DOE/EIS-0380D
June 2006

Draft
Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory Los Alamos, New Mexico

Summary

National Nuclear Security Administration

AVAILABILITY OF
THE DRAFT SITE-WIDE ENVIRONMENTAL IMPACT
STATEMENT FOR CONTINUED OPERATION OF
LOS ALAMOS NATIONAL LABORATORY,
LOS ALAMOS, NEW MEXICO

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COVER SHEET

Responsible Agency: U.S. Department of Energy (DOE)
National Nuclear Security Administration (NNSA)

Title: *Draft Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (SWEIS) (DOE/EIS-0380D)

Location: Los Alamos, New Mexico

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***Abstract*:** NNSA proposes to continue operating the Los Alamos National Laboratory (LANL) located in Los Alamos County, in north-central New Mexico. NNSA has identified and assessed three alternatives for continued operation of LANL: (1) No Action, (2) Reduced Operations, and (3) Expanded Operations. Expanded Operations is NNSA's Preferred Alternative. In the No Action Alternative, NNSA would continue the historical mission support activities LANL has conducted at currently approved operational levels. Under the Reduced Operations Alternative, NNSA would eliminate selected activities and limit the operations of other selected activities. In the Expanded Operations Alternative, NNSA would operate LANL at the highest levels of activity currently foreseeable, including full implementation of the mission assignments. Under all of the alternatives, the affected environment is primarily within 50 miles (80 kilometers) of LANL. Analyses indicate little difference in the environmental impacts among alternatives for many resource areas. The primary discriminators are: public risk due to radiation exposure, collective worker risk due to radiation exposure, socioeconomic effects due to LANL employment changes, electrical power and water demand, waste management and transportation.

Public Comments: In preparation of this Draft SWEIS, NNSA considered comments received from the public during the scoping period (January 19, 2005 to February 17, 2005). Locations and times of public hearings on this document will be announced in the *Federal Register* in June 2006. Comments on this Draft SWEIS will be accepted at the address listed above for a period of 60 days following its issuance and will be considered for preparation of the Final SWEIS. Any comments received after the 60-day period will be considered to the extent practicable for the preparation of the Final EIS.

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ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ALARA	as low as reasonably achievable
CFR	*Code of Federal Regulations*
CMR	Chemistry and Metallurgy Research (Facility)
CMRR	Chemistry and Metallurgy Research Building Replacement Project
Consent Order	Compliance Order on Consent
CO	carbon monoxide
DD&D	decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
EIS	environmental impact statement
ERPG	Emergency Response Planning Guideline
FR	*Federal Register*
LANL	Los Alamos National Laboratory
LANL SWEIS	*Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico*
LANSCE	Los Alamos Neutron Science Center
LCF	latent cancer fatality
MDA	material disposal area
MEI	maximally exposed individual
NEPA	National Environmental Policy Act of 1969
NNSA	National Nuclear Security Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PM_n	particulate matter less than or equal to *n* microns in aerodynamic diameter
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
SHEBA	Solution High-Energy Burst Assembly
SO_2	sulfur dioxide
SWEIS	Site-Wide Environmental Impact Statement
TA	technical area
teraops	a trillion operations per second
WIPP	Waste Isolation Pilot Plant

