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U.S. Department of Energy

Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility

Summary

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COVER SHEET

***Responsible Agency*:** United States Department of Energy (DOE) National Nuclear Security Administration (NNSA)

***Title*:** Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility

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Abstract: DOE's NNSA is responsible for the safety and reliability of the U.S. nuclear weapons stockpile, including production readiness required to maintain that stockpile. Since 1989, DOE has been without the capability to produce certified plutonium pits, which are an essential component of nuclear weapons. NNSA, the Department of Defense, and Congress have highlighted the lack of long-term pit production capability as a national security issue requiring timely resolution. While a small interim capacity is currently being established at the Los Alamos National Laboratory (LANL), classified analyses indicate that long-term support of the nuclear stockpile, which is a cornerstone of U.S. national security policy, will require a long-term pit production capability.

Pursuant to *National Environmental Policy Act* of 1969, as amended (42 USC 4321 et seq.), and DOE Regulations Implementing *National Environmental Policy Act* (10 CFR Part 1021), NNSA has prepared a Supplement to the Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility (hereafter, referred to as the MPF EIS) to support a Record of Decision (ROD) by the Secretary of Energy on: (1) whether to proceed with a Modern Pit Facility (MPF); and (2) if so, where to locate a MPF. This MPF EIS evaluates the environmental impacts associated with constructing a new MPF at the following sites: (1) Los Alamos Site, New Mexico; (2) Nevada Test Site; (3) Carlsbad Site, New Mexico; (4) Savannah River Site, South Carolina; and (5) Pantex Site, Texas. The MPF EIS also evaluates an upgrade to the plutonium pit manufacturing capabilities currently being established at Technical Area 55 (TA-55) at LANL, and the No Action Alternative of relying on the small interim capacity at LANL. The MPF EIS evaluates a range of pit production capabilities consistent with national security requirements. Additional NEPA analysis will be required for

the specific siting of such a facility should the decision be made that a MPF is required. For this MPF Draft EIS, constructing and operating a MPF is the preferred alternative. A preferred site for a MPF has not yet been determined, but will be identified in the Final EIS.

Public Comments: In preparing this MPF Draft EIS, NNSA considered comments received during the public scoping period from September 20, 2002, through November 22, 2002. In addition, six public hearings were held to assist NNSA in defining the scope of the analysis. The first of these public hearings was held on October 8, 2002, in Amarillo, Texas. Hearings were also held in Carlsbad, New Mexico, on October 10, 2002, in Washington, DC, on October 15, 2002, in Las Vegas, Nevada, on October 17, 2002, in Los Alamos, New Mexico, on October 24, 2002, and in North Augusta, South Carolina, on October 29, 2002. Comments made at these hearings, as well as each comment received by fax, e-mail, and mail during the scoping period, were considered in the preparation of the MPF Draft EIS. A summary of the comments is included in this draft.

The comment period for this MPF Draft EIS will be from June 6, 2003 to August 5, 2003. Public meetings will also be held during this 60-day comment period. The dates, times, and locations of these meetings will be announced in the *Federal Register* and in local newspapers. All comments received during the comment period will be considered by NNSA in the Final EIS.

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CONVERSION CHART

To Convert Into Metric			To Convert Into English		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inch	2.54	centimeter	centimeter	0.3937	inch
feet	30.48	centimeter	centimeter	0.0328	feet
feet	0.3048	meter	meter	3.281	feet
yard	0.9144	meter	meter	1.0936	yard
mile	1.60934	kilometer	kilometer	0.62414	mile
Area					
square inch	6.4516	square centimeter	square centimeter	0.155	square inch
square feet	0.092903	square meter	square meter	10.7639	square feet
square yard	0.8361	square meter	square meter	1.196	square yard
acre	0.40469	hectare	hectare	2.471	acre
square mile	2.58999	square kilometer	square kilometer	0.3861	square mile
Volume					
fluid ounce	29.574	milliliter	milliliter	0.0338	fluid ounce
gallon	3.7854	liter	liter	0.26417	gallon
cubic feet	0.028317	cubic meter	cubic meter	35.315	cubic feet
cubic yard	0.76455	cubic meter	cubic meter	1.308	cubic yard
Weight					
ounce	28.3495	gram	gram	0.03527	ounce
pound	0.45360	kilogram	kilogram	2.2046	pound
short ton	0.90718	metric ton	metric ton	1.1023	short ton
Force					
dyne	0.00001	newton	newton	100,000	dyne
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

METRIC PREFIXES

Prefix	Symbol	Multiplication Factor
exa-	E	1 000 000 000 000 000 000 = 10^{18}
peta-	P	1 000 000 000 000 000 = 10^{15}
tera-	T	1 000 000 000 000 = 10^{12}
giga-	G	1 000 000 000 = 10^{9}
mega-	M	1 000 000 = 10^{6}
kilo-	k	1 000 = 10^{3}
hecto-	h	l00 = 10^{2}
deka-	da	l0 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	µ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}
femto-	f	0.000 000 000 000 001 = 10^{-15}
atto-	a	0.000 000 000 000 000 001 = 10^{-18}

This document summarizes the Supplemental Environmental Impact Statement for the National Nuclear Security Administration's Modern Pit Facility (MPF) proposal. In addition to information concerning the background, purpose and need for the proposed action, and the National Environmental Policy Act process, this summary includes the requirements for the proposed MPF, the alternatives and planning assumptions, the Department of Energy's identified Preferred Alternative, and a comparison of environmental impacts among alternatives. The summary identifies the major conclusions, areas of controversy, and issues to be resolved.

S.1 INTRODUCTION AND BACKGROUND

S.1.1 Overview

The U.S. Department of Energy's (DOE) National Nuclear Security Administration (NNSA) is responsible for the safety and reliability of the U.S. nuclear weapons stockpile, including production readiness required to maintain that stockpile. Since 1989, DOE has been without the capability to produce stockpile certified plutonium pits, which are an essential component of nuclear weapons. NNSA, the Department of Defense (DOD), and Congress have highlighted the lack of long-term pit production capability as a national security issue requiring timely resolution. While a small interim capacity is currently being established at the Los Alamos National Laboratory (LANL), classified analyses indicate projected capacity requirements (number of pits to be produced over a period of time), and agility (ability to rapidly change from production of one pit type to another, ability to simultaneously produce multiple pit types, or the flexibility to produce pits of a new design in a timely manner) necessary for long-term support of the stockpile will require a long-term pit production capability. In particular, identification of a systemic problem associated with an existing pit type, class of pits, or aging phenomenon cannot be adequately responded to today, nor could it be with the small capability being established at LANL (see Section S.2 for a more detailed discussion regarding the purpose and need for a Modern Pit Facility [MPF]).

Prudent risk management requires that NNSA initiate action now to assure readiness to support the stockpile and that appropriate pit production capacity is available when needed. Pursuant to the *National Environmental Policy Act* of 1969 (NEPA), as amended (42 United States Code [USC] 4321 *et seq.*), and the DOE Regulations Implementing NEPA (10 Code of Federal Regulations [CFR] Part 1021), NNSA is preparing this Supplement to the Programmatic Environmental Impact Statement (PEIS) on Stockpile Stewardship and Management (SSM) for a MPF in order to decide: (1) whether to proceed with a MPF; and (2) if so, where to locate a MPF. Hereafter, this document will be referred to as the Modern Pit Facility Environmental Impact Statement (MPF EIS).

S.1.1.1 Relevant History

Plutonium pits for the nuclear weapons stockpile were manufactured at the DOE Rocky Flats Plant in Golden, Colorado, from 1952-1989. In December 1989, due to environmental and safety concerns, production at Rocky Flats was shut down by DOE and no stockpile-certified pits have since been produced by this country. Today, the United States is the only nuclear weapons power without the capability to manufacture plutonium pits suitable for use in the nuclear weapons stockpile.[1] During the mid-1990s, DOE conducted a comprehensive analysis of the capability and capacity needs for the entire Nuclear Weapons Complex and evaluated alternatives for maintaining the Nation's nuclear stockpile in the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (SSM PEIS) (DOE/EIS-0236) (DOE 1996b). Issued in September 1996, the SSM PEIS assessed future stockpile requirements and looked extensively at pit manufacturing capability and capacity needs. The SSM PEIS evaluated reasonable alternatives for re-establishing interim pit production capability on a small scale. A large pit production capacity—in line with the capacity planned for other manufacturing functions—was not evaluated in the SSM PEIS "because of the small current demand for the fabrication of replacement pits, and the significant, but currently undefined, time period before additional capacity may be needed." In the SSM PEIS Record of Decision (ROD) (61 FR 68014) on December 26, 1996, the Secretary of Energy decided to re-establish an interim pit fabrication capability, with a small capacity, at LANL. That decision limited pit fabrication to a facility "sized to meet programmatic requirements over the next ten or more years." In the ROD, DOE committed to "performing development and demonstration work at its operating plutonium facilities over the next several years to study alternative facility concepts for larger capacity."

Subsequent to the SSM PEIS ROD, a number of citizen groups filed suit challenging the adequacy of the SSM PEIS. In August 1998, the SSM PEIS litigation was resolved. As a result of that litigation, DOE agreed to entry of a court order that required, "prior to taking any action that would commit DOE resources to detailed engineering design, testing, procurement, or installment of pit production capability for a capacity in excess of the level that has been analyzed in the SSM PEIS (50 pits per year [ppy] under routine conditions, 80 ppy under multiple-shift operations), DOE shall prepare and circulate a Supplemental PEIS, in accordance with DOE NEPA Regulation 10 CFR 1021.314, analyzing the reasonably foreseeable environmental impacts of and alternatives to operating such an enhanced capacity, and shall issue a ROD based thereon." This MPF EIS is being prepared in part to satisfy that obligation.

Following the SSM PEIS, in January 1999, DOE prepared the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory* (LANL SWEIS) (DOE/EIS-0238) (DOE 1999a), which evaluated site-specific alternatives for implementing pit production at LANL. Consistent with the SSM PEIS ROD, the LANL SWEIS evaluated alternatives that would implement pit production with a capacity up to 50 ppy under single-shift operations and 80 ppy using multiple shifts. In the ROD for the LANL SWEIS (64 FR 50797) issued on September 20, 1999, DOE decided to initiate actions that would allow for the production of up to 20 ppy at LANL, and deferred any decision to expand pit manufacturing beyond that level. Consistent with the 1996 SSM PEIS ROD and the 1999 LANL SWEIS ROD, NNSA has been establishing a small pit manufacturing capability at LANL. The establishment of the interim pit production capacity is expected to be completed in 2007.

[1] NNSA has demonstrated the capability to manufacture development pits at the LANL TA-55 Plutonium Facility.

S.1.1.2 Function of the Pit in Nuclear Weapons

Nuclear weapons function by initiating and sustaining nuclear chain reactions in highly compressed material which can undergo both fission and fusion reactions. Modern nuclear weapons have a primary, which is used as the initial source of energy, and a secondary, which provides additional explosive energy release. The primary contains a central core, the "pit." Nuclear weapons cannot operate without a fully functioning pit.

S.1.1.3 Nuclear Weapons Stockpile

The size and composition of the U.S. nuclear weapons stockpile is determined annually by the President. The Secretaries of Defense and Energy jointly sign the Nuclear Weapon Stockpile Memorandum (NWSM), which includes the Nuclear Weapons Stockpile Plan (NWSP) as well as a long-range planning assessment. As such, the NWSM is the basis for all DOE stockpile support planning. The DOD prepares the NWSP based on military requirements and coordinates the development of the plan with NNSA concerning its ability to support this plan. The NWSP, which is classified, covers the current year and a 5-year planning period. It specifies the types and quantities of weapons required, and sets limits on the size and nature of stockpile changes that can be made without additional approval of the President. The NWSM directly specifies the number and types of weapons required to support the stockpile.

Section S.2 discusses the relevant factors, such as treaties and the Nuclear Posture Review (NPR), that shape national security policies related to the MPF Proposed Action.

S.1.2 Proposed Action, Environmental Impact Statement Scope, and Alternatives

NNSA proposes to site, construct, and operate a MPF for the purpose of producing plutonium pits to support long-term national security needs. A range of pit production capacities consistent with national security requirements is analyzed in this EIS (see Sections S.2 and S.3 for a discussion of pit production capacity and the range of capacities that are utilized in this EIS). This MPF EIS analyzes the reasonably foreseeable environmental impacts of, and alternatives to, operating at the various capacities. Consistent with this approach, the MPF EIS also evaluates the No Action Alternative of maintaining the plutonium pit capabilities at LANL that are currently planned to be in place by 2007, and an upgrade of the Technical Area (TA)-55, Plutonium Facility, Building 4 (PF-4), at LANL.

For the proposed MPF, this EIS analyzes all reasonable site locations. As described in detail in Appendix G, NNSA utilized a site screening process to determine a reasonable range of site alternatives for the MPF EIS. In this site screening process, all existing, major DOE sites were initially considered to serve as potential host locations for a MPF. The site screening analysis considered the following criteria: population encroachment, mission compatibility, margin for safety/security, synergy with existing/future plutonium operations, minimizing transportation of plutonium, NNSA presence at the site, and infrastructure. The first two criteria were deemed to be "exclusionary" criteria; that is, a site either passed or failed on each of these two criteria. The sites that passed the exclusionary criteria were then scored against all criteria. Based upon results from the site screening analysis, the following were determined to be reasonable alternatives for a MPF: (1) Los Alamos Site, New Mexico; (2) Nevada Test Site; (3) Carlsbad Site, New Mexico; (4) Savannah River Site, South Carolina; and (5) Pantex Site, Texas.

S.1.3 *National Environmental Policy Act* Strategy

Deciding whether to proceed with a MPF, and if so, where to locate a MPF, is a major Federal action that could significantly affect the quality of the human environment; therefore, an EIS is required. NNSA envisions this MPF EIS as a "programmatic document" that would support these two decisions. In addition, this MPF EIS analyzes a No Action Alternative and an Upgrade Alternative to the existing PF-4 at TA-55 at LANL. If the Secretary of Energy decides to proceed with a MPF, a second, tiered, project-specific EIS would be prepared after the MPF EIS ROD. That EIS would utilize more detailed design information to evaluate reasonable site-specific alternatives in the vicinity of the host site picked in the MPF EIS ROD. In the event that the tiered EIS considers alternative site locations beyond existing DOE site boundaries, such locations would be required to be consistent with the original host site selection criteria. That tiered EIS would ultimately support a ROD for the construction and operation for a MPF of a specific capacity and design at a specific location.

S.1.4 Other Relevant *National Environmental Policy Act* Reviews

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management, DOE/EIS-0236 (SSM PEIS)

The SSM PEIS evaluated alternatives for maintaining the safety and reliability of the Nation's nuclear stockpile in the post-Cold War world (DOE 1996b). In the December 26, 1996, SSM PEIS ROD (61 FR 68014), the Secretary of Energy decided, among other decisions, to establish an interim, small pit fabrication capability at LANL "sized to meet programmatic requirements over the next ten or more years." In the ROD, DOE committed to "performing development and demonstration work at its operating plutonium facilities over the next several years to study alternative facility concepts for larger capacity." Consistent with the SSM PEIS ROD, a MPF would provide a larger plutonium pit capacity to meet long-term national security needs.

Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory, DOE/EIS-0238 (LANL SWEIS)

The LANL SWEIS evaluated alternatives for the continued operation of LANL (DOE 1999a). Four alternatives were evaluated: (1) No Action, (2) Expanded Operations, (3) Reduced Operations, and (4) a Greener Alternative. The LANL SWEIS evaluated site-specific alternatives for implementing pit production at LANL consistent with the SSM PEIS ROD. A LANL SWEIS ROD was issued on September 20, 1999, to select the Expanded Operations Alternative (64 FR 50797) with a modification in the level of pit production. This alternative included the continuation of all activities presently undertaken at LANL, at the highest level of activity, and an increased pit production capability. In this ROD, DOE decided to implement actions that would allow for the production of up to 20 ppy at LANL, and deferred any decision to expand pit manufacturing beyond that level. The LANL SWEIS provides the framework for the No Action Alternative in the MPF EIS. That is, if the Secretary of Energy decides to not proceed with a MPF or upgrade the LANL plutonium pit capabilities, then NNSA would rely upon the planned capacity at LANL to meet long-term national security needs (i.e., the No Action Alternative).

Final Programmatic Environmental Impact Statement for the Storage and Disposition of Weapons-Usable Fissile Materials, DOE/EIS-0229 (S&D PEIS)

The S&D PEIS analyzed the potential environmental consequences of alternatives for the long-term storage (up to 50 years) and disposition of plutonium from U.S. nuclear weapon dismantlements (DOE 1996d). Three storage alternatives were evaluated: (1) Upgrade at Multiple Sites, (2) Consolidation of Plutonium, and (3) Collocation of Plutonium and Enriched Uranium. Six candidate sites were considered: Hanford Site, Nevada Test Site (NTS), Idaho National Engineering Laboratory, Pantex, Oak Ridge Reservation, and the Savannah River Site (SRS). On January 14, 1997, DOE issued a ROD (62 FR 3014) to upgrade the plutonium storage capabilities of Pantex, Hanford, and SRS and to continue to store plutonium at these facilities. Weapons-usable plutonium at Rocky Flats would be transported to Pantex and SRS. On August 13, 1998, DOE issued an amended ROD (63 FR 43386) to expand improvements to SRS storage facilities to allow for accelerated movement of plutonium from Rocky Flats. DOE further decided in the ROD that the Y-12 National Security Complex (Y-12) on the Oak Ridge Reservation would continue to store nonsurplus enriched uranium (for the long-term) and surplus enriched uranium (on an interim basis) in upgraded facilities pending final disposition. Based on these decisions, plutonium pits to be used in a MPF would be stored at Pantex and enriched uranium components for the MPF would be stored at Y-12.

Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada, DOE/EIS-0243 (NTS SWEIS)

The NTS SWEIS evaluated alternatives for the continued operation of NTS (DOE 1996a). Four alternatives were evaluated: (1) No Action Alternative, (2) Discontinuation of Operations, (3) Expanded Use, and (4) Alternate Use of Withdrawn Lands. On December 13, 1996, DOE published a ROD (61 FR 65551) selecting the Expanded Use Alternative. In July 2002, DOE issued a *Supplement Analysis for the Final EIS for the NTS and Off-Site Locations in the State of Nevada* (DOE/EIS-0243-SA-01) (DOE 2002b). This supplement analysis determined that there were no significant changes from actions foreseen in 1996. Furthermore, there were no new major proposals and projects. Accordingly, it was determined that no supplemental EIS for the 1996 NTS EIS is required. For purposes of the MPF EIS, the analyses and decisions in the NTS SWEIS ROD and Supplement Analysis represent the No Action Alternative at NTS. That is, if the Secretary of Energy decides to not proceed with a MPF, or decides to not locate a MPF at NTS, then NNSA would conduct business at NTS within the framework of the NTS SWEIS ROD and Supplement Analysis.

