposes of LLW generate from onsite and from other DOE sites (DOE 2013: Table 4-48).

Potential LLW generated at NNSS under the proposed action is anticipated to be a minor part of ongoing LLW generation and disposal at the site. The NNSS SWEIS analyzed LLW generation, which was estimated to be 3,681 cubic meters per year (DOE 2013: Table 5-50).[6] NNSS has the capacity to receive and dispose of onsite up to 1,360,000 cubic meters of LLW from all DOE facilities (DOE 2013: Section 5.1.11.2.1).[7]

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[6] Table 5-50 projected 130,000 cubic feet of LLW. Conversion to cubic meters is cubic feet multiplied by 0.028317.

[7] Section 5.1.11.2.1 projected disposal capacity for LLW at the NNSS to be 48,000,000 cubic feet. Conversion to cubic meters is cubic feet multiplied by 0.028317.

The generation and disposal of LLW from the proposed action at NNSS represents a minimal increase from the analysis in the NNSS SWEIS (DOE 2013: Section 5.1.11.2.1, Tables 4-48 and 5-50).

LANL

Waste management capabilities and generation of LLW at LANL were analyzed in the LANL SWEIS (DOE 2008b). LANL provides packaging, storage, and transport of LLW generated at the site (DOE 2008b: Section 3.1.3.15).

LLW that would be generated at LANL from the proposed action is anticipated to be minor. LLW generated at the site from ongoing operations was estimated to be 9,174 cubic meters per year (DOE 2008b: Table 5-39).[8] LLW from LANL would be transported to NNSS for disposal (DOE 2008b).

The generation of LLW from the proposed action at LANL represents a minimal increase from the analysis in the LANL SWEIS (DOE 2008b: Section 3.1.3.15, Table 5-39).

Summary

Previous NEPA analyses addressed LLW generation for repackaging nuclear material, including plutonium. LLW generated by the proposed action represents a minimal increase from existing analyses in the Surplus Plutonium Disposition Final EIS (DOE 1999), the Final Complex Transformation SPEIS (DOE 2008a), the LANL SWEIS (DOE 2008b), the NNSS SWEIS (DOE 2013), and the Final Plutonium Surplus Disposition SEIS (DOE 2015).

3.2.6 Facility Accidents and Intentional Destructive Acts

Facility accidents are addressed for routine activities at the four sites and for transportation. This evaluation of facility accidents identifies if there are similar or different circumstances than previously analyzed in NEPA documents. Accident analyses from relevant NEPA documents were selected based on similarities of risk and potential impacts from design-basis and beyond-design-basis accidents. Accident scenarios were developed at each site based on mission activities, hazardous materials, and natural phenomena hazards (including seismic events). Criticality safety limits are used in the material mass limit for 3013 canisters (DOE 2012b). This constraint prevents potential criticality incidents. Finally, an off-normal event such as external contamination identified during repackaging at any of the sites would result in implementing existing site procedures to safely and securely reduce risk to human health and are not analyzed as an accident.

Intentional destructive acts and potential impacts for each of the sites are discussed in separate classified appendices for the relevant NEPA documents. Substantive details of terrorist attack scenarios and security countermeasures are not released to the public because disclosure of this information could be exploited. Potential impacts from intentionally destructive acts are bounded by previous classified NEPA documents. Analysis for intentional destructive acts, potential

[8] LLW in Table 5-39 reported 12,000 cubic yards. Conversion to cubic meters is cubic yards multiplied by 0.76456.

impacts, and security countermeasures are contained in existing NEPA documents for each site including:

- SRS – Final Complex Transformation SPEIS (DOE 2008a: Section 3.16.6); Final Surplus Plutonium Disposition SEIS (DOE 2015: Section 4.1.2.5)
- Pantex – Final Complex Transformation SPEIS (DOE 2008a: Section 3.16.6)
- NNSS – NNSS SWEIS (DOE 2013: Section 5.1.12.3); Final Complex Transformation SPEIS (DOE 2008a: Section 3.16.6)
- LANL – LANL SWEIS (DOE 2008b: Section 5.12.6); Final Complex Transformation SPEIS (DOE 2008a: Section 3.16.6); and Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement (DOE 2015: Section 4.1.2.5)
- Transportation – Final Complex Transformation SPEIS (DOE 2008a: Section 3.16.6), Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement (DOE 2015: Section 4.1.2.5), and Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes (NRC 1977: Section 7.1)

SRS

Potential accident scenarios pertaining to SRS have been previously analyzed in the Final Surplus Plutonium Disposition SEIS (DOE 2015). These scenarios are relevant as they are specified for K-Area Interim Surveillance Vault and K-Area Storage where one metric ton is currently stored (DOE 2015: Table D-10). Scenarios and consequences are described in Table 3-8. Potential impacts from accident scenarios associated with the proposed action are bounded by potential impacts analyzed in the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table D-10).

Table 3-8. Radiological impacts from accident scenarios at SRS.