CONVERSIONS

METRIC TO ENGLISH			ENGLISH TO METRIC		
Multiply	**by**	**To get**	**Multiply**	**by**	**To get**
Area					
Square meters	10.764	Square feet	Square feet	0.092903	Square meters
Square kilometers	247.1	Acres	Acres	0.0040469	Square kilometers
Square kilometers	0.3861	Square miles	Square miles	2.59	Square kilometers
Hectares	2.471	Acres	Acres	0.40469	Hectares
Concentration					
Kilograms/square meter	0.16667	Tons/acre	Tons/acre	0.5999	Kilograms/square meter
Milligrams/liter	1 [a]	Parts/million	Parts/million	1 [a]	Milligrams/liter
Micrograms/liter	1 [a]	Parts/billion	Parts/billion	1 [a]	Micrograms/liter
Micrograms/cubic meter	1 [a]	Parts/trillion	Parts/trillion	1 [a]	Micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	Pounds/cubic feet	Pounds/cubic feet	0.016018	Grams/cubic centimeter
Grams/cubic meter	0.0000624	Pounds/cubic feet	Pounds/cubic feet	16,025.6	Grams/cubic meter
Length					
Centimeters	0.3937	Inches	Inches	2.54	Centimeters
Meters	3.2808	Feet	Feet	0.3048	Meters
Kilometers	0.62137	Miles	Miles	1.6093	Kilometers
Temperature					
Absolute					
Degrees C + 17.78	1.8	Degrees F	Degrees F - 32	0.55556	Degrees C
Relative					
Degrees C	1.8	Degrees F	Degrees F	0.55556	Degrees C
Velocity/Rate					
Cubic meters/second	2118.9	Cubic feet/minute	Cubic feet/minute	0.00047195	Cubic meters/second
Grams/second	7.9366	Pounds/hour	Pounds/hour	0.126	Grams/second
Meters/second	2.237	Miles/hour	Miles/hour	0.44704	Meters/second
Volume					
Liters	0.26418	Gallons	Gallons	3.78533	Liters
Liters	0.035316	Cubic feet	Cubic feet	28.316	Liters
Liters	0.001308	Cubic yards	Cubic yards	764.54	Liters
Cubic meters	264.17	Gallons	Gallons	0.0037854	Cubic meters
Cubic meters	35.314	Cubic feet	Cubic feet	0.028317	Cubic meters
Cubic meters	1.3079	Cubic yards	Cubic yards	0.76456	Cubic meters
Cubic meters	0.0008107	Acre-feet	Acre-feet	1233.49	Cubic meters
Weight/Mass					
Grams	0.035274	Ounces	Ounces	28.35	Grams
Kilograms	2.2046	Pounds	Pounds	0.45359	Kilograms
Kilograms	0.0011023	Tons (short)	Tons (short)	907.18	Kilograms
Metric tons	1.1023	Tons (short)	Tons (short)	0.90718	Metric tons

ENGLISH TO ENGLISH					
Acre-feet	325,850.7	Gallons	Gallons	0.000003046	Acre-feet
Acres	43,560	Square feet	Square feet	0.000022957	Acres
Square miles	640	Acres	Acres	0.0015625	Square miles

a. This conversion is only valid for concentrations of contaminants (or other materials) in water.

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}
deca-	D	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}

SUMMARY

SUMMARY

The National Nuclear Security Administration (NNSA) has prepared a *Draft Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0380D) (SWEIS) that evaluates the potential impacts of current and proposed activities at the Los Alamos National Laboratory (LANL) in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations, and the U.S. Department of Energy (DOE) NEPA Implementing Procedures. This Summary is a concise stand-alone version of the main text of the Draft SWEIS, and includes information about the NEPA process as applied to the Draft SWEIS, background information (including a summary of the changes at LANL since the *Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico [1999 SWEIS]* [DOE/EIS-0238] was prepared), the purpose and need for the agency action, reasonable alternatives, and a comparison of the environmental consequences of the reasonable alternatives.

S.1 Background

The NEPA Implementing Procedures of DOE (Title 10 *Code of Federal Regulations* [CFR], Part 1021.330[c]) require the preparation of a SWEIS, a broad-scoped document that identifies and assesses the individual and cumulative impacts of ongoing and reasonably foreseeable future actions at a DOE site for large multiple-facility sites like LANL in Los Alamos, New Mexico (see **Figure S–1**). Since 1992, these procedures also require evaluation of a DOE SWEIS at least every 5 years by means of a Supplement Analysis. Based on the Supplement Analysis, DOE determines whether an existing SWEIS remains adequate, or whether to prepare a new SWEIS or supplement the existing SWEIS, as appropriate.

DOE issued the first SWEIS and Record of Decision (ROD) for the operation of LANL (then known as the Los Alamos Scientific Laboratory) in 1979. That environmental impact statement (EIS) was entitled *Final Environmental Impact Statement, Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico* (DOE/EIS-0018). Twenty years later, DOE issued the *1999 SWEIS* and its associated ROD (64 *Federal Register* [FR] 50797).

In early 2004, NNSA[1] undertook the required 5-year evaluation of the *1999 SWEIS* by initiating the preparation of a Supplement Analysis. In mid-2004, shortly into the process of preparing the Supplement Analysis, NNSA determined that the criteria for preparing at least a Supplemental SWEIS had been met. Criteria identified in DOE NEPA Implementing Procedures (10 CFR 1021.314) state that a Supplemental EIS shall be prepared if there are substantial changes to the proposal or significant new circumstances or information relevant to environmental concerns.