Final Environmental Impact Statement for the Continued Operation of Pantex and Associated Storage of Nuclear Weapons Components, DOE/EIS-0225 (Pantex SWEIS)

The Pantex SWEIS evaluated alternatives for the continued operation of Pantex (DOE 1996c). The SWEIS examined environmental impacts resulting from a reasonable range of activity levels by assessing the operations on 2,000, 1,000, and 500 weapons per year. The SWEIS also addressed environmental impacts resulting from the relocation of interim pit storage to other

DOE sites. On January 27, 1997, DOE issued a ROD (62 FR 3880) selecting the implementation of upgrades to enable continued operations, and continued interim pit storage, at Pantex, to enable increasing the storage level from 12,000 to 20,000 pits.

In April 2002, DOE completed a *Supplement Analysis for the Final EIS for the Continued Operation of Pantex and Associated Storage of Nuclear Weapon Components* (DOE/EIS-0225/SA-03) (DOE 2002a). This analysis looked at the SWEIS completed in 1996 and concluded that there is no need to supplement the Pantex SWEIS.

With respect to the MPF EIS, the decision to store up to 20,000 pits in upgraded storage facilities at Pantex is applicable to all alternatives analyzed in the MPF EIS; that is, regardless of any decisions in the MPF EIS, Pantex will continue to store plutonium pits for the Nation's nuclear weapon stockpile. Additionally, if the Secretary of Energy decides to not proceed with a MPF, or decides to not locate a MPF at Pantex, then NNSA would conduct business at Pantex within the framework of the Pantex SWEIS ROD and Supplement Analysis.

Final Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant Disposal Phase, DOE/EIS-0026-S-2 (WIPP SEIS)

In 1980, the original *Final Environmental Impact Statement for the Waste Isolation Pilot Plant* (DOE/EIS-0200) was issued. Supplemental EISs (SEISs) were issued in 1990 and again in 1997. In addition, several Supplement Analyses (SAs) have been issued. In July 2002, DOE issued the WIPP EIS-SA (DOE/EIS-0026-S-2) (DOE 1997). This EIS-SA, supported by the earlier analyses, examined the alternatives associated with the treatment, storage, transportation and disposal of transuranic (TRU) waste at WIPP, located near Carlsbad, New Mexico. On September 6, 2002, DOE issued a revised ROD (67 FR 56989) to allow for shipments from various locations to WIPP. For purposes of the MPF EIS, the analyses and decisions in the WIPP SEIS and ROD represent the No Action Alternative at WIPP. That is, if the Secretary of Energy decides not to proceed with a MPF, or decides not to locate a MPF at WIPP, then DOE would conduct business at WIPP within the framework of the RODs for WIPP EISs and SEISs.

Nonnuclear Consolidation Environmental Assessment, DOE/EA-0792

In June 1993, DOE issued the *Nonnuclear Consolidation Environmental Assessment* (EA) (DOE 1993). This EA analyzed the proposed consolidation of the facilities within the Nation's Nuclear Weapons Complex that manufactured the nonnuclear components used in the Nation's nuclear weapons arsenal. Based on the findings of this EA, on September 14, 1993, DOE issued a Finding of No Significant Impact (FONSI) which resulted in defense activities being withdrawn from the Mound Plant in Miamisburg, Ohio, the Pinellas Plant in Pinellas, Florida, and the nonnuclear activities at the Rocky Flats Plant in Golden, Colorado (58 FR 36658). These activities were relocated and consolidated at the Kansas City Plant in Kansas City, Missouri and Sandia National Laboratories, New Mexico. This action also transferred the tritium handling activities performed at the Mound Plant to SRS. With respect to the MPF EIS, the decision based on this Nonnuclear Consolidation EA would apply equally to all MPF alternatives. That is, nonnuclear components for pits would be produced in existing facilities and shipped to the pit production facility for assembly into pits.

Supplement Analysis, Changes Needed to the Surplus Plutonium Disposition Program

On April 19, 2002, DOE issued an amended ROD (67 FR 19432) for both the *Surplus Plutonium Disposition Final Environmental Impact Statement* (DOE/EIS-0283) (DOE 1999b) and the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE/EIS-0229) (DOE 1996d). This ROD cancelled the immobilization component of the U.S. surplus plutonium disposition program for surplus weapons-usable plutonium described in these two EISs and selected the alternative of immediate implementation of consolidated long-term storage at SRS of surplus non-pit plutonium now stored separately at Rocky Flats. The ROD also explained that DOE's current disposition strategy involves a mixed oxide-only approach, under which DOE would dispose of up to 34 metric tons (37 tons) of surplus plutonium by converting it to mixed oxide fuel and irradiating it in nuclear power reactors. The Supplement Analysis concluded that changes to the mixed oxide facility in the F-Area at SRS to allow for the amended ROD would result in no additional impacts, and that no new or different bounding accident scenarios had been identified. Accordingly, it was determined that the original analysis was sufficient and that a SEIS was not required. Relative to the MPF EIS, the NNSA considered use of the plutonium disposition facilities at SRS, but eliminated this option from detailed study (see Section S.3.4.2).

Environmental Impact Statement for the Chemical and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, DOE/EIS-0350D (CMRR EIS)

DOE/NNSA is currently preparing an EIS for the Chemistry and Metallurgy Research Building Replacement Project (CMRR) at LANL (DOE 2003). The purpose of the CMRR EIS is to evaluate the potential environmental impacts associated with alternatives for replacing the existing Chemistry and Metallurgy Research Building (CMR) at LANL, which is scheduled to be shut down in approximately 2010. The preferred alternative is to construct a new CMRR Facility at TA-55, consisting of two or three buildings. On July 23, 2002, DOE/NNSA published a Notice of Intent (NOI) in the *Federal Register* (67 FR 48160). Public scoping meetings were held in August 2002. DOE/NNSA issued a Draft CMRR EIS in May 2003. The Final CMRR EIS is expected to be issued in late 2003 or early 2004. Under the No Action Alternative and the TA-55 Upgrade Alternative, direct analytical chemistry and metallurgical support would be provided by the existing CMR or the proposed CMRR (see Section S.3.4.5).

S.1.5 Public Scoping Process

Scoping is a process in which the public and stakeholders provide comments directly to the Federal agency on the scope of the EIS. This process begins with the publication of a NOI in the *Federal Register*. On September 23, 2002, DOE published a NOI to prepare the MPF EIS (67 FR 59577) and invited public comment on the MPF EIS proposal. Subsequent to this notice, DOE held public scoping meetings in Amarillo, Texas; Carlsbad, New Mexico; Las Vegas, Nevada; Los Alamos, New Mexico; North Augusta, South Carolina; and Washington, DC. In addition, the public was encouraged to provide comments via mail, e-mail, fax, and the Internet.

A neutral facilitator conducted the meetings to direct and clarify discussions and comments. Court reporters were also present to provide a verbatim transcript of the proceedings and record any formal comments. All scoping meeting comments, along with those received by mail or

Internet during the public scoping comment period, were considered by DOE in preparing this EIS. A summary of the comments received during the public scoping process, as well as DOE's consideration of these comments, is provided in Appendix E of this EIS.

Summary of Major Comments Received

Nearly 1,600 comments were received from individuals, interested groups, and Federal, state, and local officials during the public scoping period, including approximately 480 oral comments made during the public meetings. The remainder of the comments (1,106) was submitted at the public meetings in written form, or were submitted via U.S. mail, e-mail, or fax, over the entire scoping period.

Many of the oral and written comments questioned the need for a MPF. In particular, commentors questioned why the facility was needed since the NOI stated that no problems that would require pit replacements had been found to date. Commentors also quoted several previous DOE documents and DOE and other government officials who stated that both the nuclear and nonnuclear parts of pits in the stockpile were stable and reliable into the foreseeable future.

Other commentors cited a number of studies done by both DOE and independent researchers that demonstrated the stability of plutonium, a main component of a pit, over time; thus commentors felt that until conclusive evidence on pit aging is established, a MPF is not necessary.

Several commentors dismissed the need for the Proposed Action by stating that the PF-4, the current interim production plutonium facility at LANL, analyzed in the 1996 *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE 1996b) for production of up to 80 ppy, already met the needs of pit refurbishment for the nuclear stockpile. Many commentors also noted that the NOI statement that "…DOE has been without the capability to produce plutonium pits…" is alarmist and false, considering the PF-4 capability.

Many commentors raised the issue of international treaties and decisions, particularly the Nuclear Nonproliferation Treaty, the Strategic Offensive Nuclear Reduction Treaty (Moscow Treaty), the Comprehensive Test Ban Treaty, and International Court of Justice Decision, July 1996 opinion, questioning whether a MPF would be consistent with international law. Commentors specifically stated that since the United States had agreed, under the Moscow Treaty, to reduce its number of operationally deployed strategic nuclear weapons to approximately 1,700-2,200, the PF-4 was more than sufficient to meet pit refurbishment needs; thus a MPF would not be necessary. Furthermore, commentors wanted clarity on why "agility," defined in the NOI as the ability to change and expand pit production types and plutonium pit designs simultaneously, was necessary at all considering the United States had committed, under the Moscow Treaty, to reduce its number of weapons.

Other issues raised regarding need included questions on why the several thousand pits in reserve at Pantex could not be used to replace any potentially deteriorating pits in the active nuclear stockpile. Others questioned why a MPF was necessary at all since DOE had created the Stockpile Stewardship Program to monitor the nuclear stockpile. They went on to question that if a MPF were built, why would it be necessary to have both the Stockpile Stewardship Program and a MPF.

A significant number of commentors also expressed concern about the costs associated with building a MPF. Commentors wanted to see the full costs associated with each phase of a MPF: design, construction, operation, transportation of materials, waste handling and final disposition of waste, security, decommissioning, destruction and return of land to its original condition.

Several commentors expressed concern about environmental, safety, and health risks associated with a MPF, particularly the transportation of pit materials and waste across the Nation's highways. DOE representatives were urged to thoroughly evaluate the potential consequences of the Proposed Action on local wildlife, water resources, air quality, the potential for accidents and their consequences, and the health and safety of residents near a prospective site and along transportation routes. Commentors suggested that the EIS quantify all radionuclide and chemical emissions associated with the MPF Alternative. Many were concerned that a MPF would not avoid the waste and contamination problems of the old pit facility at the Rocky Flats Plant, which ceased operations in 1989.

Many commentors also expressed concern about the safety and security of a MPF from terrorist actions both from on the ground and from the sky and wanted to know what measures DOE would implement to prevent such actions.

Many commentors expressed support for the No Action Alternative. More than 70 of the comments received were part of a write-in postcard campaign objecting to nuclear weapons. A number of commentors expressed support for a MPF. Other commentors also expressed favor or opposition to the MPF Alternative, reasons for which included security, cost, and workforce advantage.

Major issues identified through the scoping period are addressed in this EIS by analyses in the following areas:

- Land resources, including land use and visual resources
- Site infrastructure
- Air quality and acoustics
- Water resources, including surface water and groundwater
- Geology and soils
- Biotic resources, including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species
- Cultural and paleontological resources, including prehistoric resources, historic resources, and Native American resources

- Socioeconomics, including employment and local economy, population, housing, community or local government public finances, and local transportation
- Radiological and hazardous chemical impacts during normal operations and accidents
- Waste management
- Transportation of nuclear materials

In addition to analyses in these areas, the EIS also addresses unavoidable impacts and irreversible and/or irretrievable commitment of resources, and impacts of long-term production. A complete listing of the comments that were received, as well as how each specific comment was considered in the analysis of this document, is also included in Appendix E.

S.1.6 Organization of this Environmental Impact Statement

This EIS consists of this summary plus two volumes. Volume I contains the main analyses, while Volume II contains technical appendixes that support the analyses in Volume I, along with additional project information. Volume I contains 11 chapters that include the following information:

Chapter 1—Introduction: MPF EIS background and the environmental analysis process.

Chapter 2—Purpose and Need: Reasons why DOE needs to take action and purposes to be achieved.

Chapter 3—Proposed Action and Alternatives: The way DOE proposes to meet the specified need and achieve the objectives. This chapter also includes a summary comparison of the potential environmental impacts of the EIS alternatives and identifies any preferred alternative.

Chapter 4—Affected Environment: Aspects of the environment that might be affected by the EIS alternatives.

Chapter 5—Environmental Impacts: Analyses of the potential impacts on the environment. Impacts are compared to the projected environmental conditions that would be expected if no action were taken.

Chapter 6—Regulatory Requirements: Environmental, safety, and health regulations that would apply for the EIS alternatives, and agencies consulted for their expertise.

Chapters 7-11: An index; list of references; a list of preparers; a list of agencies, organizations, and persons to whom copies of this EIS were sent; and a glossary.

Volume II contains eight appendixes of technical information in support of the environmental analyses presented in Volume I. These appendixes contain the following information: details of the pit production process and requirements; human health; accidents; transportation; summary of scoping comments; methodology; project studies and notices; and contractor disclosure.

S.2 PURPOSE AND NEED

This section discusses the reasons why the NNSA is proposing to construct and operate a MPF, as well as the goals to be achieved with MPF. This section also discusses relevant national security policies and their relationship to MPF.

S.2.1 Introduction and Need for a Modern Pit Facility

As explained in Section S.1.1, DOE's NNSA is responsible for the safety and reliability of the U.S. nuclear weapons stockpile, including production readiness required to maintain that stockpile. Plutonium pits are an essential component of nuclear weapons. Historically, plutonium pits for the nuclear weapons stockpile were manufactured at the DOE's Rocky Flats Plant in Colorado. At peak production, the Rocky Flats Plant produced a thousand or more pits per year. In 1989, due to environmental and safety concerns, pit production was shut down by the DOE at the Rocky Flats Plant, leaving the Nation without the capability to produce plutonium pits for the nuclear weapons stockpile. Today, the United States is the only nuclear weapons power without the capability to manufacture plutonium pits suitable for use in the nuclear weapons stockpile.[1]

Since approximately 1996, the NNSA has been establishing a small interim pit manufacturing capability at the LANL. While this small interim pit production capacity is expected to be completed in 2007, classified analyses indicate projected capacity requirements (number of pits to be produced over a period of time), and agility (ability to rapidly change from production of one pit type to another, ability to simultaneously produce multiple pit types, or the flexibility to produce pits of a new design in a timely manner) necessary for long-term support of the stockpile will require a long-term pit production capability. In particular, identification of a systemic problem associated with an existing pit type, class of pits, or aging phenomenon cannot be adequately responded to today, nor could it be with the small capability currently being established at LANL. Sections S.2.1.1 and S.2.1.2 discuss pit aging and accelerated aging testing. Sections S.2.1.3 and S.2.1.4 provide a discussion of capacity and agility requirements that would be addressed by the proposed MPF.

S.2.1.1 Pit Aging as a Driver

Modern nuclear weapons have a primary, which contains a central core, the "pit" (typically composed of plutonium-239). Many complex physical and chemical interactions occur during the split second that the primary operates.

However, as materials age, particularly those in nuclear weapons, they tend to change. Age-related changes that can affect a nuclear weapon's pit include changes in plutonium properties as impurities build up inside the material due to radioactive decay, and corrosion along interfaces, joints, and welds. The reliability of the U.S. nuclear weapons stockpile requires that pits will operate as designed.

Although the U.S. nuclear weapons stockpile is presently safe and reliable, these nuclear weapons are aging. The average age of the stockpile is currently about 19 years, and many

[1] NNSA has demonstrated the capability to manufacture development pits at the LANL TA-55 Plutonium Facility.

weapons have exceeded their original design life. In the past, individual weapons in the stockpile were replaced by new-design or upgraded weapons before they approached the end of their design life. However, because the United States has not produced any new nuclear weapons since 1989, some weapons are remaining in the stockpile much longer than previously. This may create issues about the performance capability of stockpile weapons because of uncertainties in the effects of pit aging past the design life. Planning and design of a MPF is a prudent risk management approach to assure readiness to support the stockpile.

S.2.1.2 Assessment of the Pit Lifetime

Pit lifetime is a fundamental uncertainty which NNSA is working to quantify. Currently deployed, enduring stockpile pits will reach their end-of-life (EOL) at some presently unknown future date. (In this context, EOL refers to the time when a weapon system with a particular pit can no longer be certified to meet military characteristics in required environments, due to aging [discussed above in Section S.2.1.1]). In order to determine when this EOL occurs, NNSA must understand aging in plutonium and the effect of aging-related changes on pit performance. The three most important potential aging effects in plutonium result from the radioactive decay of the various plutonium isotopes (and the impact of this decay on the chemistry, structure, and properties of the material), the thermodynamic phase stability of the plutonium alloy, and the corrosion of the plutonium during both storage and function. In many cases, these aging effects accumulate slowly over decades, and not necessarily in a linear fashion. Only when key properties have sufficiently changed would NNSA anticipate a measurable impact on weapons safety or performance. Through the process of accelerated plutonium aging experiments, model development of the age-related changes, and design sensitivity studies, weapons designers are working to specify the limits of acceptable change for each of these properties by evaluation of performance margins associated with each system. By combining these limits with the measured or predicted rates of change due to aging effects, NNSA expects to improve estimates for pit lifetimes.

A series of experiments are being conducted to measure the properties (fundamental structural, physical, chemical and mechanical properties, such as electrical resistivity and elastic constants, and metallic properties such as density, chemistry and strength) of the accelerated-aging plutonium samples as they age beyond the oldest plutonium in the stockpile. The results from accelerated aging experiments will be used in design analyses and further tests to assess the potential impact of aging on the performance of weapons. Based on information developed to date, which includes careful evaluation of the effects described above through extensive characterization of old pits, modeling, and preliminary design sensitivity calculations, initial estimates of minimum pit lifetimes have been derived. Evaluation of the oldest samples of plutonium metal, both metal of oldest absolute age (40 years) as well as the oldest samples most directly comparable to the enduring stockpile (25 years) have shown predictably stable behavior. Hence, the NNSA weapons laboratories have determined that pits will perform adequately for 45-60 years. Moreover, continuing research will strengthen the linkage between changes resulting from aging, key properties, and weapons performance as determined by prior nuclear tests.