Accident	Noninvolved worker		Maximally exposed individual		Offsite population at 50 miles	
	Dose (rem)	Probability of Latent cancer fatality risk	Dose (rem)	Probability of Latent cancer fatality risk	Dose (person-rem)	Latent cancer fatality risk
Fire in KIS Vault with 3013 can rupture at 1,000 psig[a, b]	4.5	3.0×10^{-3}	0.18	1.0×10^{-4}	52	0.03
Design-basis earthquake vibration release[c]	0.16	9.0×10^{-5}	6.3×10^{-3}	4.0×10^{-6}	1.8	0.001
Beyond-design-basis Earthquake with fire (bounded by unmitigated pressurized 3013 can due to an external fire and vault release [1,000 psig])[d]	310	0.4	9.1	5.0×10^{-3}	2,500	2

a – Annual frequency is extremely unlikely to beyond extremely unlikely; 1.0×10^{-5} to 1.0×10^{-7}.
b – psig = pounds per square inch gauge.
c – Annual frequency is unlikely; 1.0×10^{-2} to 1.0×10^{-4}.
d – Annual frequency is beyond extremely unlikely; less than 1.0×10^{-6}.

Pantex

Accident scenarios and consequences at Pantex are compared to the potential impacts in the Final Complex Transformation SPEIS (DOE 2008a). These scenarios are relevant as they are specific for continued operations at the site for staging up to 20,000 pits (DOE 2008a: Table 5.5.12.7). Scenarios and consequences are described in Table 3-9. Potential impacts from accident scenarios associated with the proposed action represents a minimal increase from the Final Complex Transformation SPEIS (DOE 2008a: Table 5.5.12.7).

Table 3-9. Radiological impacts from accident scenarios at Pantex.

Accident	Noninvolved worker		Maximally exposed individual		Offsite population at 50 miles	
	Dose (rem)	Latent cancer fatality risk	Dose (rem)	Latent cancer fatality risk	Dose (person-rem)	Latent cancer fatality risk
Pit breach from an internal event[a]	1.87×10^{-5}	1.12×10^{-8}	2.15×10^{-7}	1.29×10^{-10}	8.73×10^{-5}	5.24×10^{-8}
Fire-driven dispersal involving stored pits from an external event or natural phenomena[b]	26.3	0.03	0.47	2.84×10^{-4}	218	0.13
Plutonium and tritium dispersal from an external event or natural Phenomena[a]	0.2	1.17×10^{-4}	3.52×10^{-3}	2.11×10^{-6}	1.61	9.66×10^{-4}

a – Annual frequency is unlikely; 1.0×10^{-2} to 1.0×10^{-4}.

b – Annual frequency is extremely unlikely; 1.0×10^{-4} to 1.0×10^{-6}.

NNSS

Accident scenarios and consequences at NNSS were analyzed in the Final Complex Transformation SPEIS (DOE 2008a: Table 5.3.12-7) and the NNSS SWEIS (DOE 2013: Table G-18). These scenarios are relevant as they are specific for the capability at the Device Assembly Facility to stage plutonium (DOE 2013). Scenarios and consequences are described in Table 3-10.

Table 3-10. Radiological impacts from accident scenarios at NNSS.

Accident	Noninvolved worker		Maximally exposed individual		Offsite population at 50 miles	
	Dose (rem)	Latent cancer fatality risk	Dose (rem)	Latent cancer fatality risk	Dose (person-rem)	Latent cancer fatality risk
Pit breach from an internal event[a, b]	1.86×10^{-5}	1.12×10^{-8}	1.74×10^{-8}	1.04×10^{-11}	6.7×10^{-6}	4.02×10^{-9}
Plutonium and tritium dispersal from an external event or natural phenomena[a, b]	0.2	1.22×10^{-4}	3.33×10^{-4}	2.0×10^{-7}	0.14	8.22×10^{-5}
Device Assembly Facility beyond-design-basis Earthquake[c, d]	2,800	1	0.86	5.0×10^{-4}	113	0.07

a – DOE 2008a: Table 5.3.12-7.
b – Annual frequency is unlikely; 1.0×10^{-2} to 1.0×10^{-4}.
c – DOE 2013: Table G-18.
d – Annual frequency is beyond extremely unlikely; 1.0×10^{-6} to 1.0×10^{-7}.

Potential impacts from accident scenarios associated with the proposed action represents a minimal increase from the Final Complex Transformation SPEIS (DOE 2008a: Table 5.3.12-7) and the NNSS SWEIS (DOE 2013: Table G-18).

LANL

Accident scenarios and consequences at LANL were analyzed in the LANL SWEIS (DOE 2008b: Sections D.3.2.1 and D.4.2.2) and the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table D-18). These scenarios are relevant as they are specific for plutonium operations (DOE 2008b) and pit disassembly and conversion of up to two metric tons of plutonium in PF-4 (DOE 2015). Scenarios and consequences are described in Table 3-11.

Potential impacts from accident scenarios associated with the proposed action represents a minimal increase from the LANL SWEIS (DOE 2008b: Sections D.3.2.1 and D.4.2.2) and the Final Surplus Plutonium Disposition SEIS (DOE 2015: Table D-18).

Transportation

Accidents and consequences for the proposed action related to transportation of one metric ton of plutonium and LLW shipments are compared to transportation accidents analyzed in the NNSS SWEIS (DOE 2013: Table E-14) and the Final Surplus Plutonium Disposition SEIS, Table 3-12. (DOE 2015: Table E-8). These accidents are relevant as they are specific for transportation routes for nuclear material between sites (DOE 2015) and routes for LLW disposal at NNSS (DOE 2013).