[1] *NNSA is a semiautonomous agency within DOE (see the 1999 National Nuclear Security Administration Act [Title 32 of the Defense Authorization Act for Fiscal Year 2000, Public Law 106-65]).*

In January 2005, NNSA published a Notice of Intent in the *Federal Register* (70 FR 307) announcing its plan to prepare a Supplemental SWEIS and conduct a public scoping meeting to receive comments. Subsequently, NNSA determined that changes in the LANL environment and proposed new activities warranted preparation of a new SWEIS. Changes to the LANL environment resulted from the 2000 Cerro Grande Fire, which burned a part of LANL, the Los Alamos townsite, and the surrounding forested area; a regional drought; and a massive regional infestation of bark beetles that killed many evergreen trees. Additional information about the LANL environmental setting has become available, as various elements of this setting, particularly the hydrology, have undergone intense investigation by LANL scientists.

Security requirements have evolved in response to changes in recognized threats to facilities and materials at LANL, and DOE and NNSA have finalized several EISs and environmental assessments for LANL operations and activities since issuance of the *1999 SWEIS*. These documents evaluate implementation of new or changed operations and facilities, land conveyances and transfers, and emergency actions taken at LANL in response to the Cerro Grande Fire.

NNSA is proposing new actions for implementation at LANL over the next 5 years that could affect several areas of LANL operations originally analyzed in the *1999 SWEIS*. While consistent with the 1999 ROD, these proposed activities represent potentially substantial changes to some operations. They include the refurbishment or replacement of existing infrastructure so that LANL operations can continue into the future.

Jointly, the activities analyzed through NEPA compliance documents completed since 1999, newly proposed activities for LANL, existing and developing changes to the LANL environmental setting, and changes in site security conditions have led NNSA to decide to update the *1999 SWEIS* by preparing a new SWEIS rather than a Supplemental SWEIS. Preparation of a new SWEIS also responds to comments received from the public during the scoping period. The new SWEIS impact analysis tiers from the *1999 SWEIS*, as appropriate, and incorporates information from that document by reference where the information presented in the earlier document remains valid.

Another benefit of preparing a new SWEIS is the reevaluation of cumulative impacts associated with LANL operations. When DOE personnel issued the *1999 SWEIS* and its associated ROD, the analyses considered operational impacts to the northern New Mexico environment that would likely occur over the "foreseeable future" (approximately 10 years for the purposes of that analysis). This new SWEIS considers cumulative impacts associated with ongoing activities at LANL in the context of the new information on the changed environment in the region. For example, a great deal of effort that was not anticipated in 1999 has been expended to implement forest thinning and watershed protection measures on the Pajarito Plateau since the 2000 Cerro Grande Fire.

The following section of this summary describes the purpose and need for continued operation of LANL. Sections S.3 and S.4 explain the scope of this new SWEIS and describe the decisions to be made by NNSA based, in part, on the analyses in this SWEIS, respectively. A description of LANL, as well as terms used in discussing the site and environmental impacts, is presented in Section S.5. The public participation process and a summary of the comments received during

the scoping process are provided in Section S.6. Changes that have occurred at LANL and a comparison to the projected environmental impacts of the *1999 SWEIS* are summarized in Section S.7. Alternatives considered and analyzed in this SWEIS are discussed in Section S.8. The environmental consequences are presented in Section S.9 for the alternatives analyzed in this SWEIS as well as for the individual projects analyzed in appendices of this SWEIS.

S.2 Purpose and Need for Agency Action

The purpose and need for agency action for this new SWEIS remains unchanged from that stated in the *1999 SWEIS*:

> *The purpose of the continued operation of LANL is to provide support for DOE's core missions as directed by Congress and the President. DOE's need to continue operating LANL is focused on its obligation to ensure a safe and reliable nuclear stockpile. For the foreseeable future, DOE, on behalf of the U.S. Government, will need to continue its nuclear weapons research and development, surveillance, computational analysis, components manufacturing, and nonnuclear aboveground experimentation. Currently, many of these activities are conducted solely at LANL so stopping these activities would run counter to national security policy as established by Congress.*

With the creation of NNSA in 2000, the President and Congress reaffirmed the Nation's need for ongoing operations at LANL by assigning administration of LANL to NNSA and by designating LANL as one of three national security laboratories. Further affirmation of the need for continued operations at LANL occurred in 2002, with the creation of the Department of Homeland Security and the subsequent assignment of many of its mission support activities to LANL and other national security laboratories.