During the public scoping period, some commentors questioned whether plutonium pits degrade over time. Many cited an article written by Raymond Jeanloz that appeared in *Physics Today* in

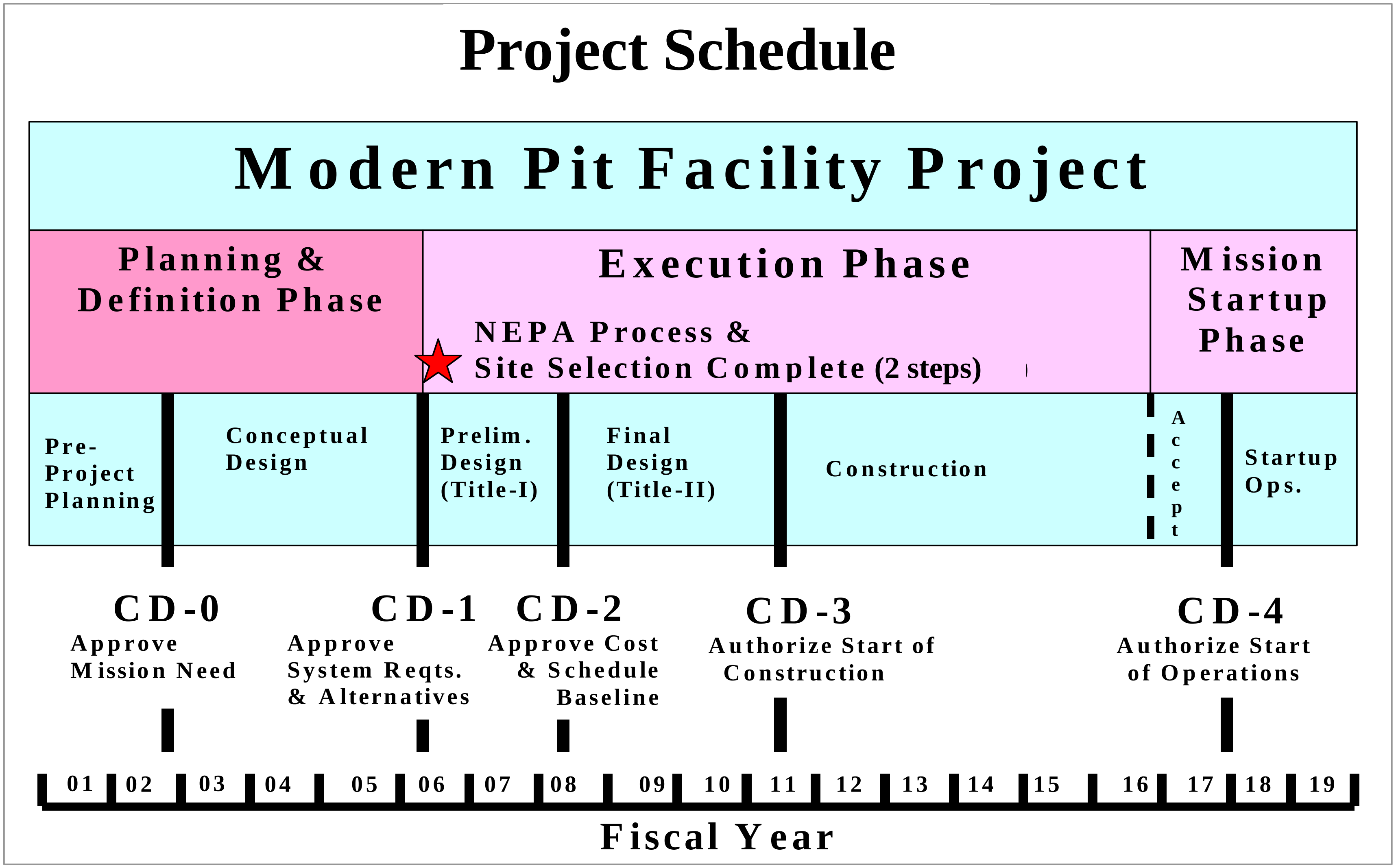
December 2000, in which Professor Jeanloz concluded that, "Plutonium exhibits good crystalline order even after decades of aging." Professor Jeanloz suggested this as evidence that phase stability was not a likely concern. Unfortunately, recent local-structure measurements by the weapons laboratories have demonstrated the immense complexity of local atomic arrangements in the crystalline plutonium lattice and increased delta-phase stability with aging cannot be assumed. Although measurements of naturally aged plutonium have shown macroscopic delta-phase stability over time, NNSA is examining the local structure picture carefully in the accelerated aging program to assure that the 45-60 year pit lifetime remains valid.

NNSA has made substantial progress in the past few years in achieving a fundamental understanding of some of the age-related changes in plutonium. The theoretical, modeling, and experimental components are now in place to make significant progress over the next few years to quantify the margins and uncertainties. NNSA is encouraged that measurements to date have not shown any significant degradation of pits over approximately 40 years. The changes observed to date have been quite small, giving both LANL and LLNL investigators reasonable confidence in the 45-year minimum lifetime estimate based on the data collected to date.

S.2.1.3 Capacity as a Driver

Most of the pits in the enduring stockpile were produced in the mid-to-late 1970s and 1980s, and no pits have been produced since 1989. In approximately 2020, some pits in the enduring stockpile will be approaching the 45-year pit lifetime. Given the fact that many types of pits in the enduring stockpile may reach their EOL at about the same time (see Section S.2.1.4), prudent risk management requires that NNSA initiate action now to ensure that appropriate pit production capacity is available when needed. As shown on Figure S.2.1.3–1, it will take approximately 17 years to design and construct a MPF before full-scale production can begin. Consequently, in order for a MPF to be in production by approximately 2020, planning for such a facility must begin now.

It should also be noted that the size and composition of the enduring stockpile are also uncertain. In classified analyses, the NNSA has considered possible futures in which the stockpile size could be reduced to 1,000 total weapons or in which it could be as large as required to meet Nuclear Posture Review (NPR) requirements. Although the precise future capacity requirements are not known with certainty, enough clarity has been obtained through these ongoing classified studies (which are part of the classified appendix to this MPF EIS) that NNSA can identify a range of pit production capacity requirements that form the basis of initial MPF alternative evaluations during the conceptual design phase. The classified studies examined capacity requirements that would result from a wide range of enduring stockpile sizes and compositions, pit lifetimes, emergency production needs (referred to as "contingency" requirements), facility full-production start dates, and production operating practices, e.g., single versus multiple shifts.



Source: NNSA 2002.

Figure S.2.1.3–1. Modern Pit Facility Project Schedule

Pit capacity requirements must also account for the need for additional pits, e.g., logistics spares and surveillance units. As a result of this requirement, the number of pits that must be available to support a specific weapon system will exceed the number of deployed strategic weapons and vary by pit type.

Contingency production requirements are also an important driver for the need for a MPF. Contingency production, which is the ability to produce a substantial quantity of pits on short notice, is distinct from the capacity needed to replace pits destroyed for surveillance or other reasons (such as for production quality assurance or other experiments). The capacity of a MPF needs to support both scheduled stockpile pit replacement at EOL and any "unexpected" short-term production. Such short-term "contingency" production may be required for reliability replacement (replacement of pits to address, for example, a design, production, or unexpected aging flaw identified in surveillance), or for stockpile augmentation (such as the production of new weapons, if required by national security needs).

In all cases, and in all combinations with other capacity drivers, the interim production capacity being established at LANL will be inadequate to maintain these projected stockpiles. The required production capacity is a function of pit lifetime, stockpile size, and start date of full-scale production. To account for these variables, this MPF EIS evaluates a pit production capacity between 125-450 ppy for full-scale production beginning in approximately 2020.

S.2.1.4 Agility as a Driver

A critical element of production readiness is the agility (the ability to change rapidly from the production of one pit type to another, or to simultaneously produce different pit types) of the production line. Pits in the current enduring stockpile were produced over a relatively short period of time and can therefore be expected to reach their respective EOLs at about the same time, as well. Thus, any strategy to replace the enduring stockpile pits before they reach their EOL must address both the production rate for a particular pit type (the capacity driver discussed in Section S.2.1.1), and the ability to produce all necessary pit types in a relatively short period of time. For this reason, agility is an essential requirement for a MPF.

Contingency production also requires agility. If contingency production is ever needed, the response time will likely be driven by either a reliability problem that requires prompt response, or another type of emergency that must be addressed quickly. Thus, changeover from production of one pit type to another will have to be demonstrated for both replacements of pits at EOL (a process that will allow for planning and scheduled activities in advance of the need date), as well as for startup of contingency production with little notice (and therefore little planning time).

S.2.2 Purposes to be Achieved by a Modern Pit Facility

If constructed and operated, a MPF would address a critical national security issue by providing sufficient capability to maintain, long-term, the nuclear deterrent that is a cornerstone of U.S. national security policy. A MPF would provide the necessary pit production capacity and agility that cannot be met by pit production capabilities at LANL.

As explained in Section S.1.4, this EIS and NEPA process will support a ROD by the Secretary of Energy on: (1) whether to proceed with a MPF; and (2) if so, where to locate a MPF. A siting decision would enable NNSA to better focus detailed design activities and to improve the efficiency and cost-effectiveness of pre-construction activities. If the Secretary decides to proceed with a MPF, a tiered, project-specific EIS would be prepared after the MPF EIS ROD. That tiered EIS, which would utilize detailed design information to evaluate site-specific location alternatives in the vicinity of the host site picked in the MPF EIS ROD, would ultimately support a ROD for construction and operation of a MPF.

S.2.3 National Security Policy Considerations

There are several principal national security policy overlays and related treaties that are potentially relevant to the proposal to construct and operate the MPF, such as: the NPR; the Nuclear Weapons Stockpile Memorandum and the corresponding Nuclear Weapons Stockpile Plan; the Nuclear Nonproliferation Treaty (NPT), and the Comprehensive Test Ban Treaty. Each of these is discussed below.

S.2.3.1 Nuclear Posture Review

In 2001, Congress required the DOD, in consultation with DOE, to conduct a comprehensive review of the nuclear posture of the United States for the next 5-10 years. The resulting classified report to Congress, entitled the *Nuclear Posture Review*, addresses the following elements:

- The role of nuclear forces in U.S. military strategy, planning, and programming
- The policy requirements and objectives for the United States to maintain a safe, reliable, and credible nuclear deterrence posture
- The relationship among the U.S. nuclear deterrence policy, targeting strategy, and arms control objectives
- The levels and composition of the nuclear delivery systems that will be required for implementing the U.S. national and military strategy, including any plans for replacing or modifying existing systems
- The nuclear weapons complex that will be required for implementing the U.S. national and military strategy, including any plans to modernize or modify the complex
- The active and inactive nuclear weapons stockpile that will be required for implementing the U.S. national and military strategy, including any plans for replacing or modifying warheads

With respect to the Proposed Action in this EIS, the NPR confirms that a MPF production facility will be required for large-scale replacement of existing plutonium components and any production of new designs. The NPR also recommends that the DOE/NNSA "accelerate preliminary design work on a modern pit manufacturing facility so that production capacity can be brought online when needed."

S.2.3.2 Nuclear Weapons Stockpile Memorandum and Nuclear Weapons Stockpile Plan

Although the NWSP and NWSM are classified documents, their effect in shaping the MPF EIS can be explained in an unclassified context. As explained in Section S.1.3, the NWSP specifies the types and quantities of nuclear weapons required, and sets limits on the size and nature of stockpile changes that can be made without additional approval by the President. The NWSM, which is jointly signed by the Secretaries of Defense and Energy, includes the NWSP and a long-range planning assessment. As such, the NWSM is the basis for NNSA stockpile support planning. The NWSP and NWSM are highly dependent upon national security objectives determined by the President. In this regard, the United States has committed to reduce the number of operationally deployed strategic nuclear weapons to 1,700-2,200 in 2012.

S.2.3.3 Nuclear Nonproliferation Treaty

The NPT was ratified by the U.S. Senate in 1969 and officially entered into force as a Treaty of the United States in 1970. Today, the United States continues to view the NPT as the bedrock of the global effort to prevent the spread of nuclear weapons and to reduce nuclear weapons stockpiles. Article VI of the NPT obligates the parties "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control." The United States has taken this obligation seriously and has reduced its nuclear weapons stockpile. Some examples are the 1987 Treaty on Intermediate Range Nuclear Forces, which eliminated an entire class of nuclear weapon systems; and the 1991 Presidential Nuclear Initiative, which led to the withdrawal and destruction of thousands of U.S. nonstrategic nuclear weapons. U.S. and Russian cooperation throughout the 1990s has led to continued reductions in nuclear weapons and the withdrawal of hundreds of tons of fissile material from defense stockpiles. The 1991 Strategic Arms Reduction Treaty led to significant reductions in the number of deployed strategic nuclear warheads. In the future, the United States will require far fewer nuclear weapons. Accordingly, President Bush has decided that the United States will reduce its operationally deployed strategic nuclear weapons to a level between 1,700 and 2,200 over the next decade.

It must be noted that the NPT does not provide any time period for achieving the ultimate goal of nuclear disarmament nor does it preclude the maintenance of nuclear weapons until their disposition. For this MPF EIS, speculation on the terms and conditions of a "zero level" U.S. stockpile, as some have suggested during the scoping meetings, goes beyond the bounds of the reasonably foreseeable future consistent with the NPR. The Proposed Action in this EIS, which would enable NNSA to maintain the reliability of the enduring stockpile until the ultimate goals of the NPT are attained, is consistent with the NPT.

S.2.3.4 Comprehensive Test Ban Treaty

The Comprehensive Test Ban Treaty, which bans all nuclear explosions for civilian or military purposes, was signed by the United States on September 24, 1996, but has never been ratified by the U.S. Senate. Nonetheless, the United States has been observing a moratorium on nuclear testing since 1992, and the NPR strategy discussed in Section S.2.3.1 reflects this policy. The

Proposed Action in this EIS would be consistent with a continuing U.S. moratorium or a Comprehensive Test Ban Treaty.

S.3 ALTERNATIVES

S.3.1 Pit Production Operational Requirements

This EIS analyzes the impacts from the construction and operation of a new facility, referred to as a MPF, to produce plutonium pits for nuclear weapons. In addition to the construction of a totally new facility, an option to upgrade the existing TA-55 Facility at the LANL to increase its output is analyzed as well as the No Action Alternative. This section discusses the overall pit production process, and lists the facility requirements necessary to accommodate this process. The MPF is in a conceptual design stage.

S.3.1.1 Pit Production Process

The following discussion is a brief summary of the pit production process that would be accomplished in a MPF. The overall process is depicted in Figure S.3.1.1–1 which shows three main areas: Material Receipt, Unpacking, & Storage; Feed Preparation; and Manufacturing.

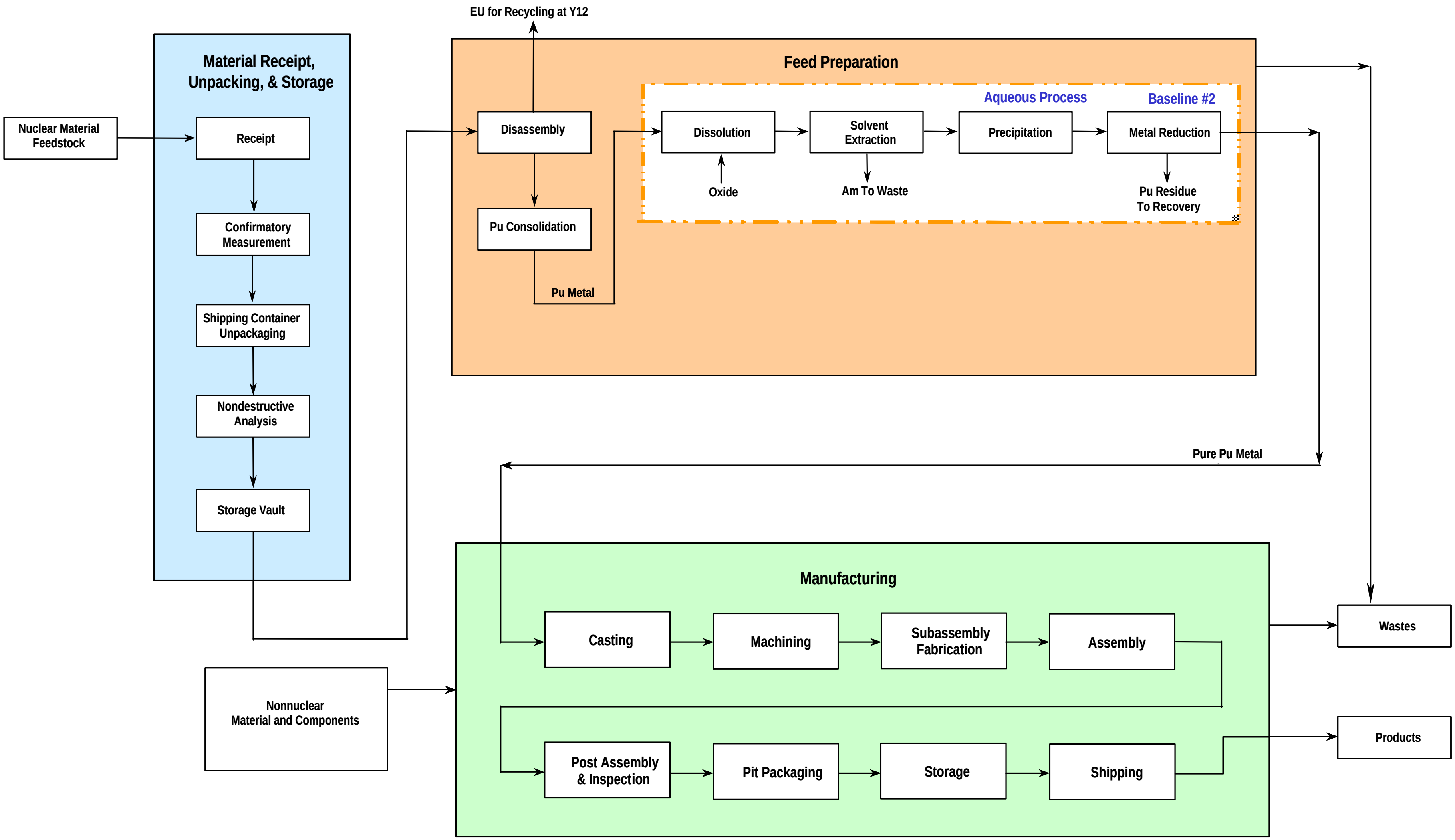
Material Receipt, Unpacking, & Storage

Plutonium feedstock material would be delivered from offsite sources in DOE/Department of Transportation (DOT) approved shipping containers, hauled by Safe Secure Trailers (SST) or Safeguards Transporters (SGT). The bulk of the feedstock material would be in the form of pits from old weapons to be recycled with small amounts of plutonium metals from LANL and SRS. Each shipment would be measured to confirm the plutonium content, entered into the facility's Material Control & Accountability (MC&A) database, and placed into temporary storage. Containment vessels with the feedstock material would then be accountability measured and transferred to the Receipt Storage Vault pending transfer to the Feed Preparation Area.

Feed Preparation

The containers would then be transferred through a secure transfer corridor to an adjacent Feed Preparation Area where plutonium metal is prepared for manufacturing. For pits to be recycled, mechanical disassembly involves cutting the pit in half and removing all non-plutonium components. Notable among these non-plutonium components is enriched uranium, which would be decontaminated and then shipped to the Y-12 National Security Complex for recycling. All of the other disassembled components would be decontaminated to the maximum extent possible and then disposed of as either low level waste (LLW) or TRU waste as appropriate.

There are two baseline processes being evaluated for the purification of the plutonium metal. One baseline relies more heavily on aqueous chemistry (aqueous process) and the other on pyrochemical reactions (pyrochemical process). The primary difference between the two baselines is that the aqueous process does not employ chloride containing aqueous solutions, which means conventional stainless steels can readily be used to contain all of its processes. On the other hand the pyrochemical process requires specialized materials to contain the corrosive chloride bearing solutions that it employs.