There is also a potential for attempted sabotage or terrorist attack during transport. The safety features of the transportation casks provide containment, shielding, and thermal protection for protection against sabotage. Although it is not possible to predict an occurrence of sabotage or terrorism or the exact nature of such events if they were to occur, DOE/NNSA has previously examined several transportation accident scenarios that would have the types of consequences that could result from such acts, such as documented in the Final Complex Transformation SPEIS (DOE 2008a). Potential impacts from transportation accident scenarios and intentionally destructive acts under the proposed action are bounded by previous analyses (NRC 1977, DOE 2008a, DOE 2013, DOE 2015).

Table 3-11. Radiological impacts from accident scenarios at LANL.

Accident	Noninvolved worker		Maximally exposed individual		Offsite population at 50 miles	
	Dose (rem)	Latent cancer fatality risk	Dose (rem)	Latent cancer fatality risk	Dose (person-rem)	Latent cancer fatality risk
Fire in TA-55 vault[a]	0.025	2.0×10^{-5}	4.6×10^{-3}	3.0×10^{-6}	3.4	2.0×10^{-3}
Plutonium Facility Materials Staging Area Fire[b, c]	1,600	1.9	73	0.09	9,000	5.4
Design-basis earthquake with spill plus fire (two metric tons of plutonium)[a, d]	6.5	4.0×10^{-3}	0.19	1.0×10^{-4}	45	0.03
Seismic 1 (Design-basis) Plutonium Facility Building 185[e, f]	240	0.29	6	3.6×10^{-3}	590	0.35
Beyond-design-basis earthquake induced collapse plus fire (two metric tons of plutonium)[a, g]	550	1	16	0.01	3,800	2
Seismic 2 (Beyond-design-basis) PF-4[h, i]	2,700	3.3	150	0.17	14,000	8.6

a – DOE 2015, Table D-18.
b – DOE 2008b, Tables D-4 and D-5.
c – Annual frequency is unlikely; 1.0×10^{-2}.
d – Annual frequency is extremely unlikely 1.0×10^{-4} to 1.0×10^{-6}.
e – DOE 2008b, Tables D-13 and D-14. Plutonium Facility Building 185 is an outdoor radiological staging facility adjacent to PF-4.
f – Annual frequency is unlikely; 1.0×10^{-3}.
g – Annual frequency is extremely unlikely to beyond extremely unlikely; 1.0×10^{-5} to 1.0×10^{-7}.
h – DOE 2008b, Tables D-16 and D-17.
i – Annual frequency is extremely unlikely; 1.0×10^{-4}.

Table 3-12. Radiological impacts from transportation accident scenarios.

Transportation Route	Accidental Radiological Risk	
	Radiological Risk	Nonradiological Risk
Routes considered for nuclear materials in the Final Surplus Plutonium Disposition SEIS[a]	3×10^{-5}	0.06
LLW from LANL to NNSS[a]	7×10^{-9}	8.0×10^{-3}
LLW from SRS to NNSS[a]	1×10^{-7}	0.08
LLW from Pantex to NNSS[b]	2×10^{-5}	0.3

a – DOE 2015, Table E-8. For 1,700 nuclear material shipments; 320 shipments of LLW originating from LANL; and 430 shipments originating from SRS.
b – DOE 2013, Table E-13. For 7,800 shipments from the southwest region, which includes LLW from Pantex.

Summary

Previous NEPA analyses addressed potential impacts from accident scenarios and intentionally destructive acts. Potential impacts from accident scenarios relevant to the proposed action are bounded by existing analyses in the Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes (NRC 1977), the Pantex EIS (DOE 1996), the Final Complex Transformation SPEIS (DOE 2008a), the LANL SWEIS (DOE 2008b), the NNSS SWEIS (DOE 2013), and the Final Plutonium Surplus Disposition SEIS (DOE 2015).

3.2.7 Greenhouse Gases

Greenhouse gases are measured by the metric carbon dioxide equivalents for assessing potential impacts from transport vehicle emissions. Carbon dioxide, methane, and nitrous oxide are the dominant constituents of carbon dioxide equivalents. Potential impacts from greenhouse gases are compared to greenhouse gas emissions for the four DOE sites and annual emissions in the United States to evaluate significance. For this supplement analysis, transport vehicle emissions are evaluated for onsite transportation and ten shipments between SRS and Pantex, SRS and NNSS, then Pantex and NNSS to LANL. Transportation-related greenhouse gases are the only source of greenhouse gases considered in this supplement analysis. Any other sources of greenhouse gases resulting from this proposed action are considered insignificant.

Greenhouse gas emissions for onsite transportation for the proposed action at the four sites are presented in Table 3-13. Carbon dioxide equivalents at the four sites are well below the total emissions in the United States of 6.1×10^9 metric tons of carbon dioxide equivalents per year (DOE 2015: Section 3.1.4.2).

Transportation

Greenhouse gas emissions for transportation segments between the sites for the proposed action are in Table 3-14 below. The longest transportation segment for the proposed action is from SRS to NNSS, and then to LANL. The carbon dioxide equivalents for the longest transportation segment are approximately 249 metric tons. This amount is well below the total emissions in the United States of 6.1×10^9 metric tons of carbon dioxide equivalents per year analyzed in the Final Surplus Plutonium Disposition SEIS (DOE 2015: Section 3.1.4.2).