On July 13, 2005, a Task Force of the Secretary of Energy Advisory Board issued its report entitled, *Recommendations for the Nuclear Weapons Complex of the Future*. This report contains a comprehensive review of the nuclear weapons complex, which includes LANL, and a vision for a modern nuclear weapons complex of the future that would address the needs of the nuclear weapons stockpile. NNSA is developing a strategy for continuing the transformation of the weapons complex, which began with the cessation of manufacturing at the Rocky Flats Plant, the end of the Cold War, and the U.S.'s suspension of nuclear weapons testing. NNSA refers to this strategy as a "planning scenario for Complex 2030;" it will set NNSA's vision of the complex in 2030. Budgetary requests to Congress, beginning with the President's Budget for Fiscal Years 2007 through 2011, will influence the evolution of this strategy. When the strategy has become sufficiently defined so that proposed actions can be identified, NNSA will need to determine what NEPA analyses it needs to conduct for the proposals. In the short term, over the next 5 years, LANL operations are not expected to change dramatically regardless of the strategy NNSA develops for continuing the transformation of the nuclear weapons complex. However, in recognition of the uncertainties associated with future work assignments to LANL, the "foreseeable future" for the purposes of proposed actions in this SWEIS has been changed from the 10 years of LANL operations considered in the *1999 SWEIS* to consideration of proposals regarding LANL operations over the next 5 years. While uncertainty remains about the future

work NNSA will assign to LANL to support NNSA missions, the overall need to continue operation of LANL is unlikely to change over the next several years.

S.3 Scope of the New SWEIS

This new SWEIS builds on the descriptions and analyses of past and future operational impacts presented in the *1999 SWEIS*, as well as the information contained in the LANL *SWEIS Yearbooks* prepared since the issuance of the 1999 ROD, and additional documents and data sources. The SWEIS Yearbooks are published annually to compare projections in the *1999 SWEIS* with actual operations data. This comparison assists in determining the adequacy of the analysis of environmental consequences in the *1999 SWEIS*. The new SWEIS provides a more focused environmental impact analysis, using the level of operations selected in the ROD of the *1999 SWEIS* as a starting point. In the new SWEIS, the No Action Alternative is the continued implementation of decisions in the *1999 SWEIS* ROD together with other activities for which separate NEPA reviews have been completed and decisions made since 1999. Other alternatives evaluated in this SWEIS include a Reduced Operations Alternative with newly proposed decreases in or elimination of certain activities, and an Expanded Operations Alternative that includes increases in certain ongoing activities and proposed new activities. The proposed new activities are evaluated by means of project-specific analyses contained in appendices of this SWEIS. **Figure S–2** is a simplified depiction of the alternatives evaluated in the new SWEIS; more detailed descriptions of the alternatives are provided in Section S.8 of this Summary.