Am = Americium.
EU = Enriched Uranium.
Pu = Plutonium.
Source: Modified from NNSA 2002.

Figure S.3.1.1–1. Modern Pit Facility Flow Process

The primary process evaluated in this EIS is the aqueous process. This is a well-known process that has been successfully used at DOE sites for many years. It is comparatively simple and experiences few, but well controlled corrosion problems. However, it is not as space efficient and does not produce as pure a product metal as the pyrochemical process. This lower purity requires more complete processing and historically the aqueous process produces significantly more waste than the pyrochemical process. This provides a bounding analysis of the waste impact from a MPF.

The pyrochemical process is more complex than the aqueous process, employing seven versus four major processing steps. However, this can be done in less space with more processing flexibility. It also produces very pure metal and a lower volume of waste. The purity of metal allows the pyrochemical process to have the option of only partially processing metallic plutonium to obtain adequate production purity. Although it requires special materials of construction to contain the corrosive chloride solutions it appears to have the greatest potential for improvement based on results from ongoing technology development projects. The pyrochemical process has been used for many years at LANL.

The pyrochemical process is being investigated because it has the potential to be environmentally more benign, thus having less environmental impact than the aqueous process. The impacts from both of these processes will therefore be bounded in this EIS. As the design of the MPF develops and a final purification method is chosen, the site-specific tiered-EIS will evaluate the impact of the actual process to be used.

Manufacturing

The plutonium metal resulting from the purification process would be transferred to the manufacturing area where it would be melted and cast into required shapes in a foundry operation. These castings would be machined to proper dimensions, combined with other non-plutonium parts, and assembled into pits. New pits would be inspected and prepared for storage and eventual shipment to Pantex.

S.3.1.2 Modern Pit Facility Requirements

Aside from the question of when a MPF would need to become operational, the question of design size of a MPF is next in importance. Design size would be primarily affected by both the operational lifetime of pits and the size of the stockpile. Since there is uncertainty over both these issues (see Section S.2), the final design size of a MPF has not yet been determined. These uncertainties have been evaluated in classified studies. Three levels of production are evaluated to provide a reasonable range for analysis in this MPF EIS. These are 125, 250, and 450 pits per year in a single-shift operation. To accommodate these three production rates, this EIS analyzes three different plant sizes. Another consideration is the contingency or surge use of two-shift operations for emergencies.

Security

The majority of the facilities of a MPF would be located within a Perimeter Intrusion Detection and Assessment System (PIDAS). The PIDAS is a multiple sensor system within a 9-m (30-ft) wide zone enclosed by two fences that surround the entire Security Protection Area. In addition, there would be 6-m (20-ft) clear zones on either side of the PIDAS. There would be an Entry Control Facility (ECF) at the entrance to the Security Protection Area.

Process Buildings

A proposed concept being evaluated for a MPF divides the major plant components into three separate process buildings identified as Material Receipt, Unpacking, & Storage; Feed Preparation; and Manufacturing. The process buildings would be two-story reinforced concrete structures located above ground at grade.

The first story of each building would include plutonium processing areas, manufacturing support areas, waste handling, control rooms, and support facilities for operations personnel. The second story of each of the three process buildings would include the heating, ventilating, and air conditioning (HVAC) supply fans, exhaust fans and high-efficiency particulate air (HEPA) filters, breathing/plant/instrument air compressor rooms, electrical rooms, process support equipment rooms, and miscellaneous support space. Each of these processing buildings would have its own ECF, truck loading docks, operations support facility, and safe havens designed in accordance with applicable safety and security requirements. The three process buildings would be connected with secure transfer corridors.

Support Buildings Within the Perimeter Intrusion Detection and Assessment System

The major support structures located within the PIDAS would include the Analytical Support Building and the Production Support Building. The Analytical Support Building would contain the laboratory equipment and instrumentation required to provide analytical chemistry and metallurgical support for the MPF processes, including radiological analyses. The Production Support Building would provide the capability for performing nonradiological classified work related to the development, testing, staging, and troubleshooting of MPF processes and equipment during operations. A number of other smaller structures also supporting the MPF would include the standby generator buildings, fuel and liquid gas storage tanks, HVAC chiller buildings, cooling towers, and the HVAC exhaust stack.

Support Buildings Outside the Perimeter Intrusion Detection and Assessment System

The major structures located outside the PIDAS would include the Engineering Support Building, the Commodities Warehouse, and the Waste Staging/TRU Packaging Building. This Waste Staging/TRU Packaging Building would be used for characterizing and certifying the TRU waste prior to packing and short-term lag storage prior to shipment to the TRU waste disposal site. Parking areas and stormwater detention basins would also be located outside the PIDAS. In addition, a temporary Concrete Batch Plant and Construction Laydown Area would be required during construction.

A generic layout showing the major buildings and their relationship to each other is shown in Figure S.3.1.2–1. Table S.3.1.2–1 shows the dimensions involved for the three different plant capacities.

Table S.3.1.2–1. Dimensions for the Three Different MPF Capacities

	125 ppy	250 ppy	450 ppy
Processing Buildings Footprint (m^2)	28,600	32,800	44,900
Support Buildings Footprint (m^2)	26,000	26,200	29,900
Total Buildings Footprint (m^2)	54,600	59,000	74,800
Total Buildings Footprint (ha)	5.46	5.90	7.48
Area inside PIDAS (ha)	25.5	26.3	31.6
Area Developed During Construction (ha)	56.3	58.3	69.2
Post Construction Developed Area (ha)	44.5	46.5	55.8

Source: MPF Data 2003.

S.3.1.3 Differences Between a Modern Pit Facility and the Rocky Flats Plant

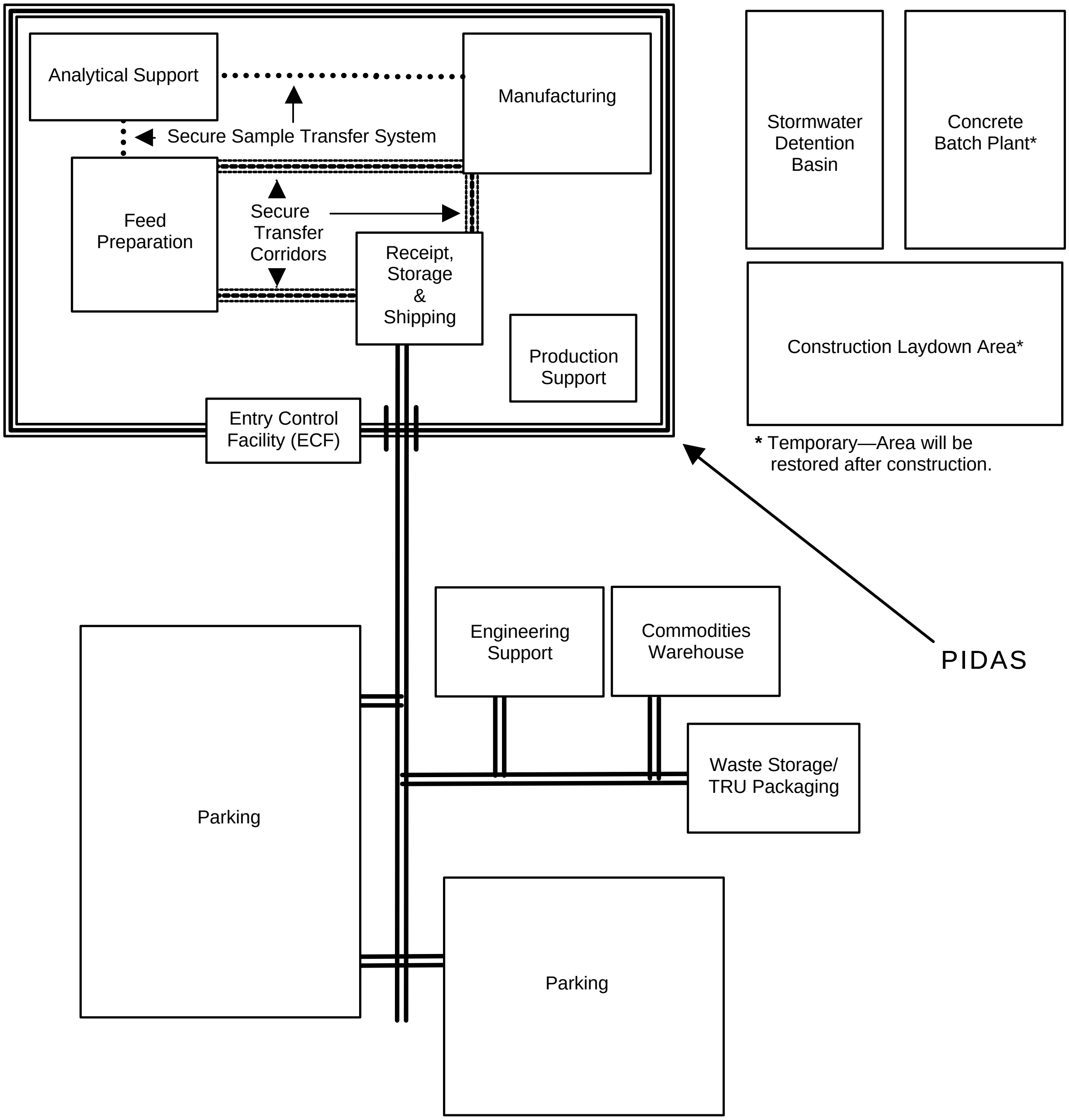
A MPF would be designed and operated to minimize risk to both workers and the general public during normal operations and in the event of an accident. Benefiting from decades of experience, the MPF would employ modern processes and manufacturing technologies and would utilize an oversight structure for safety, environmental protection, and management oversight that has been established since Rocky Flats ceased operations.

Building Design

Modern safety and security design standards of today require substantially different structures from the earlier pit manufacturing facilities at the Rocky Flats Plant, near Golden, Colorado. The buildings at the Rocky Flats Plant were constructed in the 1950s with metal roof sheeting covered by a built-up weather seal. In contrast, the exterior walls and roof of PF-4 (the current interim production plutonium machining facility at LANL) are constructed of reinforced concrete more than a foot thick. Internal walls at PF-4 are designed to provide multiple-hour fire barriers between wings. A MPF would be designed with similar improvements over practices at Rocky Flats.

Fire Control

Although DOE experienced accidents associated with the manufacture of plutonium pits, most of these accidents occurred in a relatively short time period (from 1966-1969) at the Rocky Flats Plant. The majority of these accidents involved plutonium metal and chips undergoing spontaneous ignition. Such events can occur when the environment they are in allows for the rapid oxidation of plutonium, often in association with a moist air environment. Efforts at Rocky Flats concentrated on the elimination of such fires. It is now recognized that potential for fire initiation cannot be totally eliminated. Although the frequency and severity of fires can be reduced through the management of combustible materials and facility design, such events are now anticipated and planned for in the structural and process design and operational procedures. Engineering monitoring systems would be activated if a fire occurs. These systems would activate controls and procedures to control, quickly suppress, and contain fires within the specific originating glovebox, minimizing the risk to workers and the general public.



Source: Modified from MPF Data 2003.

Figure S.3.1.2–1. Generic Layout of a Modern Pit Facility

Today, plutonium machining activities are conducted in gloveboxes supplied with an inert gas. Furthermore, gloveboxes are now equipped with exhaust filter systems. All working areas are separately vented with systems containing HEPA filters. These HEPA filters are fabricated of special nonflammable bonded material. Filter plenums are equipped with an automatic cooling system to reduce the temperature of the air reaching the final stages of HEPA filters. Unlike Rocky Flats, a MPF would have an automatic fire detection and suppression system designed to meet the latest National Fire Protection Association life safety codes and standards for manufacturing facilities. The design features would include multiple zones for both fire detection and suppression to assure that any fire which may occur would be isolated in small, separated areas of the facility, and thereby preclude the spread of fire to other separated areas or the entire building.

Waste Management and Material Control

A MPF would have a dedicated waste handling area capable of preparing waste for transport in accordance with established procedures and waste acceptance requirements. In addition, all waste streams to be generated by the MPF would have an established disposition path for each alternative being considered. Since the MPF EIS analyzes operations over a 50-year period, it is reasonable to expect that some disposition paths may change. A MPF would utilize a stringent Material Control and Accountability System to accurately account for all special nuclear material.

S.3.1.4 TA-55 Upgrade Facility Requirements

The TA-55 Upgrade Alternative (80 ppy) would involve expanding the current pit production capabilities of plutonium facilities in Building PF-4 up to approximately 80 pits per year without expanding the size of the building. To do this, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or downsized and consolidated within PF-4. Material characterization and chemical analyses would be performed at another LANL facility.

The TA-55 Upgrade Alternative differs from a MPF in several important aspects that derive from upgrading existing facilities. First, a production level of only 80 ppy is the maximum deemed feasible and is used in this analysis. Next, the MPF design life of 50 years may not be achievable by a facility that will have already operated about 40 years before achieving these increased production levels. Since equipment for feed material preparation, recovery of metal from scrap, and waste processing already exist in this building, feed preparation will use the pyrochemical process to purify material in conjunction with aqueous processing of recoverable residues.

Additionally, all production functions—Receipt and Storage, Feed Preparation, Manufacturing, and Analytical Support—will be performed within a single PIDAS at TA-55 in buildings connected by secure transfer corridors. Feed preparation and manufacturing will be performed in PF-4 and analytical support functions will be performed at another LANL facility. PF-4 will be upgraded as appropriate to perform required material receipt and storage functions.

PF-4 Alterations

Additional space for pit manufacturing would be obtained by expanding into laboratory space currently used for processing operations that are unrelated to pit manufacturing. In this option, these activities would have to be relocated to another facility or downsized/consolidated (with a subsequent reduction of capacity) and the vacated space used for pit manufacturing support. The affected activities include analytical chemistry and materials characterization (AC and MC) operations. Approximately 511 m^2 (5,500 ft^2) of floorspace would be realized by moving the AC and MC operations out of PF-4.

Modifications to the facility would include major upgrades to the residue recovery/metal feed facilities in the 400 Area of PF-4. Many of the gloveboxes in this part of the facility would have to be replaced. Replacement of these older gloveboxes would be required to ensure that the recovery/feed process operations are adequate to supply plutonium metal to the manufacturing operations. There would also be significant glovebox decontamination/decommissioning/ disposal operations as new process development and certification operations are moved into other areas of PF-4. In addition, various manufacturing equipment will be added to or replaced in the fabrication areas of PF-4 to increase capacity and reliability.

To obtain the required space in PF-4 and to expand the pit manufacturing production to greater than 20 pits per year, consolidation of plutonium-238 operations and relocation of plutonium-239 oxide characterization operations within the facility would be necessary. Consolidation of plutonium-238 operations from approximately 790 m^2 (8,500 ft^2) to about 641 m^2 (6,900 ft^2) of laboratory space would reduce the capacity, but not eliminate the capability, for heat source fabrication. Additional space could be obtained by moving some plutonium-239 oxide characterization operations (214 m^2 [2,300 ft^2]) from one laboratory to the upgraded 400 Area and by acquiring space from some programs that would be completed in the 2015 to 2020 timeframe when space is needed for expanding pit production capacities.

Support Facilities

Modifications to existing facilities at TA-55 would be to accommodate additional workers employed in pit manufacturing. As the capacity of the pit fabrication operations is increased, the plant ingress/egress requirement for plutonium workers also increases. This results in the need for additional space for the increased access/egress as well as additional change rooms. New engineering support facilities containing a cold (nonradiological) laboratory, additional office space, and a warehouse for receipt and storage of nonradioactive materials and parts would have to be constructed. The cold laboratory is needed for cold process development, staging, training, and as space for uncleared workers. Office space at TA-55 is currently oversubscribed and increasing the pit fabrication capacity would require additional space.

The Radioactive Liquid Waste Treatment Facility (TA-50) and the Solid Waste Management Facility (TA-54) would be capable of processing the waste streams from PF-4 even with the enhanced fabrication mission of 80 ppy. A small glovebox decontamination/handling facility at TA-54 that is specifically designed to prepare decommissioned gloveboxes for shipment to the Waste Isolation Pilot Plant as TRU waste or burial as low-level waste would be required. This facility is required because the modifications in this alternative would entail the removal of approximately 140 gloveboxes over the course of about 10 years. The new decontamination/handling facility would perform decontamination, size-reduction, packaging, and/or other activities necessary to satisfy the waste acceptance or burial criteria.

The construction of these new facilities would result in an addition of approximately 1.0 ha (2.5 ac) to the permanent TA-55 footprint with 2.5 ha (6.2 ac) total area disturbed during construction. The actual removal of the gloveboxes from PF-4 and decontamination/ decommissioning are not included as part of the construction process, and the workers and waste resulting from these activities are not included in the construction data presented in Section 3.1.4.3 of this EIS. Because the removal of the approximately 140 gloveboxes would take place over a 10-year period, the requirements and wastes from the activity are included with the operational values.

S.3.2 Development of Reasonable Alternatives and Environmental Impact Statement Scope

S.3.2.1 Planning Assumptions and Basis for Analysis

This MPF EIS evaluates reasonable alternatives in order to decide: (1) whether to proceed with construction and operation of a MPF; and (2) if so, where to locate a MPF. Five alternatives are evaluated for a new MPF: (1) Los Alamos Site, New Mexico; (2) Nevada Test Site, (3) Carlsbad Site, New Mexico; (4) Savannah River Site, South Carolina; and (5) Pantex Site, Texas. For the five MPF site alternatives, the EIS evaluates the environmental impacts associated with constructing and operating the MPF to produce sufficient quantities of plutonium pits to support the U.S. nuclear stockpile. In addition, the EIS evaluates the environmental impacts associated with expanding operations at TA-55 while upgrading the existing TA-55 facilities (TA-55 Upgrade Alternative). Some of the more specific assumptions and considerations that form the basis of the analyses and impact assessments that are the subject of this EIS are presented below.

- As required by the Council on Environmental Quality (CEQ) regulations, the MPF EIS evaluates a No Action Alternative. The No Action Alternative would utilize the capabilities currently being established at LANL for interim capacity to meet the Nation's long-term needs for pit manufacturing. Under the No Action Alternative, NNSA would not proceed with a MPF, which might limit the ability to maintain, long-term, the nuclear deterrent that is a cornerstone of U.S. national security policy. In previous NEPA documents (the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, DOE/EIS-0236 and the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, DOE/EIS-0238 [LANL SWEIS]), DOE evaluated the environmental impacts associated with producing up to 50-80 ppy at LANL; however, the ROD for the LANL SWEIS limited production to 20 ppy. Thus, under the MPF EIS No Action Alternative, NNSA could produce up to 20 ppy for the foreseeable future.
- In the LANL SWEIS, DOE committed to provide appropriate NEPA review to implement manufacturing capacity beyond 20 ppy. This MPF EIS provides NEPA coverage for nominal pit production up to approximately 80 ppy at LANL under the TA-55 Upgrade Alternative. Construction activities (primarily the addition of office space) associated with

approximately 140 gloveboxes over the course of about 10 years. The new decontamination/handling facility would perform decontamination, size-reduction, packaging, and/or other activities necessary to satisfy the waste acceptance or burial criteria.