Table 3-13. Greenhouse gas emissions onsite for all four DOE sites.

Transportation Segment	Distance (One-way miles for ten shipments)	Emissions (Metric Tons)				
		Carbon Dioxide	Methane	Nitrous Oxide	Carbon Dioxide Equivalent (Proposed Action)	Carbon Dioxide Equivalent (Previously Analyzed)
SRS	14	0.83	6.71×10^{-6}	3.86×10^{-6}	0.84	5.0×10^{5} [a]
Pantex	2	0.12	9.58×10^{-7}	5.52×10^{-7}	0.12	24,040[b]
NNSS	26	1.43	1.15×10^{-5}	6.62×10^{-6}	1.43	70,461[c]
LANL	6	0.36	2.87×10^{-6}	1.66×10^{-6}	0.36	4.48×10^{5} [d]

a – DOE 2015: Section 3.1.4.2. Carbon dioxide equivalents at SRS for all operations with vehicle emissions.
b – DOE 2012a: Table 2-1. Carbon dioxide equivalents at Pantex for vehicle emissions.
c – DOE 2013, Table 5-41. Carbon dioxide equivalents at NNSS for vehicle emissions.
d – DOE 2018b, Section 3.17.2. Carbon dioxide equivalents at LANL for all operations including vehicle emissions.

Summary

Previous NEPA analyses addressed greenhouse gas emissions for transportation. Impacts from greenhouse gas emissions relevant to the proposed action are bounded by existing analyses in the supplement analysis for the Pantex EIS (DOE 2012a), the NNSS SWEIS (DOE 2013), the Final Plutonium Surplus Disposition SEIS (DOE 2015), and the supplement analysis to the LANL SWEIS (DOE 2018b).

Table 3-14. Greenhouse gas emissions for transportation between the four DOE sites.

Transportation Segment	Distance (One-way miles; DOE 2015 Table E-1)	Emissions (Metric Tons)			
		Carbon Dioxide	Methane	Nitrous Oxide	Carbon Dioxide Equivalent
SRS/Pantex/ LANL	1,714	86.11	6.93×10^{-4}	3.99×10^{-4}	86.24
SRS/NNSS/LANL	3,187	155.39	1.25×10^{-3}	7.21×10^{-7}	155.6
Pantex/NNSS	1,053	64.25	5.17×10^{-4}	2.98×10^{-4}	64.36

3.2.8 Environmental Justice

Executive Order 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*) directs federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations. Based on the analysis of impacts for other resource areas (infrastructure, noise, nonradiological air emissions, radiological impacts to work and public health, waste management, facility accidents and intentionally destructive acts, and greenhouse gases), DOE/NNSA expects there to be no disproportionately high or adverse impacts from the proposed action to minority and low-income populations.

SRS

Potential impacts to low-income and minority populations residing near SRS were analyzed in the Final Surplus Plutonium Disposition SEIS (DOE 2015). Routine operations at the site pose no significant risks to the public. Operations at SRS for the proposed action would not result in disproportionately high and adverse impacts on minority or low-income populations residing near the site and are bounded by the analysis in the Final Surplus Plutonium Disposition SEIS (DOE 2015: Section 4.1.6.1, Table 4-25).

Pantex

Potential impacts to low-income and minority populations residing near Pantex were analyzed in the Pantex EIS (DOE 1996) and in the supplement to the EIS (DOE 2018a). Minority and low-income populations were not expected to experience any disproportionately high and adverse impacts from operations at the site. Operations at Pantex for the proposed action would not result in disproportionately high and adverse impacts on minority or low-income populations residing near the site and are bounded by the analysis in the Pantex EIS (DOE 1996 Section 4.17.2) and the supplement analysis to the Pantex EIS (DOE 2018a: Section 2.3.9, Table 3-1).

NNSS

Potential impacts to low-income and minority populations residing near NNSS were analyzed in the NNSS SWEIS (DOE 2013). No disproportionately high and adverse impacts to human health for minority and low-income populations were anticipated to be the same as those of the general population residing near the site (DOE 2013: Section 5.1.13). Operations at NNSS for the proposed action would not result in disproportionately high and adverse impacts on minority or low-income populations residing near the site and are bounded by the analysis in the NNSS SWEIS (DOE 2013: Section 5.1.13).

LANL

Potential impacts to low-income and minority populations residing near LANL were analyzed in the LANL SWEIS (DOE 2008b). No disproportionately high and adverse impacts to minority or low-income populations were anticipated to occur from routine operations at the site (DOE 2008b: Section 5.11.1). Operations at LANL for the proposed action would not result in disproportionately high and adverse impacts on minority or low-income populations residing near the site and are bounded by the analysis in the LANL SWEIS (DOE 2008b: Section 5.11.1).

3.3 Summary

Potential impacts to resource areas analyzed in this supplement analysis are bounded by analyses in previous DOE NEPA documents. The proposed action does not constitute a substantial change from actions previously analyzed in existing DOE/NNSA NEPA documents, and there are no significant new circumstances or information relevant to environmental concerns.

4.0 CUMULATIVE IMPACTS

4.1 Methodology and Analytical Baseline

Council of Environmental Quality (CEQ) regulations (40 CFR Parts 1500–1508) define cumulative impact as effects on the environment that result from implementing a proposed Federal action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (40 CFR 1508.7). Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action, as well as all other actions affecting that resource, no matter what entity (Federal, non-Federal, or private) is taking the action (EPA 1999).