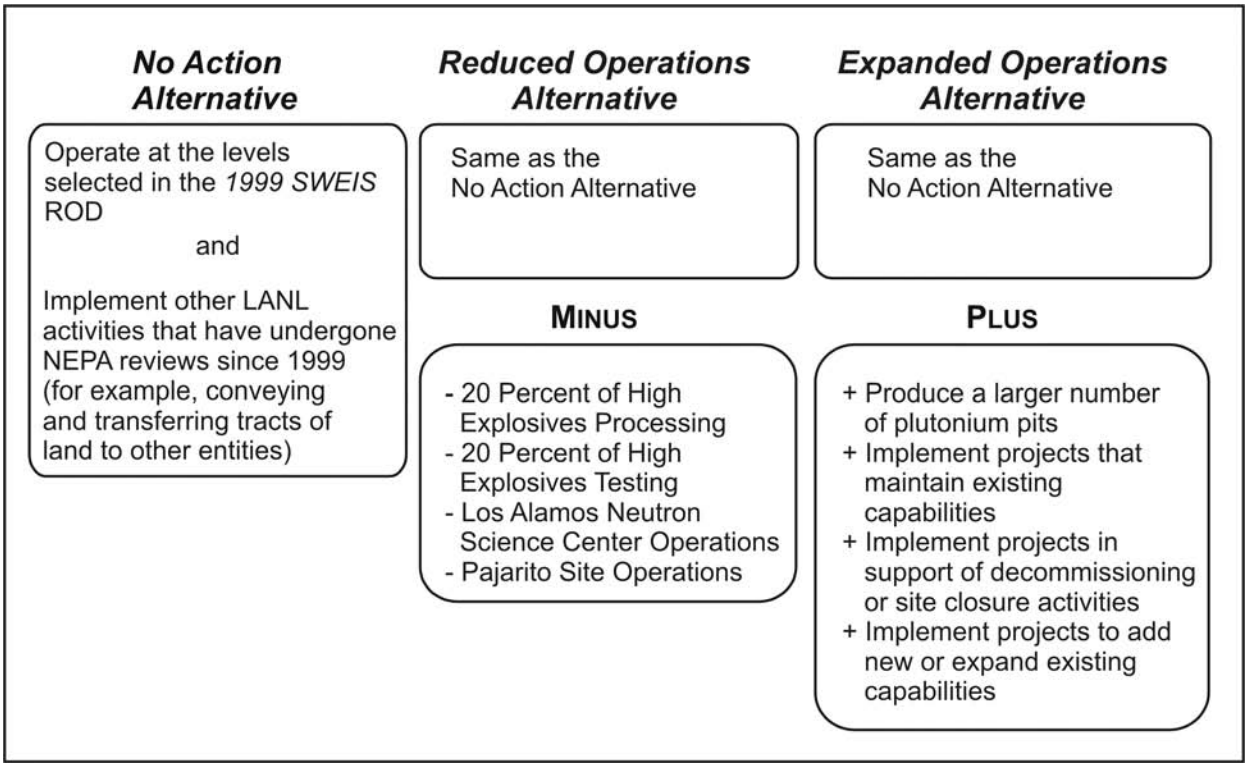

Figure S–2 Summary Comparison of Alternatives Considered in the New Site-Wide Environmental Impact Statement

The new SWEIS also provides an update of current activities at LANL by describing changes that have occurred at the site and presenting a summary of performance compared to *1999 SWEIS* projections. Consistent with the concept of tiering, or building on a previous NEPA document, pertinent information from the *1999 SWEIS* is summarized and incorporated by reference into the new SWEIS. The SWEIS analyzes the potential direct and indirect effects on the human environment under each Alternative. Other programmatic decisions currently being considered that might affect LANL and its missions, in combination with activities in the vicinity of LANL, are considered in the cumulative impacts analysis for this new SWEIS.

Appendices of this SWEIS include specific information and impact analyses for projects that are proposed as part of the Expanded Operations Alternative (project-specific analyses). The project-specific analyses evaluate the potential environmental consequences of projects that are proposed for initiation or implementation prior to 2011. These projects include:

Projects to Maintain Existing LANL Operations and Capabilities – Projects in this group would provide new structures for existing activities at LANL by replacing old and transportable buildings with new modern buildings. This group also includes projects that would provide major refurbishment of selected facilities to maintain capabilities, improve reliability, and prolong operations.

Center for Weapons Physics Research Project – provides for the construction and operation of secure and nonsecure facilities in Technical Area (TA) 3.

Replacement Office Buildings Project – provides up to 9 office buildings in TA-3 to replace temporary or obsolete buildings.

Technical Area (TA)

Geographically distinct administrative unit established for the control of LANL operations. There are currently 49 active TAs; 47 in the 40 square miles of the LANL site, one at Fenton Hill, west of the main site, and one comprising leased properties in town.

Radiological Sciences Institute Project (including Phase I – the Institute for Nuclear Nonproliferation Science and Technology) – provides for the consolidation and modernization of radiochemistry capabilities at LANL. Phase I would provide Security Category III and IV laboratories and Security Category I and II training facilities in TA-48 in support of nonproliferation activities.

Radioactive Liquid Waste Treatment Facility (RLWTF) Upgrade Project – provides replacement capabilities in TA-50 for the treatment of radioactive liquids; an auxiliary action provides treatment capability for effluents that could result in no effluent discharges to the environment.

Los Alamos Neutron Science Center (LANSCE) Refurbishment Project – provides for the replacement of equipment and system refurbishment and improvements at LANSCE in TA-53 to increase the reliability of operations and reduce maintenance costs.

TA-55 Radiography Facility Project – provides radiography capability within the secure area at the TA-55 Plutonium Facility Complex, avoiding the need to transport nuclear components to other locations at LANL for examination.

Plutonium Facility Complex Refurbishment Project – provides for a number of subprojects to upgrade electrical, mechanical, safety, and other facility-related systems at the TA-55 Plutonium Facility Complex.

Science Complex Project – provides for the construction of a Science Complex in TA-62 or TA-3. Most bioscience activities currently performed in the Health Research Laboratory would be moved to the new Science Complex.

Remote Warehouse and Truck Inspection Station Project – provides for a warehouse and truck inspection station in TA-72, away from the center portion of LANL.

Projects for Closure and Remediation Actions, including Consent Order Actions – Projects in this group include various actions that would result in the decontamination, decommissioning and demolition (DD&D) of excess facilities and the remediation of the LANL site. It also includes replacement of waste management capabilities that are displaced as a result of remediation activities.

Decontamination, Decommissioning, and Demolition (DD&D)

DD&D are those actions taken at the end of the useful life of a building or structure to reduce or remove substances that pose a substantial hazard to human health or the environment, retire it from service, and ultimately eliminate all or a portion of the building or structure.