The construction of these new facilities would result in an addition of approximately 1.0 ha (2.5 ac) to the permanent TA-55 footprint with 2.5 ha (6.2 ac) total area disturbed during construction. The actual removal of the gloveboxes from PF-4 and decontamination/ decommissioning are not included as part of the construction process, and the workers and waste resulting from these activities are not included in the construction data presented in Section 3.1.4.3 of this EIS. Because the removal of the approximately 140 gloveboxes would take place over a 10-year period, the requirements and wastes from the activity are included with the operational values.

S.3.2 Development of Reasonable Alternatives and Environmental Impact Statement Scope

S.3.2.1 Planning Assumptions and Basis for Analysis

This MPF EIS evaluates reasonable alternatives in order to decide: (1) whether to proceed with construction and operation of a MPF; and (2) if so, where to locate a MPF. Five alternatives are evaluated for a new MPF: (1) Los Alamos Site, New Mexico; (2) Nevada Test Site, (3) Carlsbad Site, New Mexico; (4) Savannah River Site, South Carolina; and (5) Pantex Site, Texas. For the five MPF site alternatives, the EIS evaluates the environmental impacts associated with constructing and operating the MPF to produce sufficient quantities of plutonium pits to support the U.S. nuclear stockpile. In addition, the EIS evaluates the environmental impacts associated with expanding operations at TA-55 while upgrading the existing TA-55 facilities (TA-55 Upgrade Alternative). Some of the more specific assumptions and considerations that form the basis of the analyses and impact assessments that are the subject of this EIS are presented below.

- As required by the Council on Environmental Quality (CEQ) regulations, the MPF EIS evaluates a No Action Alternative. The No Action Alternative would utilize the capabilities currently being established at LANL for interim capacity to meet the Nation's long-term needs for pit manufacturing. Under the No Action Alternative, NNSA would not proceed with a MPF, which might limit the ability to maintain, long-term, the nuclear deterrent that is a cornerstone of U.S. national security policy. In previous NEPA documents (the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management*, DOE/EIS-0236 and the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, DOE/EIS-0238 [LANL SWEIS]), DOE evaluated the environmental impacts associated with producing up to 50-80 ppy at LANL; however, the ROD for the LANL SWEIS limited production to 20 ppy. Thus, under the MPF EIS No Action Alternative, NNSA could produce up to 20 ppy for the foreseeable future.
- In the LANL SWEIS, DOE committed to provide appropriate NEPA review to implement manufacturing capacity beyond 20 ppy. This MPF EIS provides NEPA coverage for nominal pit production up to approximately 80 ppy at LANL under the TA-55 Upgrade Alternative. Construction activities (primarily the addition of office space) associated with

the upgrade would begin in approximately 2008 and end in approximately 2012. However, production of 80 ppy would not be possible until replacement of all gloveboxes would be completed by approximately 2018.

- If the Secretary decides to build and operate the proposed MPF at one of the five site alternatives, construction would begin in approximately 2011, peak in 2014, and last about 6 years. Mission start-up and initial operations would occur between 2017 and 2019, with full-scale production beginning in 2020. Because a MPF would be designed for a service life of at least 50 years, the EIS assesses the environmental impacts associated with the operation of a MPF for a period of 50 years, at which time the structures would undergo decontamination and decommissioning (D&D).

- The MPF is in a conceptual design stage. As such, best available design information for the analysis is contained in this EIS (see the descriptions of a MPF in Sections S.3.1 and Appendix A). For the purpose of the environmental impact analysis, assumptions have been used such that construction requirements and operational characteristics of the MPF would maximize the environmental impacts. Thus, the potential impacts from the implementation of any MPF final designs are expected to be less severe than those analyzed in this EIS.

- The exact size and composition of the enduring stockpile is determined on an annual basis as explained in Sections S.1.1.3. In the classified appendix to a MPF EIS, the NNSA has considered a range of future stockpiles. Based on current long-range planning consistent with the NPR, NNSA must be capable of supporting a stockpile of approximately 1,700-2,200 strategic deployed weapons in 2012 and beyond. Classified studies have examined capacity requirements that would result from a wide range of enduring stockpile sizes and compositions, pit lifetimes, emergency production needs (referred to as "contingency" requirements), and facility full-production start dates. Although the precise future capacity requirements are not known with certainty, enough clarity has been obtained through these ongoing classified studies that the NNSA has identified a range of pit production capacity requirements (125-450 ppy) that form the basis of the capacity evaluations in this EIS. The EIS evaluates the impacts of a MPF designed to produce three capacities: 125 ppy, 250 ppy, and 450 ppy. A pit lifetime range of 45-60 years is assumed.

- For each of the capacities (125 ppy, 250 ppy, and 450 ppy), the EIS evaluates the environmental impacts associated with single-shift operations 5 days per week, as this represents the most likely long-term, normal operating scenario for the MPF. However, if national security requirements ever demand, the MPF could be operated in a two-shift mode to produce more pits than in the single-shift mode. Because the environmental impacts associated with single-shift production of 250 ppy would bound the impacts associated with two-shift production in a 125 ppy plant, no additional NEPA analysis would be necessary for this scenario. Likewise, because the environmental impacts associated with single-shift production of 450 ppy would bound the impacts associated with two-shift production in a 250 ppy plant, no additional analysis would be necessary for this scenario. For the 450 ppy capacity, the EIS assesses the environmental impacts of two-shift operations in a qualitative sensitivity analysis.

- This EIS does not support decisions to select a specific location at any DOE site alternative for a MPF. However, initial reference locations have been identified at each site, consistent with the environmental analysis in this EIS to evaluate the potential environmental impacts of a MPF. These reference locations were designated by the individual DOE site offices not to conflict or interfere with existing or planned future site operations. Other locations may be identified by the DOE office at the selected site, if the Secretary of Energy decides to proceed with a MPF. In general, undeveloped areas are used so that any potential environmental impacts would be greater than those projected for a specific location to be developed. These reference locations are defined for each site in Section S.3.3.2. The characterization of the affected environment addresses the entire candidate site and the affected region surrounding the site. Each region varies by resource, but generally extends to an 80-km (50-mi) radius from the center of each site.

- Both construction and operational impacts are considered for all resources at all sites. Construction impacts are generally short-term (e.g., would occur over the 6-year construction period), while operational impacts are expected to be long-term (e.g., would occur annually over the 50-year operating period).
- Generated wastes would be managed in accordance with applicable Federal, state, and local laws, regulations, and requirements, as well as DOE/NNSA's waste management orders and pollution prevention and waste minimization policy.
- The EIS analyzes low-consequence/high-probability accidents and high-consequence/low probability accidents. A spectrum of both types of accidents is analyzed. For radiological accidents, impacts are evaluated for both the general population residing within an 80-km (50-mi) radius (including the maximally exposed individual) and for non-involved workers in collocated facilities. The accident analyses in this EIS are based on facility conditions that are expected to exist in 2020. The core set of accident scenarios is applicable to each location alternative with adjustments to certain parameter values (e.g., leak path factors and materials at risk) to reflect site-specific features. Added to the core set of accidents are other site-specific accidents, if any, caused by natural phenomena or accidents at collocated facilities, that have the potential for initiating accidents at a MPF. The impacts of accidents analyzed for each alternative reflect and bound the impacts of all reasonably foreseeable accidents that could occur if the alternative were implemented.
- The plutonium Research and Development (R&D) mission and pit surveillance functions would remain at LANL and Lawrence Livermore National Laboratory and would be unaffected by the Proposed Alternative.
- Proven technology is used as a baseline. No credit is taken for emerging technology improvements. The design goal of the MPF includes consideration of waste minimization and pollution prevention to minimize facility and equipment contamination, and to make future D&D as simple and inexpensive as possible. The EIS includes a general discussion of the environmental impacts from D&D, including a discussion of the D&D process, the types of actions associated with D&D, and the general types of impacts associated with D&D. Any discussion of specific D&D impacts are more appropriate for tiered NEPA documents because the extent of contamination, the degree of decontamination, and the environmental impacts associated with performing D&D, cannot be known without performing a detailed study of a MPF at the appropriate time.
- Liquid TRU and low level waste (LLW) streams will be solidified as part of the MPF process, (i.e., the MPF would not generate any liquid TRU or LLW that requires

disposition). The solidified waste forms would meet applicable waste acceptance criteria prior to leaving the MPF. Any TRU waste generated by the MPF would be treated and packaged in accordance with the WIPP Waste Acceptance Criteria and transported to WIPP or a similar type facility for disposition. The preferred alternative in the *WIPP Disposal Phase Final Supplemental Environmental Impact Statement* (SEIS) (DOE 1997b) currently includes a 35-year operating period starting in March 1999. To accommodate all project TRU waste from MPF and other NNSA operations, DOE must ensure that either the WIPP or another similar type facility would be available for long-term disposition of TRU waste. Section 6.5.1.5 gives additional detail relative to the WIPP. All other wastes would be managed in accordance with applicable site procedures and disposed of in accordance with decisions made in the *Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* Records of Decision.

- The MPF would be capable of producing all existing pit types in the nuclear weapons stockpile, as well as any future new-design pits. The environmental impacts associated with manufacturing a particular type of pit, whether an existing design pit or future new-design pit, are considered to be similar.
- The operation of a MPF would require transporting existing pits from Pantex, where more than 12,000 are presently stored, to a MPF, and transporting new pits from a MPF to Pantex where they would be assembled into weapons. In addition, small quantities of plutonium metal would be transported from LANL and SRS to a MPF location. All transportation of pits and plutonium metal is assumed to occur via the NNSA transportation fleet of SSTs over Federal and state highways to the extent practicable. The quantities of pits and other materials that would be transported to/from the MPF are provided in Appendix D.
- A modern nuclear weapon consists of many components, most of which are nonnuclear. In general, any components for pits not produced at the MPF would be produced in existing facilities and shipped to a MPF for assembly into the pit. The environmental impacts associated with producing these components have been addressed in previous NEPA documents (see specifically the Nonnuclear Consolidation EA, DOE/EA- 0792, DOE 1993).
- Because the NNSA will need a facility to manufacture beryllium components required for the MPF, this programmatic EIS assesses the environmental impacts of such manufacturing for completeness (see Section 5.7.1). Site-specific issues concerning the manufacturing of beryllium components will be addressed in the future NEPA documentation, as required.
- The methodology used to assess the environmental impacts of constructing and operating a MPF is described in Appendix F.
- As explained in Section S.3.3.3, the MPF EIS evaluates an upgrade to the TA-55 Facility at LANL to increase pit production capacity. Although this Upgrade Alternative does not meet the minimum capacity requirement of 125 ppy, it is evaluated as a “hedge” in the event of significant further reductions in the nuclear weapons stockpile size, or if future technical studies demonstrate that pit lifetimes significantly exceed 45-60 years. The TA-55 Facility is the only existing pit production facility capable of being upgraded to provide such a hedge (see Sections S.3.4.3 and S.3.4.4). As such, this is the only

reasonable Upgrade Alternative assessed in this EIS. It is noted that this Upgrade Alternative would be timed to minimize disruptions of LANL's interim small-scale pit production activities required to meet current DOD requirements.

- The classified appendix with information relevant to this EIS has been prepared and will be considered by the decisionmaker during this NEPA process. To the extent allowable, the MPF EIS summarizes this information in an unclassified manner.

S.3.2.2 Development of the Environmental Impact Statement Site Alternatives

Following the approval of the Critical Decision on Mission Need (CD-0) by the Secretary of Energy on May 24, 2002, the NNSA developed a site screening process to develop the reasonable site alternatives that are evaluated in this MPF EIS. The purpose of the site screening process was two-fold: (1) to identify reasonable site alternatives for the MPF EIS; and (2) to identify unsuitable site alternatives and document why these alternatives were not reasonable for the MPF EIS.

A two-step screening process was employed: first, all potential sites were evaluated against "go/no go" criteria; and second, those sites satisfying the go/no go criteria were evaluated against desired, weighted criteria. The desired criteria and weights were developed by members of the MPF project office. Federal employees from the NNSA and other relevant DOE program offices then "scored" the potential sites using the desired criteria. Aggregate scores for the alternatives were then tallied, and the reasonable site alternatives were determined.

Existing, major DOE sites were considered to serve as the host location for a MPF. Non-DOE or new sites were not considered to avoid potential contamination issues at a new location that had not previously been associated with plutonium or plutonium-bearing waste operations. Many DOE sites did not satisfy the go/no-go criteria and were eliminated during the first step of the screening process. The seven sites that were evaluated through both steps of the screening process were: Idaho National Engineering and Environmental Laboratory, LANL, NTS, Pantex, SRS, the Carlsbad Site, and the Y-12 National Security Complex.

The site screening analysis considered the following criteria: population encroachment, mission compatibility, margin for safety/security, synergy with existing/future plutonium operations, minimizing transportation of plutonium, NNSA presence at the site, and infrastructure. The first two criteria were deemed to be go/no go criteria; that is, a site either passed or failed on each of these two criteria. The sites that passed the go/no go criteria were then scored against all criteria. Based upon results from the site screening analysis, the following were determined to be reasonable alternatives for a MPF: (1) Los Alamos Site, New Mexico; (2) Nevada Test Site; (3) Carlsbad Site, New Mexico; (4) Savannah River Site, South Carolina; and (5) Pantex Site, Texas. Appendix G contains a copy of the site screening study.

S.3.3 Reasonable Alternatives

S.3.3.1 No Action Alternative

Consistent with the 1996 SSM PEIS ROD (61 FR 68014) and the 1999 LANL SWEIS ROD (64 FR 50797), NNSA has been re-establishing an interim pit manufacturing capability at LANL. The establishment of the interim pit production capacity is expected to be completed in 2007. As required by the CEQ NEPA Regulations (40 CFR Parts 1500-1508) and the DOE NEPA Regulations (10 CFR Part 1021), the MPF EIS includes a No Action Alternative. The No Action Alternative would be to maintain the interim pit production capacity at LANL PF-4 in TA-55 and not build the MPF at any site. The No Action Alternative is encompassed within the Expanded Operations Alternative listed in the LANL SWEIS, which evaluated the impact of producing 50-80 ppy at PF-4, but selected a 20 ppy level in the respective Record of Decision. There would be no additional impact on the other four sites.

S.3.3.2 Modern Pit Facility Alternatives

This section presents the alternatives to build a new MPF at each of the five alternative sites. In addition, if a MPF is built at any of these sites, including LANL, the interim pit capability at TA-55/PF-4 would not be relied on to meet future stockpile needs. For each of the sites, a representative or reference location for MPF at that site has been chosen for analysis purposes only. When a decision is made as to whether to proceed with the MPF, and if so, at which site to locate a MPF, a site-specific EIS process will be completed. The site-specific process will analyze reasonable locations in the vicinity of the selected site.

Each reasonable location was chosen based on the following factors: the site is approximately 32 hectares (ha) (80 acres [ac]) in size, does not conflict with any on-going or planned activities, is not potentially contaminated, and is located near an existing Category I Security Area (if possible). If the selected site did not have the requisite 32 ha (80 ac) (the maximum desired area inside a PIDAS), but still had enough space to accommodate the entire facilities footprint, it was deemed adequate for analysis purposes in this EIS. The proposed reference locations provide a basis for impact studies on the site and surrounding areas, which will allow reasonable comparisons between the various sites. If a decision is made to go forward with one of the MPF alternatives, a site will be selected, and the actual MPF location will be determined in a site-specific tiered EIS.

Los Alamos Site

The Los Alamos Site MPF Alternative would involve constructing a MPF at LANL as described in Section S.3.1.2. For analysis purposes, it is assumed that a MPF would be located on an unused location in TA-55. This is shown in Figure S.3.3.2–1. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

Nevada Test Site

The NTS MPF Alternative would involve constructing a MPF at NTS as described in Section S.3.1.2. For analysis purposes, it is assumed that a MPF would be located on an unused location

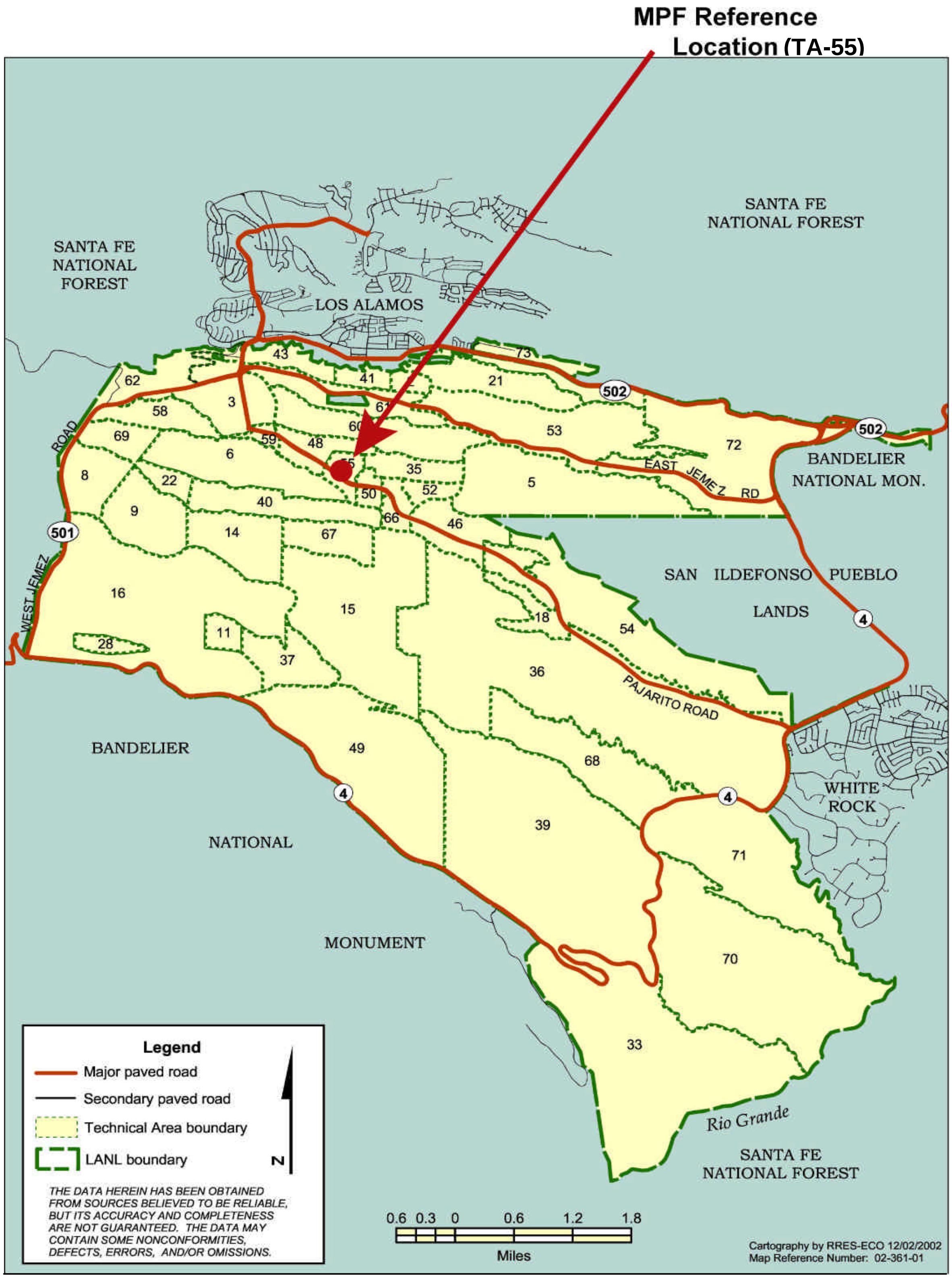


Figure S.3.3.2–1. Los Alamos Site

near the Device Assembly Facility. This is shown in Figure S.3.3.2–2. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

Pantex Site

The Pantex Site MPF Alternative would involve constructing a MPF at Pantex as described in Section S.3.1.2. For analysis purposes, it is assumed that a MPF would be located on an unused location in Area 11. This is shown in Figure S.3.3.2–3. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

Savannah River Site

The SRS MPF Alternative would involve constructing a MPF at SRS as described in Section S.3.1.2. For analysis purposes, it is assumed that a MPF would be located on an unused location southwest of the F Canyon area. This is shown in Figure S.3.3.2–4. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

Carlsbad Site

The Carlsbad Site MPF Alternative would involve constructing a new MPF at Carlsbad as described in Section S.3.1.2. For analysis purposes, it is assumed that a MPF would be located on an unused location. This is shown in Figure S.3.3.2–5. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

NNSA notes that legislation may be required to proceed with the construction and operation of a MPF at the Carlsbad Site either on land at the WIPP site or in the vicinity of the WIPP site.