Cumulative effects can result from individually minor, but collectively significant, actions taking place over time. Cumulative effects can also result from spatial (geographic) and/or temporal (time) crowding of environmental perturbations (i.e., concurrent human activities and the resulting impacts on the environment are additive, if there is insufficient time for the environment to recover). In general, the following approach was used to estimate cumulative impacts for this supplement analysis:

- The affected environment and baseline conditions were identified. Most of this information was taken from Section 3 of this supplement analysis.
- Identified past, present, and reasonably foreseeable actions and the effects of actions.
- Addressed additive effects of past, present, and reasonably foreseeable actions.

Cumulative impacts are discussed for the resource areas with potential effects from the proposed action with the same resource areas as analyzed from other past, present, and reasonably foreseeable actions at the four sites. Because the activities slated for SRS would be complete by December 2019, this SA only considers projects surrounding SRS that are proposed within this limited time frame. Activities under the proposed action for Pantex, NNSS, and LANL would take place over a longer period of time. This time frame is to allow for shipments of plutonium to LANL to occur for pit production. This supplement analysis considers projects surrounding Pantex, NNSS, and LANL that are planned for the next several years. Many of the actions considered in this cumulative impacts analysis would occur at different times and locations and may not be truly additive. The effects were combined, irrespective of the time and location of the impact, to envelop any uncertainties in the projected activities and their effects. This approach produces a conservative estimation of cumulative impacts for the proposed action.

This analysis uses the cumulative impacts analyses from the Final Complex Transformation SPEIS (DOE 2008a), the LANL SWEIS (DOE 2008b), the NNSS SWEIS (DOE 2013), the Final Surplus Plutonium Disposition SEIS (DOE 2015), and the environmental assessment for Radiological Laboratory/Utility/Office Building (DOE 2018d) as a basis for cumulative impacts associated with the proposed action. The Final Complex Transformation SPEIS considered operations at all sites in the DOE complex over an approximate 40-year period (DOE 2008a).

Based on the analysis of impacts presented in Section 3 of this supplement analysis, the resource areas evaluated for cumulative impacts are infrastructure, radiological impacts to public and worker health, and waste management. The analysis has been conducted in accordance with

CEQ NEPA regulations and the CEQ handbook, *Considering Cumulative Effects Under* the *National Environmental Policy Act* (CEQ 1997).

This cumulative impact analysis focuses on infrastructure, radiological impacts to public and worker health, and waste management for the four sites and for transportation between sites.

Nonradiological air emissions, greenhouse gases, and noise impacts for this proposed action would come solely from transportation activities. Predictions of future transportation activities, particularly from non-DOE projects, would be highly speculative, and therefore nonradiological air emissions, greenhouse gases, and noise impacts are not analyzed for cumulative impacts.

Environmental justice is addressed in cumulative impacts to identify past, present, and reasonably foreseeable DOE and non-DOE projects that have the potential for disproportionately high or adverse impacts to minority and low-income populations. Based on the analysis of cumulative impacts for resource areas at the four sites (infrastructure, radiological impacts to work and public health, and waste management,) and by other DOE and non-DOE projects at each of the four sites, DOE/NNSA expects there to be no cumulative disproportionately high or adverse impacts to minority and low-income populations

Information on present and future actions for sites involved in this proposed action was obtained from a review of site-specific actions, reviews of proposed actions by other agencies, and NEPA documents from those sites to determine if the proposed action could affect their cumulative impact analyses. Those resources that are expected to have no or negligible contribution to cumulative impacts are not included here.

4.2 Savannah River Site

SRS cumulative impacts analysis would be affected by ongoing and proposed plutonium activities. The following three DOE/NNSA projects were evaluated in this analysis as though they may take place during the time frame of the proposed action: construction of the Pit Disassembly and Conversion Facility (PDCF), the Mixed-oxide Fuel Fabrication Facility (MFFF), and the Consolidated Nuclear Production Center (CNPC). As such, for purposes of this cumulative impact assessment, the bounding assumption is: peak construction of the PDCF and MFFF occurs at approximately the same time as the peak construction of the CNPC. Operationally, the bounding assumption is that SRS operates the PDCF, MFFF, and CNPC simultaneously.

No other federal projects were identified within 50 miles of SRS that pertain to the resource areas analyzed for cumulative impacts. Therefore, no further discussion from other projects is necessary.

Infrastructure

Including activities proposed in the Final Surplus Plutonium Disposition SEIS (PDCF and MFFF), projected site activities would annually require approximately 460,000 to 600,000 megawatt-hours of electricity and 380 million to 410 million gallons of water to support plutonium operations at the site (DOE 2015: Section 4.5.3.5). SRS would remain well within its capacity to deliver electricity and water for simultaneous operations of the PDCF, the MFFF, and the CNPC. Impacts from the proposed action for infrastructure (utility consumption) would be negligible and well below the impacts analyzed in the Final Surplus Plutonium Disposition SEIS (DOE 2015) and the Final Complex Transformation PEIS (DOE 2008a).