TA-18 Closure Project, including Remaining Operations Relocation and Structure DD&D Project (TA-18 Closure Project) – provides for the relocation of the Security Category III and IV operations currently at the TA-18 Pajarito Site and the DD&D of the structures.

TA-21 Structure DD&D Project – provides for the DD&D of TA-21 structures. Options evaluated include complete and partial removal of structures to support remediation of potential release sites in TA-21.

Waste Management Facilities Transition Project – provides for the retrieval of transuranic waste stored below ground, the removal of the storage domes, and construction and operation of replacement low-level radioactive waste management facilities in TA-54, and construction and operation of a Transuranic Waste Consolidation Facility in TA-50 or TA-63. These actions are necessary to support closure of TA-54, material disposal area[2] (MDA) G.

Major Material Disposal Area Remediation, Canyon Cleanups and Other Compliance Order Actions – provides for the implementation of the Compliance Order on Consent (Consent Order) entered into by DOE, the University of California as the management and operating contractor, and the State of New Mexico in March 2005.[3] The analysis evaluates a Capping Option in which barriers are placed over the large MDAs and a Removal Option in which the large MDAs are exhumed.

[2] MDAs are areas used any time between the beginning of LANL operations in the early 1940s and the present for disposing of chemically, radioactively, or chemically and radioactively contaminated material.

[3] NNSA is not legally obligated to include the Consent Order impacts analysis, but for purposes of this SWEIS, NNSA is including this information in support of collateral decisions that NNSA may make to facilitate implementation of Consent Order activities.

Projects Associated with New Infrastructure or Levels of Operation – Projects in this group are of two types. One project would provide for changes in the transportation infrastructure within the LANL site. The other projects would provide for increases in activities or capabilities of existing facilities or projects.

Security-Driven Transportation Modifications Project – provides for the construction of parking lots and changes in access along the Pajarito Road corridor to enhance physical security at facilities in TA-35, TA-48, TA-50, TA-55, and TA-63. Proposed auxiliary actions would provide bridges across Mortandad and Sandia Canyons and roadways connecting to TA-3 and East Jemez Road.

Nicholas C. Metropolis Center for Modeling and Simulation (Metropolis Center) Increase in Level of Operations – provides for the expansion of computing capability at the Metropolis Center.

Increase in the Type and Quantity of Sealed Sources Managed at LANL by the Off-Site Source Recovery Project – expands the types of sealed sources to be managed at LANL to include non-actinide materials routinely used in sealed sources in addition to sources currently approved for management (primarily actinide-bearing sources).

S.4 Decisions to be Supported by the New Site-Wide Environmental Impact Statement

This SWEIS updates the *1999 SWEIS* analysis and evaluates the impacts of newly-proposed projects. The ROD(s) based on this new SWEIS may supersede previous decisions made in 1999 regarding the level at which LANL operations will be conducted over at least the next 5-year period, 2007 through 2011. This analysis provides an opportunity to reassess the impacts of LANL operations on workers, the public, and the environment in light of changes in the environmental setting, changes in the locations at which certain activities are performed, changes in the boundaries of LANL and therefore the locations to be considered for impacts to a member of the public, and changes in guidance for evaluating risk from radiological exposures.

These changes, together with information regarding impact analyses specific to newly proposed projects at LANL that could have overarching effects, will be considered by NNSA Administrator in making decisions about the continued operation of LANL over the next 5 years. Focusing on LANL operations over the next 5 years allows the NNSA Administrator to make decisions with a reasonable expectation of being able to implement those decisions and associated mitigation measures.

The decisions the NNSA Administrator may make regarding the operation of LANL are:

- Whether to implement the No Action Alternative for LANL operations either in whole or in part,
- Whether to implement the Reduced Operations Alternative either in whole or in part, or
- Whether to implement the Expanded Operations Alternative either in whole or in part.

The NNSA Administrator could select the level of operations for a Key Facility or whether to implement individual projects from among the Alternatives. NNSA plans to implement actions necessary to comply with the Consent Order, regardless of whether it implements other actions

analyzed as part of the Expanded Operations Alternative, the alternative that includes the analysis of the actions needed to comply with that order. Choosing to delay making an action decision for a particular Key Facility or specific project would constitute a decision to implement the No Action Alternative for that facility or project. NNSA could issue a ROD or RODs to document its decision regarding the level of operations at LANL or the implementation of a project no sooner than 30 days after the Environmental Protection Agency Notice of Availability of the Final SWEIS. In addition to the environmental impact information provided by the SWEIS, other considerations not evaluated through the NEPA process would influence the NNSA Administrator's decisions. These considerations include cost estimate information, schedule considerations, safeguards and security concerns, and programmatic considerations.