The U.S. Environmental Protection Agency's (EPA's) current compliance certification of WIPP does not consider the potential impacts of a MPF on the long-term performance of the repository. If the Secretary of Energy were to decide to locate a MPF in the vicinity of WIPP, DOE would need to provide EPA with sufficient information for the Agency to determine whether the potential impacts of a MPF should be included in the performance assessment to ensure that they would not adversely impact the repository's long-term performance. EPA's consideration of a MPF's potential impacts could result in a modification rulemaking involving the compliance certification.

S.3.3.3 TA-55 Upgrade Alternative

The TA-55 Upgrade Alternative (80 ppy) would involve expanding the pit production capability of PF-4 without expanding the size of the facility as described in Section S.3.1.4 and the Summary of TA-55/PF-4 Upgrade Evaluation to Provide Long-term Pit Manufacturing Capacity contained in Appendix G. Two support facilities would also be constructed in TA-55 and one in TA-54. The interim pit production capability at LANL would be expanded to approximately 80 ppy through the upgrade process.

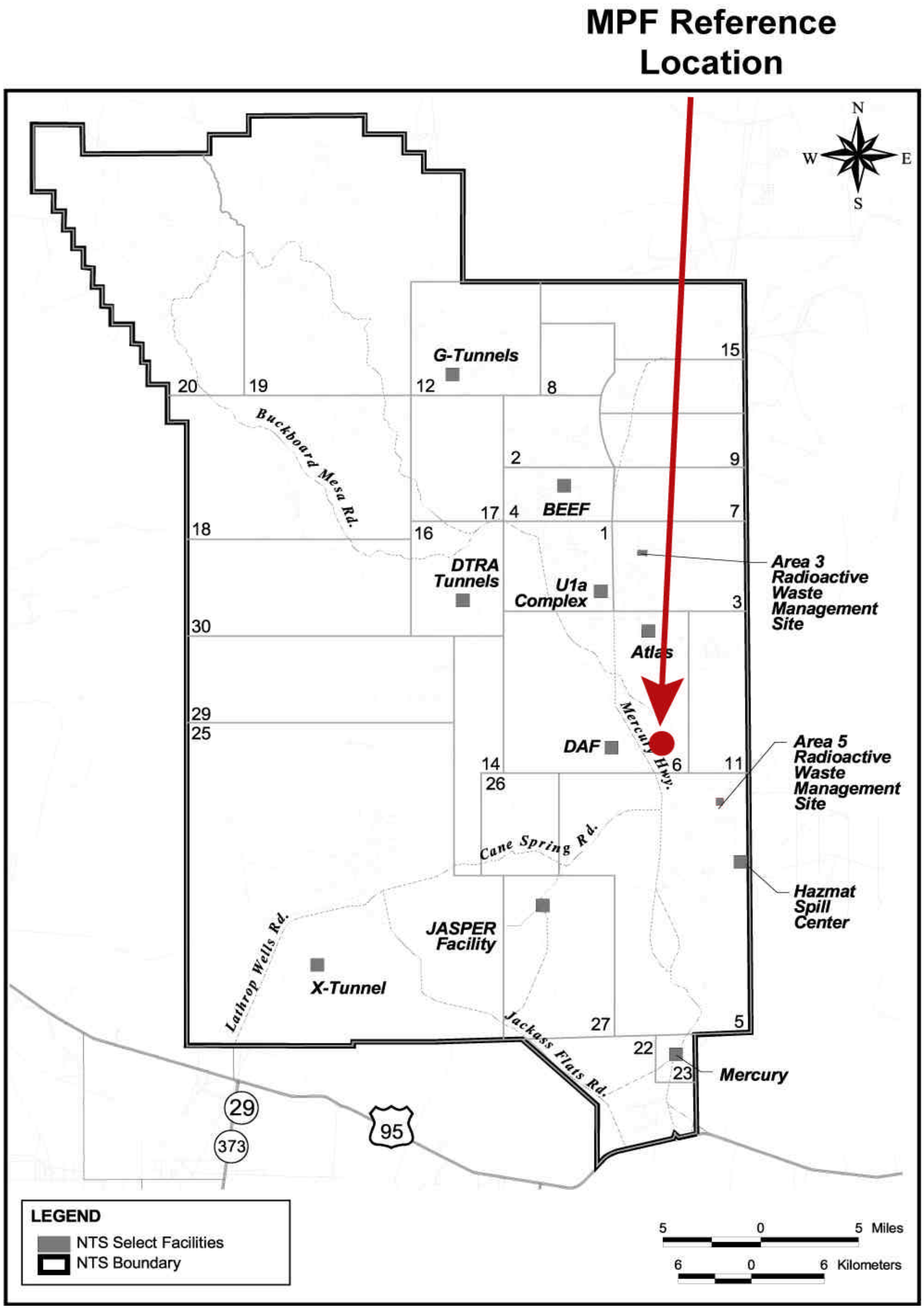


Figure S.3.3.2–2. Nevada Test Site

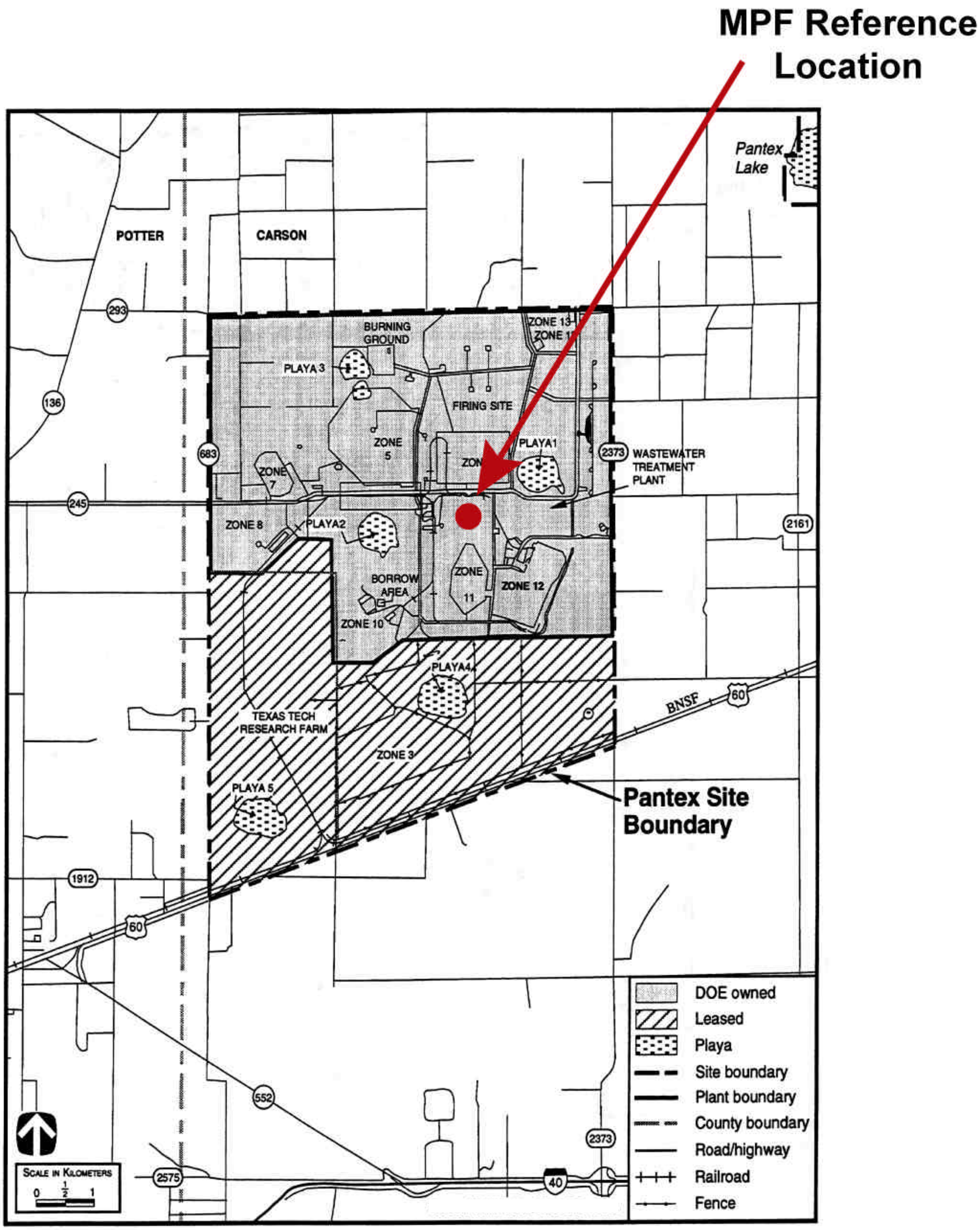


Figure S.3.3.2–3. Pantex Site

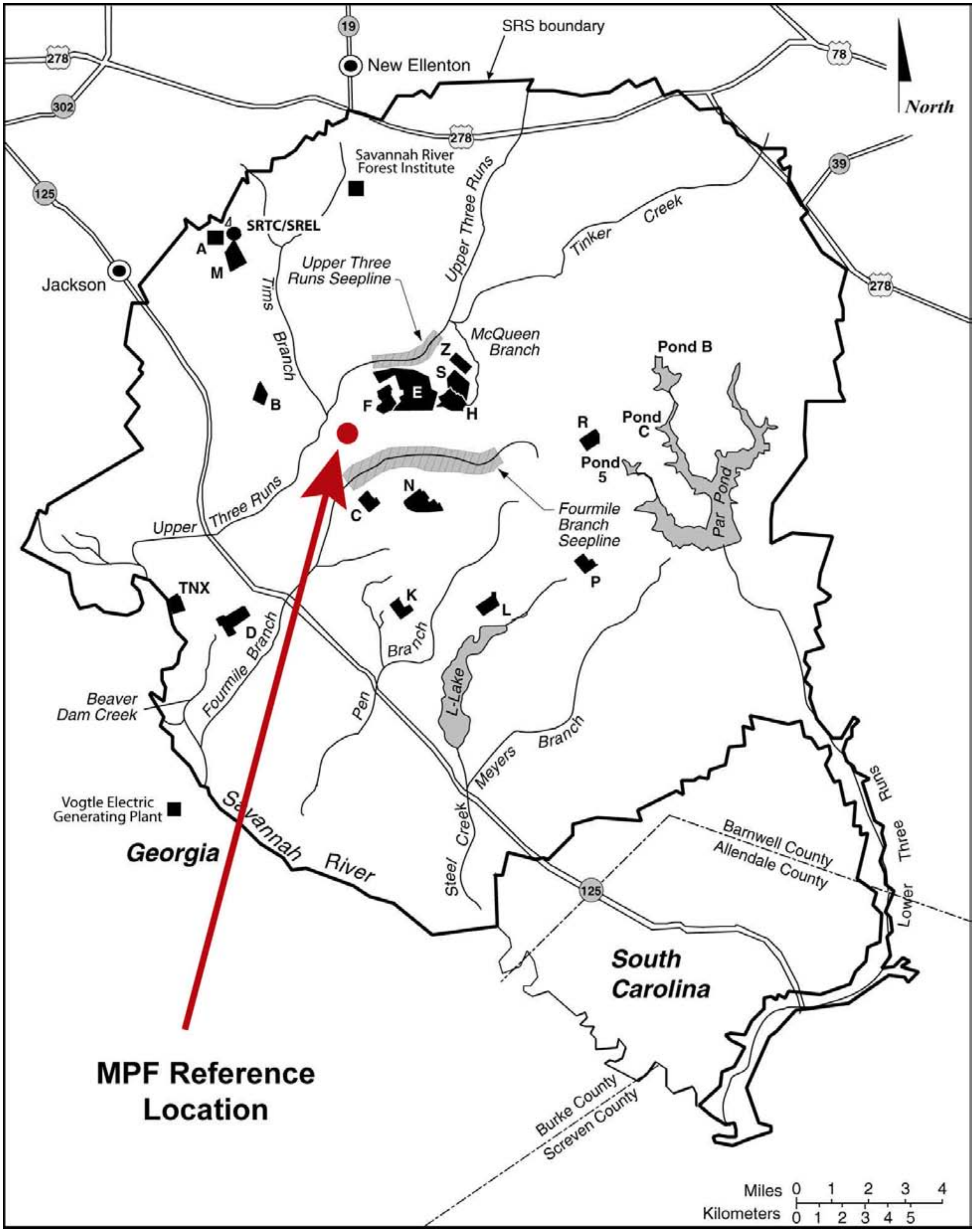


Figure S.3.3.2–4. Savannah River Site

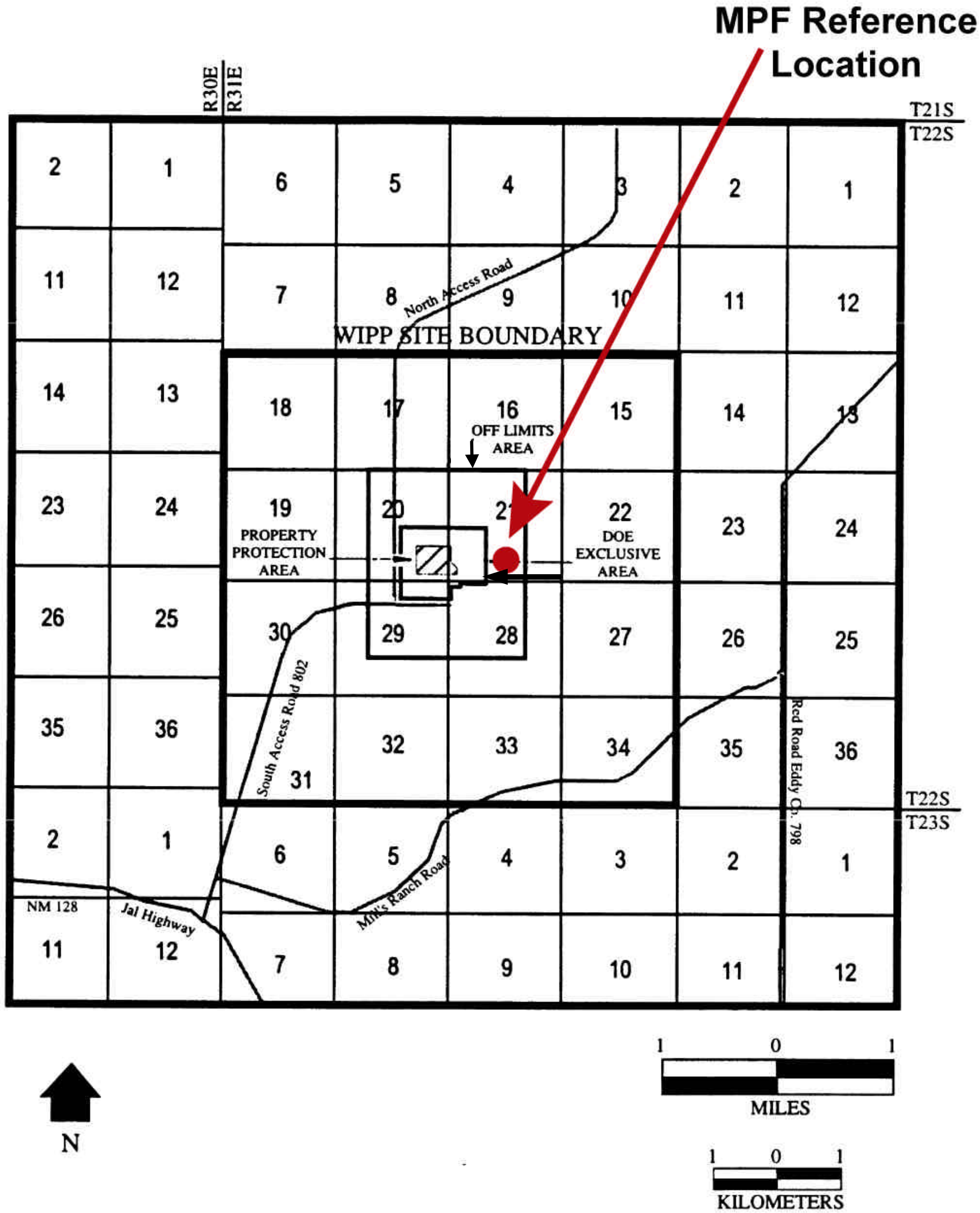


Figure S.3.3.2–5. Carlsbad Site

S.3.4 Alternatives Considered but Eliminated from Detailed Study

S.3.4.1 Purchase Pits

While there is no national policy that prohibits purchase of defense materials such as pits from foreign sources, NNSA has determined that the uncertainties associated with obtaining pits from foreign sources render this alternative unreasonable for an assured long-term supply.