Radiological Impacts to Public and Worker Health

Table 4-1 presents the estimated cumulative impacts of radiation exposure under the Final Complex Transformation SPEIS (DOE 2008a) and estimated impacts associated with potential surplus plutonium disposition alternatives at the site (DOE 2015). Operationally, the bounding assumption is that SRS operates the PDCF, MFFF, and CNPC simultaneously.

Table 4-1. Estimated Cumulative Radiological Impacts from Normal Operations at SRS.

Action	Worker		Maximally Exposed Individual		Public	
	Collective Dose (person-rem per year)	Latent cancer fatality risk	Dose (millirem per year)	Latent cancer fatality risk	Collective Dose (person-rem per year)	Latent cancer fatality risk
CNPC[a]	507	0.3	3.3×10^{-3}	2.0×10^{-9}	0.429	2.6×10^{-4}
PDCF and MFFF[b]	450	0.3	0.017	1.0×10^{-8}	1.77	1.0×10^{-3}
Total	957	0.6	0.02	1.0×10^{-8}	2.2	1.3×10^{-3}

a – DOE 2008a, Section 6.3.4.6. Annual worker exposure was estimated to be 121 person-rem. Plus 386 person-rem from the CNPC.
b – DOE 2015, Tables 4-3 and 4-4.

The cumulative impact analysis for radiological impacts to worker and public health identifies that the potential impacts from the proposed action are minor and bounded by the analyses in the Final Complex Transformation SPEIS (DOE 2008a) and the Final Surplus Plutonium Disposition SEIS (DOE 2015).

Waste Management

The cumulative impacts from LLW were analyzed for SRS in the Final Complex Transformation SPEIS (DOE 2008a) and the Final Surplus Plutonium Disposition SEIS (DOE 2015). Table 4-2 presents the cumulative impacts of LLW generation from combining routine operations, the CNPC, the PDCF, and the MFFF. LLW generated from the proposed action would be negligible and bounded by the analyses in the Final Complex Transformation SPEIS (DOE 2008a) and the Final Surplus Plutonium Disposition SEIS (DOE 2015).

Summary of Cumulative Impacts for SRS

A cumulative impacts analysis for the proposed action was conducted to determine those resource areas that have the greatest potential for cumulative impacts, which includes the proposed surplus plutonium disposition activities at SRS. Based on the cumulative impacts analysis in this supplement analysis, the resource areas considered for potential cumulative impacts were infrastructure, radiological impacts to public and worker health, and waste management. These impacts would be minor and bounded by the cumulative impacts analyses in the Final Complex Transformation SPEIS (DOE 2008a) and the Surplus Plutonium Disposition SEIS (DOE 2015).

Table 4-2. LLW generation at SRS.

Action	LLW (cubic meters per year)
SRS routine operations[a]	2,600
CNPC[b]	3,030
PDCF and MFFF[c]	3,000
Total	8,630

a – DOE 2015, Table 3-21. Reported in five-year total as 13,000 cubic meters.
b – DOE 2008a, Table 6.3.4-1.
c – DOE 2015, Table 4-18.

4.3 Pantex Plant

The activities at the Pantex Plant for the proposed action are anticipated to remain the same as analyzed in the supplement analysis to the Pantex EIS (DOE 2018a). Future projects analyzed in the site's supplement analysis identify that the projects will take place after the proposed action would be completed. No other Federal or non-Federal projects were identified within 50 miles of Pantex that pertain to the resource areas analyzed for cumulative impacts. Therefore, no further discussion of cumulative impacts at Pantex is necessary for the proposed action.

4.4 Nevada National Security Site

The NNSS SWEIS analyzed cumulative impacts for DOE and non-DOE projects. There have been no new DOE projects planned or identified for the site. The NNSS SWEIS identified one non-DOE project in the vicinity of the site. This project is discussed as it relates to infrastructure and energy use in the area surrounding NNSS (DOE 2013: Table 6-1).

In 2011, the United States Air Force proposed to lease 160 acres of its land to Nevada Energy for construction of a solar photovoltaic power system that would provide the United States Air Force Nevada Test and Training Range with a cost-efficient renewable energy source that would be used primarily by the Air Force. The system would generate an 18-megawatt direct current that would be transformed into 10 to 15 megawatts of alternating current. This system would be the second solar photovoltaic system to be located on the United States Air Force Nevada Test and Training Range (USAF 2011).

Infrastructure

The NNSS SWEIS analyzed utility consumption from routine operations at the site. Average electricity power demand would be 28 megawatts (DOE 2013: Table 3-4) and water used was estimated to be approximately 281 million gallons per year (DOE 2013: Section 5.1.6.2.2). Fuel oil consumption was estimated to be 83,000 gallons per year (DOE 2013: Table 5-7). Cumulative impacts from the proposed action for infrastructure (energy consumption) would be negligible and bounded by the analysis in the NNSS SWEIS (DOE 2013).

Summary of Cumulative Impacts for NNSS

A cumulative impacts analysis for this proposed action was conducted to determine those resource areas that have the greatest potential for cumulative impacts, which includes the development of solar energy projects in areas surrounding NNSS. Based on the cumulative impacts analysis in this supplement analysis and the NNSS SWEIS, infrastructure is the only resource area that was considered. Impacts related to infrastructure from the proposed action would be negligible and well below the impacts analyzed in the NNSS SWEIS (DOE 2013).