S.5 Site Description

LANL is located in northern New Mexico within Los Alamos County (see Figure S–1). The two primary residential areas within the County are the Los Alamos townsite and the White Rock residential area, home to about 18,400 people. About 13,000 people work at LANL, of which fewer than half reside within the County.

LANL occupies about 40 square miles (25,600 acres [10,360 hectares]) of land on the eastern flank of the Jemez Mountains along the Pajarito Plateau. The terrain consists of relatively flat mesa tops and canyon bottoms that trend west-to-east toward the Rio Grande. Most of LANL consists of relatively undeveloped forest that serves to provide a buffer for security and safety, as well as space for future expansion.

Activities and potential environmental impacts at LANL are discussed with respect to their location within TAs at the site and whether they are related to those facilities identified as Key Facilities for purposes of this SWEIS. Section S.5.1 describes the TAs at LANL. Section S.5.2 defines the term "Key Facilities" and identifies those facilities at LANL. Section S.5.3 discusses LANL non-Key Facilities.

S.5.1 Technical Areas

LANL operations occupy 49 TAs, including TA-0, the designation given to leased space in the Los Alamos townsite. As shown in **Figure S–3**, there are 47 contiguous TAs; in addition, TA-57 is located approximately 20 miles (32 kilometers) away at Fenton Hill. TAs are geographically discrete areas that are segregated for management, planning, operational, and security purposes. LANL operations occur within the more than 2,000 structures located within these TAs. As of the end of 2005, LANL has approximately 8.6 million square feet (800,000 square meters) under roof on land under the administrative control of NNSA; the total space available for operational use changes frequently as structures are demolished or built. Approximately half of the square footage of buildings at LANL is considered laboratory or production space; the remaining square footage is used for administrative purposes, storage, service, and other space. The number of structures within TAs varies slightly with time, due to frequent addition or removal of temporary structures and miscellaneous buildings. Permanent structures include buildings, meteorological towers, water tanks, manholes, small storage sheds, and electrical transformers, in addition to the specialized facilities that have been built and maintained at LANL over the last 50 years. **Table S–1** provides a brief overview of current activities conducted at each TA.

Table S–1 Overview of Los Alamos National Laboratory Technical Areas and Activities

Technical Area [a]	*Activities*
TA-0 (Offsite Facilities)	This TA designation is assigned to structures leased by DOE that are located outside LANL's boundaries in the Los Alamos townsite and White Rock.
TA-2 (Omega Site or Omega West Reactor)	This TA in Los Alamos Canyon was home to the now demolished Omega West Reactor.
TA-3 (Core Area or South Mesa Site)	This TA is LANL's core scientific and administrative area, with approximately half of LANL's employees and total floor space. It is the location of a number of the LANL's Key Facilities, including the Chemistry and Metallurgy Research Building, the Sigma Complex, the Machine Shops, the Material Sciences Laboratory, and the Nicholas C. Metropolis Center for Modeling and Simulation. It is also the location proposed for operating a Biosafety Level 3 laboratory.
TA-5 (Beta Site)	This TA is largely undeveloped. Located between East Jemez Road and the San Ildefonso Pueblo, it contains physical support facilities, an electrical substation, and test wells.
TA-6 (Two-Mile Mesa Site)	This TA, located in the northwestern part of LANL, is mostly undeveloped. It contains a meteorological tower, gas-cylinder-staging buildings, and aging vacant buildings that are awaiting demolition.
TA-8 (GT-Site [Anchor Site West])	This TA, located along West Jemez Road, is a testing site where nondestructive dynamic testing techniques are used for the purpose of ensuring the quality of materials in items ranging from test weapons components to high-pressure dies and molds. Techniques used include radiography, radioisotope techniques, ultrasonic and penetrant testing, and electromagnetic test methods.
TA-9 (Anchor Site East)	This TA is located on the western edge of LANL. Fabrication feasibility and the physical properties of explosives are explored at this TA, and new organic compounds are investigated for possible use as explosives.
TA-11 (K-Site)	This TA is used for testing explosives components and systems, including vibration analysis and drop-testing materials and components under a variety of extreme physical environments. Facilities are arranged so that testing may be controlled and observed remotely, allowing devices that contain explosives, radioactive materials, and nonhazardous materials to be safely tested and observed.
TA-14 (Q-Site)	This TA, located in the northwestern part of LANL, is one of 14 firing areas. Most operations are remotely controlled and involve detonations, certain types of high explosives machining, and permitted burning.
TA-15 (R-Site)	This TA, located in the central portion of LANL, is used for high explosives research, development, and testing, mainly through hydrodynamic testing and dynamic experimentation. TA-15 is the location of two firing sites, the Dual Axis Radiographic Hydrodynamic Test Facility, which has an intense high-resolution, dual-machine radiographic capability, and Building 306, a multipurpose facility where primary diagnostics are performed.
TA-16 (S-Site)	TA-16, in the western part of LANL, is the location of the Weapons Engineering Tritium Facility, a state-of-the-art tritium processing facility. The TA is also the location of high explosives research, development, and testing, and the High Explosives Wastewater Treatment Facility.
TA-18 (Pajarito Site)	This TA, located in Pajarito Canyon, is the location of the Los Alamos Critical Experiment Facility, a general-purpose nuclear experiments facility. It is the location of the Solution High-Energy Burst Assembly and is also used for teaching and training related to criticality safety and applications of radiation detection and instrumentation. In December 2002, DOE decided to relocate all TA-18 Security Category I and II materials and activities to the Nevada Test Site; these activities are in process.
TA-21 (DP-Site)	TA-21 is on the northern border of LANL, next to the Los Alamos townsite. In the western part of the TA is the former radioactive materials processing facility that has been partially decontaminated and decommissioned. In the eastern part of the TA are the Tritium Systems Test Assembly and the Tritium Science and Fabrication Facility. Operations from both facilities have been or will be transferred elsewhere by the end of 2006.
TA-22 (TD-Site)	This TA, located in the northwestern portion of LANL, houses the Los Alamos Detonator Facility. Construction of a new Detonator Production Facility began in 2003. Research, development, and fabrication of high-energy detonators and related devices are conducted at this facility.
TA-28 (Magazine Area A)	TA-28, located near the southern edge of LANL, was an explosives storage area. The TA contains five empty storage magazines that are being decontaminated and decommissioned.