S.3.4.2 Utilizing the Pit Disassembly and Conversion Facility at the Savannah River Site

NNSA is currently planning for the permanent disposition of weapons-grade plutonium no longer required for defense purposes. In September 2000, the United States and Russia signed a Plutonium Management and Disposition Agreement (PMDA) in which each country agreed to permanently dispose of 34 metric tons (37 tons) of plutonium. The obligations under this "government-to-government" agreement equate to a pledge by each country to meet the terms put forth in the agreement. Under current plans, surplus nuclear weapons pits would be disassembled and the resulting plutonium metal converted into oxide in a planned Pit Disassembly and Conversion Facility (PDCF). The resulting plutonium oxide would then be fabricated into mixed-oxide fuel at a second facility, the Mixed-Oxide Fuel Fabrication Facility, to be built at the SRS and then irradiated in existing commercial reactors. However, the PMDA includes several restrictions that would likely impact synergy between the plutonium disposition program and the MPF. For example, facilities constructed under the PMDA are designated "disposition facilities" and the use of these facilities to process plutonium other than "disposition plutonium" (such as pit manufacturing, or other defense purposes) is prohibited. Article VI Paragraph 5 of the PMDA states, "Disposition facilities may only receive and process disposition plutonium and blend stock." (See Appendix G for more details regarding the PMDA and other potential restrictions.)

NNSA has decided that the international constraints on the PDCF render the facility at SRS incompatible with the MPF National Security mission.

S.3.4.3 TA-55 Upgrade Alternatives

In August 2002, a multidisciplinary team comprised of national laboratory, NNSA production plant, and Federal Government personnel was chartered to: (1) determine the potential production rates that might be achieved at LANL with upgrades to PF-4; (2) estimate the implementation costs of these upgrade options; (3) address the advantages and disadvantages of upgrading PF-4 to higher production capacities; and (4) prepare information to support a determination on the "reasonableness" of the alternative of relying on an upgraded PF-4. The team was also tasked to prepare detailed environmental data for the MPF Draft EIS on any PF-4 upgrade alternative considered reasonable even though a 50-year life for a MPF may not be achievable for a TA-55 Upgrade.

The team evaluated three upgrade options for TA-55/PF-4 to increase production rate:

- TA-55 Upgrade Option 1 - No impact on current LANL missions in PF-4.
- TA-55 Upgrade Option 2 - Impact some current LANL nondefense-related missions in PF-4.
- TA-55 Upgrade Option 3 - Add floorspace (new wing) to PF-4 and impact some current LANL nondefense-related missions.

Based on the team's evaluation, NNSA determined that TA-55 Upgrade Option 1 would not result in an upgraded TA-55 production capacity that was greater than 50 ppy. Since production capacities in this range are already included in the bounding analyses for the No Action Alternative, no separate evaluation of TA-55 Upgrade Option 1 is necessary.

NNSA also determined that TA-55 Upgrade Option 3, which required construction of additional floor space on PF-4 and had hypothetical potential to achieve a maximum capacity of up to 150 ppy, was not a reasonable alternative. Option 3 approaches the cost and schedule of a small, newly-constructed MPF, but does not provide the agility or contingent capacity needed for the long-term.

TA-55 Upgrade Option 2, estimated to achieve a nominal manufacturing capacity approximately 80 ppy, was determined to be a reasonable alternative for evaluation in the MPF EIS. While the NNSA notes that Option 2 does not have the potential to reach the minimum production capacity (125 ppy) or agility required by a MPF, inclusion of this upgrade alternative provides a capacity greater than the No Action Alternative. This provides a "hedge" in the event of unforeseeable changes in stockpile size or pit lifetime result in a significantly smaller pit production capacity requirement. It is noted that this Upgrade Alternative would need to be timed to minimize disruptions to LANL's interim small-scale pit production activities required to meet current DOD requirements.

S.3.4.4 Upgrade Building 332 at Lawrence Livermore National Laboratory

Building 332 at the Lawrence Livermore National Laboratory (LLNL) is located in what is known as the "Superblock." Building 332 is a plutonium R&D facility containing a wide breadth of plutonium processing and fabrication technologies but offering minimal production-like capability. Building 332 does not have an existing pit-manufacturing mission and is small in comparison to the TA-55/PF-4 facility at LANL. In order to produce a meaningful quantity of pits, drastic modifications to Building 332 would be required. Additionally, because of the significant population encroachment at LLNL, an upgrade alternative at LLNL is undesirable. Accordingly, the alternative to upgrade Building 332 was eliminated from detailed study.

S.3.4.5 Chemistry and Metallurgy Research Building Replacement (CMRR)

NNSA is currently preparing an EIS for the CMRR. The purpose of the CMRR EIS is to evaluate alternatives for replacing the existing Chemistry and Metallurgy Research Building at LANL, where nuclear operations are scheduled to be shut down in approximately 2010. A new CMRR would provide analytical, chemical and material characterization support to existing missions at LANL that are expected to continue for the long term. Such support is needed independent of the MPF EIS proposal. While a CMRR could provide support to an eventual

MPF at LANL (if LANL were the selected site), such support is not in the baseline design of the CMRR, nor is it required. The environmental impacts of providing chemical and metallurgical support for a MPF at LANL would be essentially the same whether such support were to occur within the CMRR or the MPF; thus, the MPF EIS includes this analysis as a direct impact in this MPF EIS. Under the No Action Alternative and the TA-55 Upgrade Alternative, direct analytical chemistry and metallurgical support would be provided by the existing CMR or the proposed CMRR. As such, the CMRR EIS includes an analysis of environmental impacts associated with pit production up to approximately 80 ppy.

S.3.4.6 Savannah River Site Facilities

The F&H Canyon facilities, which are approximately 50-plus years old, were originally designed to recover plutonium and uranium from reactor fuel rods. As such, the portions of these facilities that might be applicable to pit production are primarily in the areas where processing operations took place. Because the only F-Area Canyon Facility that is set up to purify plutonium material from recycled pits is the New Special Recovery Facility, extensive upgrades and modifications would be required to generate an adequate capacity over the life of the MPF mission. A list of some of the major deficiencies associated with utilizing the canyons to support a MPF follows:

- Modifications to existing contaminated facilities are very costly due to radiological control issues. Labor cost increases of 300-500 percent vs. "clean" work are commonly estimated.
- Project risks are increased when using existing facilities due to the higher number of unknown conditions that may be encountered during the project, and the challenges of coordinating construction activities with any ongoing facility operations.
- There is a high potential for hidden cost and regulatory risks associated with the long-term commitment to a legacy facility.
- The service life of the renovated facility would likely not meet the 50-year MPF design requirement.
- The existing robust canyon structures cannot be modified significantly and would therefore result in inefficient equipment arrangement, material handling, and storage locations.
- Imbedded infrastructure such as shielding, ventilation systems, electrical cable/switchgear, and process piping/drains may not be suitable for a revised facility mission.
- Obstacles to adding distance and wall shielding in existing structures make achievement of the 500 millirem per year design goal, personnel exposure limit unlikely.

Based on these factors, NNSA determined that the F&H Canyon facilities are not reasonable alternatives for supporting a MPF mission. Likewise, NNSA considered whether use of the K-Area Materials Storage Facility would be beneficial to the MPF, but concluded that no such advantages existed.

S.3.4.7 Other Department of Energy/National Nuclear Security Administration Sites

Section S.3.2.2 describes the site screening process utilized to determine the reasonable site alternatives for the MPF EIS. As described in that section, all existing, major DOE sites were considered to serve as the host location for a MPF. A two-step screening process was employed: first, all potential sites were judged against "go/no go" criteria; and second, those sites satisfying the go/no go criteria were judged against desired, weighted criteria. Sites that did not satisfy the go/no go criteria, or which scored lowest against desired, weighted criteria were judged to be unreasonable site alternatives for a MPF.

S.3.4.8 Construct and Operate a Smaller Modern Pit Facility

As stated previously, the exact size and composition of the enduring stockpile is uncertain. Studies in the classified appendix have examined capacity requirements that would result from a wide range of enduring stockpile sizes and compositions, pit lifetimes, emergency production needs (referred to as "contingency" requirements), and facility full-production start dates. Although the precise future capacity requirements are not known with certainty, enough clarity has been obtained through these ongoing classified studies that the NNSA has identified a range of pit production capacity requirements (125-450 ppy) that form the basis of the capacity evaluations in this EIS. The EIS evaluates the impacts of a new MPF designed to produce three capacities: 125 ppy, 250 ppy, and 450 ppy. If there were significant further reductions in the nuclear weapons stockpile (beyond those already considered in the classified analyses), or if future technical studies demonstrate that pit lifetimes significantly exceed 45-60 years, then the need, capacity, and timing for a new MPF would need to be reassessed. With respect to these uncertainties, NNSA has chosen not to speculate beyond the assumptions described in this EIS. As such, this EIS does not propose to construct and operate a new MPF with a capacity smaller than 125 ppy. However, as described in Sections S.3.3.3, this EIS does evaluate a TA-55 Upgrade Alternative (80 ppy) as a "hedge" in the event of unforeseeable significant changes in stockpile size or pit lifetime.

S.4 PREFERRED ALTERNATIVE

The CEQ regulations require an agency to identify its preferred alternative to fulfill its statutory mission, if one or more exists in a draft EIS (40 CFR 1502.14 [e]). For this MPF Draft EIS, constructing and operating a new MPF is the preferred alternative based on considerations of environmental, economic, technical, and other factors. A preferred host site for the MPF has not yet been determined, but will be identified in the Final EIS, if the Secretary decides to proceed with a MPF.

S.5 COMPARISON OF ALTERNATIVES

S.5.1 Introduction

To aid the reader in understanding the differences among the various alternatives, this section presents a summary comparison of the potential environmental impacts associated with the alternatives in the MPF EIS. The comparisons concentrate on those resources with the greatest potential to be impacted.

S.3.4.7 Other Department of Energy/National Nuclear Security Administration Sites

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The information in this section is a summary of the environmental impacts based on information presented in Chapter 5 of the EIS. Table S.5.1–1 at the end of this document provides quantitative information that supports the text below.

S.5.2 Environmental Impacts

Land Use

All action alternatives would result in land disturbance. As shown in Table S.5.1–1, the amount of land disturbed for all alternatives would be less than 2 percent of the available land area. However, there would be no impacts to land use plans or policies.

Visual Resources

All action alternatives except SRS would result in no changes to current Class IV BLM Visual Resource Management ratings. Although SRS does not have a BLM Visual Resource Management rating, constructing and operating a MPF would be consistent with the currently developed areas of SRS.

Site Infrastructure

SRS has adequate electrical energy capacity and peak load capability for all three proposed MPF sizes. LANL has adequate electrical energy and peak load capability for the TA-55 Upgrade Alternative (80 ppy). LANL would require additional peak load capability, and Pantex Site would require additional energy capacity for the 450 ppy plant. Carlsbad Site would require additional peak load capability for all three sized plants and additional energy capacity for the 450 ppy plant. NTS would require additional energy capacity and peak load capability for all three sized plants.

Pantex Site, SRS, and the TA-55 Upgrade Alternative (80 ppy) at LANL have adequate process steam available to support all MPF size plants. The Carlsbad Site would require extension of a local gas pipeline and NTS would require the construction of a pipeline or a rail line to supply fuel for the process steam plant required for any of three production capacity options.

Air Quality

All action alternatives would result in air quality levels that would be in attainment with the NAAQS for all criteria pollutants. However, surge operations of the 450 ppy plant at LANL would exceed the 24-hour nitrogen dioxide standard by approximately 5 percent. If the 450 ppy plant is built at LANL, mitigation measures would be designed and implemented to bring these emissions into compliance. All sites are in attainment areas. A PSD analysis would be done in the site-specific tiered EIS.

Water Resources

The water requirements for the construction of all action alternatives would be within existing site water allotments. The existing site water allotment at NTS, Pantex Site, and SRS would be adequate to support the operation of all three plant sizes. Although the current water allotment at

LANL would support the TA-55 Upgrade Alternative (80 ppy) and 125 ppy options, LANL would need to expand its water allotment for the 250 ppy and 450 ppy plant by purchasing more water. Carlsbad Site would need to purchase more water to expand its water allotment for the operation of all three plant sizes. Sufficient capacity exists for both LANL and Carlsbad Site to purchase additional water to support MPF operations.

Biological Resources

For all action alternatives, some habitats unique to each area would be modified or lost and there could be a decrease in quality of the habitat adjacent to the proposed development. It is not expected that any wetlands would be impacted by any alternative. There are no designated critical habitats for any listed threatened or endangered species at any of the site alternatives, and thus no impacts are expected.

Cultural and Paleontological Resources

Any ground disturbance has the potential to impact cultural and paleontological resources at any of the alternative sites. At the programmatic level, there are no significant differences between the alternative sites with respect to potential impacts to cultural and paleontological resources. Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural and paleontological resources that could potentially be impacted by the construction of a MPF or upgrade to the TA-55 Facility. If necessary, NNSA would implement appropriate measures to avoid, reduce, or mitigate any impacts.

Socioeconomics

New jobs would be created for all action alternatives. For the MPF alternatives, the number of direct jobs created during the peak year of construction would range from approximately 770-1,100, depending upon the capacity constructed. The number of indirect jobs created would vary depending upon the site. Table S.5.1-1 displays an estimate of the total number of jobs (direct plus indirect) created during the peak year of construction for the various MPF site alternatives. The maximum population influx would not exceed 3 percent at any site.

During operations, the number of direct jobs created would range from approximately 990-1,800, depending upon the capacity of the MPF. As shown on Table S.5.1-1, the total number of jobs would range from 1,230-3,090, depending upon the capacity of the MPF. During operations, all sites except NTS and SRS would have an increase in population for all plant sizes. The population increases are shown on Table S.5.1-1. Due to the population increases, which would be less than 3 percent, there would be no impacts on community services, except at Carlsbad Site, where increases in some resources would be required to maintain comparable levels of community services.

The TA-55 Upgrade Alternative (80 ppy) would result in a maximum of 190 direct jobs during the peak year of construction and 660 direct jobs during operations. Table S.5.1-1 displays the total number of jobs (direct plus indirect) associated with the TA-55 Upgrade Alternative.

Radiological Impacts

During normal MPF operations, radiological impacts to workers and the public would occur. Impacts to workers would be independent of the MPF site. At all MPF sites, the average individual dose to a worker would be 290 mrem/yr for the 125 ppy facility, 390 mrem/yr for the 250 ppy facility, and 510 mrem/yr for the 450 ppy facility. These doses would be below regulatory limits and limits imposed by DOE Orders. Statistically, for the average worker, a 290 mrem/yr dose translates into a risk of one fatal cancer every 8,620 years of operation; a 390 mrem/yr dose translates into a risk of one fatal cancer every 6,410 years of operation; a 510 mrem/yr dose translates into a risk of one fatal cancer every 4,900 years of operation.

For the TA-55 Upgrade Alternative, the average individual dose to a worker would be a 380 mrem/yr. Statistically, this translates into a risk of one fatal cancer every 6,580 years of operation.

Doses to the public would be site dependent. Sites with the smallest 80-km (50-mi) population would have the smallest impact. For example, the collective population dose to the population surrounding NTS and Carlsbad Site would be smaller than LANL, Pantex Site, and SRS due to the relative remoteness of NTS and Carlsbad Site. However, the collective population dose at any of the five sites is small in any event. The maximum collective population dose would occur at SRS for the 450 ppy facility. This dose would be 1.3×10^{-6} person-rem/yr, which statistically would translate into one fatal cancer risk every 1.5 billion years of operation. The TA-55 Upgrade Alternative would also be bounded by this population dose. At all sites, the maximally exposed offsite individual would receive a dose less than 1 mrem per year.

Nonradiological Impacts

Statistically, nonradiological occupational impacts to workers during the construction and operation of a MPF would be expected to result in less than one fatality. The impacts to workers are estimated to be the same for all action alternatives except the TA-55 Upgrade Alternative (80 ppy) which would have the smallest potential impact due to the least amount of construction activity.

Accidents

Radiological. Potential impacts from accidents were estimated using computer modeling. In the event of any accidents, the projected annual risk of latent cancer fatality (LCF) at all MPF sites for the surrounding population would be less than one. For the bounding accident analyzed in the EIS (explosion in a feed casting furnace), the highest potential annual risk to the population within 80-km (50-mi) would be an increase in LCFs of 0.125 at LANL from either the MPF or TA-55 Upgrade Alternative. Statistically, this would equate to one additional LCF among the 80-km (50-mi) population surrounding LANL every 8 years of operation and this accident would be expected to occur once every 100 years. For this accident, the dose to the maximally exposed offsite individual would be 38 rem, which exceeds DOE exposure guidelines. The analyses in these cases for NEPA purposes are based on unmitigated releases of radioactive material to select a site for the MPF. Following the ROD and selection of a site, additional NEPA action would be taken that would identify specific mitigating features that would be incorporated in the

MPF design to ensure compliance with DOE exposure guidelines. At NTS and Carlsbad Site, this risk would be smallest due to the relative remoteness of these two sites.

Nonradiological. The impacts associated with the potential release of the most hazardous chemicals used at a MPF were modeled to determine whether any impacts could exceed site boundaries. Based upon those modeling results, it was determined that no chemical impacts would exceed site boundaries at SRS and NTS. At LANL, Pantex Site, and Carlsbad Site, an accidental chemical release had the potential to cause impacts beyond site boundaries. In such an event, emergency preparedness procedures would be employed to minimize potential impacts.

Transportation

During normal transportation of radiological materials (plutonium, enriched uranium, TRU waste and LLW), radiological impacts to transportation workers and the public would occur. Impacts to workers and the public would be dependent on the MPF site and the population along expected transportation routes. All pits would originate and terminate at Pantex and all enriched uranium components would be transported to the MPF site from the Y-12 National Security Complex at Oak Ridge, Tennessee, and back. Two locations (Pantex Site and Carlsbad Site) would transport LLW offsite.

For all alternatives, the environmental impacts and potential risks of transportation would be small, e.g., less than one latent cancer fatality per year. As shown in Table S.3.5–1, the average collective dose to transportation workers from incident free transportation would be a maximum of 10.2 person-rem/yr for the 450 ppy facility. Statistically, a 10.2 person-rem/yr dose translates into a risk of one fatal cancer every 245 years of operation. The average collective dose to the general public from incident free transportation would be a maximum of 12 person-rem/yr for the 450 ppy facility. Statistically, a 12 person-rem/yr dose translates into a risk of one fatal cancer every 167 years of operation.

In the event of a transportation accident, the maximum average collective dose to the general public from a transportation accident would be 0.29 person-rem/yr for the 450 ppy facility. Statistically, a 0.29 person-rem/yr dose translates into a risk of one fatal cancer every 6,897 years of operation.

Waste Management

The amount of waste generated by the MPF would be the same at all sites. These values and those from the TA-55 Upgrade Alternative (80 ppy) are shown in Table S.5.1–1. The TRU waste from all sites would be transported to the Waste Isolation Pilot Plant or other similar type facility for disposal (the impact of this is included in the transportation section). All LLW at LANL and at NTS would be handled in existing onsite burial LLW disposal facilities. The existing aboveground E-Area retrievable vault storage facilities at SRS are not adequate and planned onsite disposal facilities would require additional capacity to handle the quantities of LLW generated by the MPF for the 250 ppy and 450 ppy facilities. Pantex Site and Carlsbad Site do not have any onsite LLW disposal facilities and would ship their MPF LLW to NTS. Pantex Site would need to expand its temporary LLW storage facility, and Carlsbad Site would need to construct a temporary LLW storage facility.