4.5 Los Alamos National Laboratory

The Final Surplus Plutonium Disposition SEIS (DOE 2015) and the supplement analysis to the LANL SWEIS (DOE 2018b) identified reasonably foreseeable future actions at the site. The actions discussed include all those actions with potential for cumulative effect when combined with the proposed action. The analysis addresses radiological impacts to infrastructure, public and worker health, and waste management.

The Final Surplus Plutonium Disposition SEIS addresses disposition of 13.1 metric tons of surplus plutonium. The analysis evaluated the impacts of options for disassembly and conversion of pit plutonium, including analysis of potential new facilities and continued use of the plutonium complex at LANL (DOE 2015).

The Radioactive Liquid Waste Treatment Facility Upgrade Project upgrades the capabilities including construction of new facilities. Activities associated with this project were evaluated in the supplement analysis to the LANL SWEIS (DOE 2018b).

Foreseeable future actions at locations outside of LANL are not expected to affect the cumulative impacts analysis for the proposed action. This expectation is because of their distance from the site, their relatively small size, and their zoning, permitting, environmental review, and construction and operations requirements (DOE 2018b).

Infrastructure

The LANL SWEIS estimated infrastructure (utility consumption) for ongoing operations at the site (DOE 2008b: Table 5-34). The Final Surplus Plutonium Disposition SEIS estimated utility consumption for pit disassembly and conversion operations using facilities at LANL (DOE 2015: Table 4-34). Table 4-3 presents the cumulative impact for infrastructure at the site. The impacts from the proposed action for infrastructure would be negligible and bounded by the analyses in the LANL SWEIS (DOE 2008b) and the Final Surplus Plutonium Disposition SEIS, (DOE 2015: Table 4-2).

Radiological Impacts to Public and Worker Health

Table 4-4 presents the estimated cumulative impacts of radiation exposure evaluated in the LANL SWEIS (DOE 2008b) and for potential surplus plutonium disposition alternatives at the site (DOE 2015). The estimated doses analyzed in the LANL SWEIS reflects the highest level of operations expected to occur at the site.

Table 4-3. LANL infrastructure estimates.

Action	Electricity (megawatt-hours per year)	Water (million gallons per year)	Fuel (million gallons per year)
LANL SWEIS[a]	495,000	380	1.2
Final Surplus Plutonium Disposition SEIS[b]	80	0.034	2.0×10^{-3}
Total	495,080	380.03	1.2

a – DOE 2008b, Table 5-34.
b – DOE 2015, Table 4-34.

Table 4-4. Estimated cumulative radiological impacts from normal operations.

Action	Worker		Maximally Exposed Individual		Public	
	Collective Dose (person-rem per year)	Latent cancer fatality risk	Dose (millirem per year)	Latent cancer fatality risk	Collective Dose (person-rem per year)	Latent cancer fatality risk
LANL SWEIS[a]	543	0.3	8.2	5×10^{-6}	36	0.02
Final Surplus Plutonium Disposition SEIS [b]	190	0.1	0.081	5×10^{-8}	0.21	1×10^{-4}
Total	733	0.4	8.3	5.0×10^{-6}	36.2	0.02

a – DOE 2008b, Tables 5-22 and 5-27.
b – DOE 2015, Table 4-3.

These estimated doses are considered a conservative estimate for doses that could result from ongoing activities. The potential impacts analyzed in the environmental assessment for the Radiological Laboratory/Utility/Office Building (DOE 2018d) were considered but the estimated impacts were indistinguishable from the impacts of ongoing activities at the site.

The cumulative impact analysis for radiological impacts to worker and public health identifies that the potential impacts from the proposed action are minor and bounded by the analyses in the LANL SWEIS (DOE 2008b) and the Final Surplus Plutonium Disposition SEIS (DOE 2015).

Waste Management

The cumulative impacts from LLW were analyzed in the supplement analysis to the LANL SWEIS (DOE 2018b) and the Final Surplus Plutonium Disposition SEIS (DOE 2015). Table 4-5 presents the cumulative impacts of LLW generation from combining routine operations, pit disassembly, and conversion activities at the Plutonium Facility. LLW generated from the proposed action would be negligible and bounded by the analyses in the supplement analysis for the LANL SWEIS (DOE 2018b) and the Final Surplus Plutonium Disposition SEIS (DOE 2015).

Table 4-5. LLW generation at LANL.

Action	LLW (cubic meters per year)
LANL routine operations[a]	61,164 – 139,914
Final Surplus Plutonium Disposition SEIS[b]	290
Total	61,454 – 140,204

a – DOE 2018b, Table 3-19. Reported in cubic yards multiplied by 0.76456 to get cubic meters
b – DOE 2015, Section 4.1.4.2.

4.6 Cumulative impacts from transportation

Cumulative impacts for transportation of nuclear material, including plutonium, and waste focuses on radiological impacts to public and worker health. Predictions of future transportation activities, particularly from non-DOE projects, would be highly speculative, and therefore nonradiological air emissions and noise impacts are not analyzed for cumulative impacts. As such, no other projects were identified for cumulative impacts for this analysis of transportation.

Radiological Impacts to Public and Worker Health

The collective doses and cumulative health effects resulting from approximately 130 years (from 1943 to 2073) of nuclear material and waste transport across the United States were estimated in the Final Surplus Plutonium Disposition SEIS, Table 4-6 (DOE 2015: Tables 4–48 and 4-49).

Table 4-6. Potential cumulative impacts from transport of nuclear material and waste.

Action	Crew Dose (person-rem)	Risk of latent cancer fatality	Population Dose (person-rem)	Risk of latent cancer fatality
Final Surplus Plutonium Disposition SEIS (DOE 2015)	650	0.4	580	0.3
All other action from 1943 to 2073 (DOE 2015)	421,000	253	436,000	262
Total	421,650	253	436,580	262

a – DOE 2015, Table 4-49.
b – DOE 2015, Table 4-48.

The transportation cumulative impacts from the proposed action would be minor and are bounded by analyses of past, present, and foreseeable actions as analyzed in the Final Surplus Plutonium Disposition SEIS (DOE 2015).

4.7 Cumulative Impacts Summary

The cumulative impacts associated with the proposed action at the four sites and for transportation between and within the sites would be minor and are bounded by the analyses in the Final Surplus Plutonium Disposition SEIS (DOE 2015), the Final Complex Transformation SPEIS (DOE 2008a), the supplement analysis to the Pantex EIS (DOE 2018a), the NNSS SWEIS (DOE 2013), and the LANL SWEIS (DOE 2008b) and its supplement analysis (DOE 2018b). The proposed action does not constitute a substantial change from actions previously analyzed in existing DOE/NNSA NEPA documents, and there are no significant new circumstances or information relevant to environmental concerns.

5.0 CONCLUSIONS AND DETERMINATION

This supplement analysis evaluates potential impacts from repackaging and transportation of containers at SRS, and staging and repackaging of containers at Pantex and NNSS (with shipments between the staging locations, if needed) for transportation to and for pit production at LANL. This supplement analysis considered any new circumstances or information relevant to environmental concerns.

For most environmental resources, there would be no impacts as a result of the proposed action. For those with potential environmental impacts the analyses verified that these potential environmental impacts would be bounded by existing NEPA analyses identified in Section 1 or represent minimal increases.

Based on the results of this supplement analysis DOE has determined that the proposed action does not constitute a substantial change from actions previously analyzed in existing DOE/NNSA NEPA documents, and there are no significant new circumstances or information relevant to environmental concerns. Therefore, as Head of Defense Programs and pursuant to NNSA's Administrative Procedure and DOE's Implementing Procedures (10 CFR 1021.314(c)), I have determined that no further NEPA documentation is required.

DOE/NNSA Headquarters Concurrence:

Jane Summerson — 08/02/2018

Jane Summerson
NEPA Compliance Officer, DOE/NNSA — Date

Bruce M Diamond — 08/02/2018

Bruce Diamond
General Counsel, DOE/NNSA — Date

Approving Agent:

PT Calbos — 8/6/2018

Philip T. Calbos
Defense Programs Manager, DOE/NNSA — Date

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GLOSSARY

3013 container – a DOE approved container that meets or exceeds DOE Standard DOE-STD-3013-2012, "Stabilization, Packaging, and Storage of Plutonium-Bearing Materials" (DOE 2012b). Each 3013 container consists of two weld-sealed, nested, stainless steel cans that are stored in DOT-certified shipping containers, or equivalent, for transport.

Carbon dioxide equivalents – emissions of carbon dioxide and other greenhouse gases multiplied by their global warming potential, a metric for comparing the potential impact of the emissions of different greenhouse gases.

dBA—A-weighted decibel, a frequency-weighted unit for traffic and industrial noise measurements where 0 is below human perception and 130 is above the threshold of pain to humans. The A-weighted decibel scale corresponds to the frequency response of the human ear and thus correlates well with loudness. For example, a 100 dB level at 100 hertz will be perceived to have a loudness equal to only 80 dB at 1000 hertz.

Dose—a generic term meaning absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or committed equivalent dose. For ionizing radiation, the energy imparted to matter by ionizing radiation per unit mass of the irradiated material (e.g., biological tissue). The units of absorbed dose are the rad and the gray. In many publications, the rem is used as an approximation of the rad.

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

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

Megawatt – a unit of power equal to 1 million watts. Megawatt electric defines electricity consumed.

Nuclear material – composite term applied to 1) special nuclear material; 2) source material such as uranium or thorium ores containing uranium or thorium; and 3) byproduct material which is any radioactive material that is made radioactive by exposure to the radiation incident to the process of producing or using special nuclear material.

Person-rem – a unit of collective radiation dose applied to populations or groups of individuals; that is, a unit for expressing the dose when summed across all persons in a specified population or group.

Plutonium pit – the central core of a nuclear weapon, principally made of plutonium or enriched uranium.

rem (roentgen equivalent man) – a unit of dose equivalent. The dose equivalent in rem equals the absorbed dose in rad in tissue multiplied by the appropriate quality factor and possibly of modifying factors. Derived from "roentgen equivalent man," referring to the dosage of ionizing radiation that will cause the same biological effect as one roentgen of x-ray or gamma-ray exposure. Radioactivity—Defined as a process: The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation. Defined as a property: The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

Special nuclear material – as defined in Section 11 of the Atomic Energy Act: "(1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the United States Nuclear Regulatory Commission determines to be special nuclear material, or (2) any material artificially enriched by any of the foregoing."