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Table S.5.1–1. Summary of Environmental Impacts

Resource/Material Categories	No Action Alternative	TA-55 Upgrade Alternative (80 ppy)	Los Alamos Site Alternative	NTS Alternative	Pantex Site Alternative	SRS Alternative	Carlsbad Site Alternative
LAND USE							
Percent of available site disturbed	No change[a]	~ 0.03 %	~ 0.6–0.7%	~ 0.02%	~ 0.9–1.1%	~ 0.07–0.09%	~ 1.4–1.7%
SITE INFRASTRUCTURE (Operations)							
80 ppy							
Electrical Supply	No change[a]	Adequate	—	—	—	—	—
Fuel for Process Supply	No change[a]	Steam Available	—	—	—	—	—
125 ppy							
Electrical Supply	—	—	Adequate	Additional energy capacity and peak load capability would be needed	Adequate	Adequate	Additional peak load capacity would be needed
Fuel for Process Supply	—	—	Steam Available	Pipeline/Rail line required	Steam Available	Steam Available	Extension of existing pipeline required
250 ppy							
Electrical Supply	—	—	Adequate	Additional energy capacity and peak load capability would be needed	Adequate	Adequate	Additional peak load capability would be needed
Fuel for Process Supply	—	—	Steam Available	Pipeline/Rail line required	Steam Available	Steam Available	Extension of existing pipeline required
450 ppy							
Electrical Supply	—	—	Additional peak load capability would be needed	Additional energy capacity and peak load capability would be needed	Additional energy capacity would be needed	Adequate	Additional energy capacity and peak load capability would be needed
Fuel for Process Supply	—	—	Steam Available	Pipeline/Rail line required	Steam Available	Steam Available	Extension of existing pipeline required

Table S.5.1–1. Summary of Environmental Impacts *(continued)*

Resource/Material Categories	No Action Alternative	TA-55 Upgrade Alternative (80 ppy)	Los Alamos Site Alternative	NTS Alternative	Pantex Site Alternative	SRS Alternative	Carlsbad Site Alternative
WATER RESOURCES							
Construction – All Capacity Sizes							
Adequate site water allotment	No change[a]	yes	yes	yes	yes	yes	yes
Operations							
80 ppy							
Adequate site water allotment	No change[a]	yes	—	—	—	—	—
125 ppy							
Adequate site water allotment	—	—	yes	yes	yes	yes	no
250 ppy							
Adequate site water allotment	—	—	no	yes	yes	yes	no
450 ppy							
Adequate site water allotment	—	—	no	yes	yes	yes	no
BIOLOGICAL RESOURCES							
Terrestrial – All Capacity Sizes							
	No impact	No impact	Approximately 56-69 ha of low value vegetation and potential habitat modified or lost; decrease in quality of habitat adjacent to proposed development	Approximately 56-69 ha of primarily shrubland habitat cleared, modified, or lost; decrease in quality of habitat adjacent to proposed development	Approximately 56-69 ha of shortgrass prairie and habitat cleared or modified; loss of shortgrass prairie plant community and wildlife habitat; decrease in quality of habitat adjacent to proposed development	Approximately 56-69 ha of potential forested habitat modified or lost; decrease in quality of habitat adjacent to proposed development	Approximately 56-69 ha cleared, modified or lost of grass and shrub plant communities and wildlife habitat; decrease in quality of habitat adjacent to proposed development

Table S.5.1–1. Summary of Environmental Impacts *(continued)*

Resource/Material Categories	No Action Alternative	TA-55 Upgrade Alternative (80 ppy)	Los Alamos Site Alternative	NTS Alternative	Pantex Site Alternative	SRS Alternative	Carlsbad Site Alternative
SOCIOECONOMICS[b]							
Construction – Jobs Created	No change[a]	—	—	—	—	—	—
80 ppy	—	Direct: 190 Indirect: 120	—	—	—	—	—
125 ppy	—	—	Direct: 770 Indirect: 480	Direct: 770 Indirect: 740	Direct: 770 Indirect: 660	Direct: 770 Indirect: 550	Direct: 770 Indirect: 280
250 ppy	—	—	Direct: 850 Indirect: 530	Direct: 850 Indirect: 820	Direct: 850 Indirect: 730	Direct: 850 Indirect: 610	Direct: 850 Indirect: 300
450 ppy	—	—	Direct: 1,100 Indirect: 690	Direct: 1,100 Indirect: 1,060	Direct: 1,100 Indirect: 940	Direct: 1,100 Indirect: 790	Direct: 1,100 Indirect: 390
Operations – Jobs Created	No change[a]	—	—	—	—	—	—
80 ppy	—	Direct: 660 Indirect: 220	—	—	—	—	—
125 ppy	—	—	Direct: 990 Indirect: 280	Direct: 990 Indirect: 620	Direct: 990 Indirect: 710	Direct: 990 Indirect: 950	Direct: 990 Indirect: 240
250 ppy	—	—	Direct: 1,360 Indirect: 390	Direct: 1,360 Indirect: 850	Direct: 1,360 Indirect: 980	Direct: 1,360 Indirect: 620	Direct: 1,360 Indirect: 330
450 ppy	—	—	Direct: 1,800 Indirect: 510	Direct: 1,800 Indirect: 1,130	Direct: 1,800 Indirect: 1,290	Direct: 1,800 Indirect: 820	Direct: 1,800 Indirect: 430
POPULATION AND HOUSING[c]							
Construction – Total Expected New Residents	No change[a]	—	—	—	—	—	—
80 ppy	—	150	—	—	—	—	—
125 ppy	—	—	1,600	No impact	1,400	140	1,700
250 ppy	—	—	1,900	No impact	1,600	350	1,900
450 ppy	—	—	2,500	No impact	2,300	1,000	2,600
Operations – Expected New Residents	No change[a]	—	—	—	—	—	—
80 ppy	—	335	—	—	—	—	—
125 ppy	—	—	—	No impact	1,400	No impact	1,900

Table S.5.1–1. Summary of Environmental Impacts *(continued)*

Resource/Material Categories	No Action Alternative	TA-55 Upgrade Alternative (80 ppy)	Los Alamos Site Alternative	NTS Alternative	Pantex Site Alternative	SRS Alternative	Carlsbad Site Alternative
250 ppy	—	—	2,100	No impact	2,400	No impact	2,800
450 ppy	—	—	3,200	No impact	3,500	No impact	3,900
COMMUNITY SERVICES							
All Capacity Sizes	No impact	No impact	No impact	No impact	No impact	No impact	Potential impact
HUMAN HEALTH AND SAFETY							
Annual Radiological Impacts to Individual MPF Workers							
Individual Workers – Average individual dose, mrem/yr							
80 ppy	No change[a]	380	—	—	—	—	—
125 ppy	—	—	290	290	290	290	290
250 ppy	—	—	390	390	390	390	390
450 ppy	—	—	510	510	510	510	510
Average worker cancer fatality risk	No change[a]	—	—	—	—	—	—
80 ppy	—	1.5×10^{-4}	—	—	—	—	—
125 ppy	—	—	1.2×10^{-4}	1.2×10^{-4}	1.2×10^{-4}	1.2×10^{-4}	1.2×10^{-4}
250 ppy	—	—	1.6×10^{-4}	1.6×10^{-4}	1.6×10^{-4}	1.6×10^{-4}	1.6×10^{-4}
450 ppy	—	—	2.0×10^{-4}	2.0×10^{-4}	2.0×10^{-4}	2.0×10^{-4}	2.0×10^{-4}
Annual Radiological Impacts to MPF Worker Population							
Collective dose, person-rem	No change[a]	—	—	—	—	—	—
80 ppy	—	154	—	—	—	—	—
125 ppy	—	—	160	160	160	160	160
250 ppy	—	—	310	310	310	310	310
450 ppy	—	—	560	560	560	560	560
Cancer fatality risk	No change[a]	—	—	—	—	—	—
80 ppy	—	0.062	—	—	—	—	—
125 ppy	—	—	0.064	0.064	0.064	0.064	0.064
250 ppy	—	—	0.12	0.12	0.12	0.12	0.12
450 ppy	—	—	0.22	0.22	0.22	0.22	0.22
Annual Radiological Impacts on Public							
Population within 80 km (50 mi)							
Collective dose, person-rem	No change[a]	—	—	—	—	—	—
80 ppy	—	2.5×10^{-8}	—	—	—	—	—

Table S.5.1–1. Summary of Environmental Impacts *(continued)*

Resource/Material Categories	No Action Alternative	TA-55 Upgrade Alternative (80 ppy)	Los Alamos Site Alternative	NTS Alternative	Pantex Site Alternative	SRS Alternative	Carlsbad Site Alternative
125 ppy	—	—	3.4×10^{-7}	2.7×10^{-8}	1.2×10^{-7}	4.2×10^{-7}	4.2×10^{-8}
250 ppy	—	—	5.5×10^{-7}	4.3×10^{-8}	2.0×10^{-7}	7.0×10^{-7}	6.8×10^{-8}
450 ppy	—	—	1.0×10^{-6}	7.7×10^{-8}	3.6×10^{-7}	1.3×10^{-6}	1.2×10^{-7}
LCFs	No change[a]	—	—	—	—	—	—
80 ppy	—	1.2×10^{-11}	—	—	—	—	—
125 ppy	—	—	1.7×10^{-10}	1.3×10^{-11}	6.2×10^{-11}	2.1×10^{-10}	2.1×10^{-11}
250 ppy	—	—	2.8×10^{-10}	2.1×10^{-11}	1.0×10^{-10}	3.5×10^{-10}	3.4×10^{-11}
450 ppy	—	—	5.0×10^{-10}	3.8×10^{-11}	1.8×10^{-10}	6.5×10^{-10}	6.2×10^{-11}
Offsite MEI – Dose (mrem)	No change[a]	—	—	—	—	—	—
80 ppy	—	3.0×10^{-9}	—	—	—	—	—
125 ppy	—	—	4.1×10^{-8}	1.6×10^{-9}	1.7×10^{-8}	2.6×10^{-9}	2.3×10^{-8}
250 ppy	—	—	6.6×10^{-8}	2.5×10^{-9}	2.8×10^{-8}	4.3×10^{-9}	3.6×10^{-8}
450 ppy	—	—	1.2×10^{-7}	3.8×10^{-9}	5.0×10^{-8}	8.0×10^{-9}	6.5×10^{-8}
Cancer fatality risk	No change[a]	—	—	—	—	—	—
80 ppy	—	1.5×10^{-15}	—	—	—	—	—
125 ppy	—	—	2.1×10^{-14}	8.0×10^{-16}	8.5×10^{-15}	1.3×10^{-15}	1.2×10^{-14}
250 ppy	—	—	3.3×10^{-14}	1.3×10^{-15}	1.4×10^{-14}	2.2×10^{-15}	1.8×10^{-14}
450 ppy	—	—	6.0×10^{-14}	2.3×10^{-15}	2.5×10^{-14}	4.0×10^{-15}	3.3×10^{-14}
Nonradiological Impacts							
Construction total fatalities for project duration	—	—	—	—	—	—	—
80 ppy	—	0.09	—	—	—	—	—
125 ppy	—	—	0.54	0.54	0.54	0.54	0.54
250 ppy	—	—	0.60	0.60	0.60	0.60	0.60
450 ppy	—	—	0.78	0.78	0.78	0.78	0.78
Operations total fatalities per year	No change[a]	—	—	—	—	—	—
80 ppy	—	0.025	—	—	—	—	—
125 ppy	—	—	0.04	0.04	0.04	0.04	0.04
250 ppy	—	—	0.05	0.05	0.05	0.05	0.05
450 ppy	—	—	0.07	0.07	0.07	0.07	0.07

Table S.5.1–1. Summary of Environmental Impacts *(continued)*

Resource/Material Categories	No Action Alternative	TA-55 Upgrade Alternative (80 ppy)	Los Alamos Site Alternative	NTS Alternative	Pantex Site Alternative	SRS Alternative	Carlsbad Site Alternative
ACCIDENTS (Maximum Annual Cancer Risk for Highest Risk Accident)							
Population	No change[d]	0.125	0.125	0.003	0.023	0.035	0.0081
MEI	No change[d]	3.8×10^{-4}	3.8×10^{-4}	7.4×10^{-6}	8.8×10^{-5}	9.6×10^{-6}	3.1×10^{-4}
TRANSPORTATION							
Operations – Annual Incident Free-collective dose (person-rem/LCFs)							
Transportation Workers	0.23/ 9.1×10^{-5}	—	—	—	—	—	—
80 ppy	—	0.54/ 2.2×10^{-4}	—	—	—	—	—
125 ppy	—	—	$0.76/3.0 \times 10^{-4}$	$2.2/9.0 \times 10^{-4}$	$4.2/1.7 \times 10^{-3}$	$3.1/1.2 \times 10^{-3}$	$3.7/1.5 \times 10^{-3}$
250 ppy	—	—	$1.1/4.5 \times 10^{-4}$	$3.1/1.2 \times 10^{-3}$	$6.6/2.6 \times 10^{-3}$	$4.1/1.6 \times 10^{-3}$	$6.0/2.4 \times 10^{-3}$
450 ppy	—	—	$1.8/7.3 \times 10^{-4}$	$4.9/2.0 \times 10^{-3}$	$10/4.0 \times 10^{-3}$	$6.4/2.5 \times 10^{-3}$	$9.2/3.7 \times 10^{-3}$
General Public	0.36/ 1.8×10^{-4}	—	—	—	—	—	—
80 ppy	—	0.88/ 4.4×10^{-4}	—	—	—	—	—
125 ppy	—	—	$1.2/6.2 \times 10^{-4}$	$3.6/1.8 \times 10^{-3}$	$3.4/1.7 \times 10^{-3}$	$5.8/2.9 \times 10^{-3}$	$2.6/1.3 \times 10^{-3}$
250 ppy	—	—	$1.8/8.8 \times 10^{-4}$	$4.9/2.5 \times 10^{-3}$	$5.1/2.7 \times 10^{-3}$	$7.6/3.8 \times 10^{-3}$	$4.3/2.2 \times 10^{-3}$
450 ppy	—	—	$2.9/1.4 \times 10^{-3}$	$7.8/3.9 \times 10^{-3}$	$8.0/4.0 \times 10^{-3}$	$12.0/5.9 \times 10^{-3}$	$6.8/3.4 \times 10^{-3}$
Operations – Radiological Accident Impact	4.6×10^{-5}/ 2.3×10^{-8}	—	—	—	—	—	—
80 ppy	—	1.3×10^{-4}/ 6.4×10^{-8}	—	—	—	—	—
125 ppy	—	—	1.7×10^{-4}/ 8.6×10^{-8}	9.2×10^{-4}/ 4.6×10^{-7}	1.1×10^{-3}/ 5.5×10^{-7}	0.011/ 5.4×10^{-6}	4.3×10^{-4}/ 2.2×10^{-7}
250 ppy	—	—	2.2×10^{-4}/ 1.1×10^{-7}	1.2×10^{-3}/ 5.8×10^{-7}	1.6×10^{-3}/ 8.1×10^{-7}	0.013/ 6.7×10^{-6}	6.9×10^{-4}/ 3.5×10^{-7}
450 ppy	—	—	3.3×10^{-4}/ 1.6×10^{-7}	1.8×10^{-3}/ 8.8×10^{-7}	2.5×10^{-3}/ 8.1×10^{-7}	0.021/ 1.0×10^{-5}	1.1×10^{-3}/ 5.3×10^{-7}

Table S.5.1–1. Summary of Environmental Impacts *(continued)*

Resource/Material Categories	No Action Alternative	TA-55 Upgrade Alternative (80 ppy)	Los Alamos Site Alternative	NTS Alternative	Pantex Site Alternative	SRS Alternative	Carlsbad Site Alternative
WASTE MANAGEMENT – *Annual Operations (m^3)*							
80 ppy							
TRU Waste–solid	—	445[e]	—	—	—	—	—
LLW–solid	—	1,445[e]	—	—	—	—	—
Mixed LLW–solid and liquid	—	53[e]	—	—	—	—	—
Hazardous waste–solid and liquid	—	205[e]	—	—	—	—	—
Adequate onsite LLW disposal facilities	—	Adequate	—	—	—	—	—
125 ppy							
TRU Waste–solid	—	—	590	590	590	590	590
LLW–solid	—	—	2,070	2,070	2,070	2,070	2,070
Mixed LLW–solid and liquid	—	—	1.7	1.7	1.7	1.7	1.7
Hazardous waste–solid and liquid	—	—	2.8	2.8	2.8	2.8	2.8
Adequate onsite LLW disposal facilities	—	—	Adequate	Adequate	No onsite disposal; additional onsite capacity would be needed until LLW transferred	Adequate	No onsite disposal capability for MPF LLW waste
250 ppy							
TRU Waste–solid	—	—	740	740	740	740	740
LLW–solid	—	—	3,300	3,300	3,300	3,300	3,300
Mixed LLW–solid and liquid	—	—	2.4	2.4	2.4	2.4	2.4
Hazardous waste–solid and liquid	—	—	3.4	3.4	3.4	3.4	3.4

Table S.5.1–1. Summary of Environmental Impacts *(continued)*

Resource/Material Categories	No Action Alternative	TA-55 Upgrade Alternative (80 ppy)	Los Alamos Site Alternative	NTS Alternative	Pantex Site Alternative	SRS Alternative	Carlsbad Site Alternative
Adequate onsite LLW disposal facilities	—	—	Adequate	Adequate	No onsite disposal; additional onsite capacity would be needed until LLW transferred	Additional capacity required for currently planned LLW facilities	No onsite disposal capability for MPF LLW waste
450 ppy							
TRU Waste–solid	—	—	1,130	1,130	1,130	1,130	1,130
LLW–solid	—	—	5,030	5,030	5,030	5,030	5,030
Mixed LLW–solid and liquid	—	—	4.2	4.2	4.2	4.2	4.2
Hazardous waste–solid and liquid	—	—	5.6	5.6	5.6	5.6	5.6
Adequate onsite LLW disposal facilities	—	—	Adequate	Adequate	No onsite disposal; additional onsite capacity would be needed until LLW transferred	Additional capacity required for currently planned LLW facilities	No onsite disposal capability for MPF LLW waste

[a] No change from current operations
[b] Differences in the number of indirect jobs created at each site are based upon unique Bureau of Economic Analysis multipliers for each site region.
[c] Total population impacts were determined by multiplying the number of workers required from outside the ROI by the average household size for the United States. The number of in-migrating workers was determined based on the current ROI laborforce composition and unemployment rates.
[d] No Action accidents addressed by existing documentation.
[e] Operational waste values from the upgrade include the removal of 140 gloveboxes over a 10-year period and additional waste from the pyrochemical process.
Offsite MEI = Maximally Exposed Offsite Individual.
LCF = Latent Cancer Fatality.