Technical Area [a]	***Activities***
TA-33 (HP-Site)	TA-33 is a remotely-located TA at the southeastern boundary of LANL. The TA is used for experiments that require isolation, but do not require daily oversight. The National Radioastronomy Observatory's Very Long Baseline Array telescope is located at this TA.
TA-35 (Ten Site)	This TA, located in the north central portion of LANL, is used for nuclear safeguards research and development, primarily in the areas of lasers, physics, fusion, materials development, and biochemistry and physical chemistry research and development. The Target Fabrication Facility, located at this TA, conducts precision machining and target fabrication, polymer synthesis, and chemical and physical vapor deposition. Additional activities at TA-35 include research in reactor safety, optical science, and pulsed-power systems, as well as metallurgy, ceramic technology, and chemical plating. Additionally, there are some Biosafety Level 1 and 2 laboratories at TA-35.
TA-36 (Kappa-Site)	TA-36, a remotely-located area in the eastern portion of LANL, has four active firing sites that support explosives testing. The sites are used for a wide variety of nonnuclear ordnance tests.
TA-37 (Magazine Area C)	This TA is used as an explosives storage area. It is located at the eastern perimeter of TA-16.
TA-39 (Ancho Canyon Site)	TA-39 is located at the bottom of Ancho Canyon. This TA is used to study the behavior of nonnuclear weapons (primarily by photographic techniques) and various phenomenological aspects of explosives.
TA-40 (DF-Site)	TA-40, centrally located within LANL, is used for general testing of explosives or other materials and development of special detonators for initiating high explosives systems.
TA-41 (W-Site)	TA-41, located in Los Alamos Canyon, is no longer actively used. Many buildings have been decontaminated and decommissioned; the remaining structures include historic properties.
TA-43 (the Bioscience Facilities, formerly called the Health Research Laboratory)	TA-43 is adjacent to the Los Alamos Medical Center at the northern border of LANL. Two facilities are located within this TA: the Bioscience Facilities (formerly called the Health Research Laboratory) and NNSA's local Site Office. The Bioscience Facilities have Biosafety Level 1 and 2 laboratories and are the focal point of bioscience and biotechnology at LANL. Research performed at the Bioscience Facilities includes structural, molecular, and cellular radiobiology; biophysics; radiobiology; biochemistry; and genetics.
TA-46 (WA-Site)	TA-46, located between Pajarito Road and the San Ildefonso Pueblo, is one of LANL's basic research sites. Activities have focused on applied photochemistry operations and have included development of technologies for laser isotope separation and laser enhancement of chemical processes. The Sanitary Wastewater Systems Plant is also located within this TA.
TA-48 (Radiochemistry Site)	TA-48, located in the north central portion of LANL, supports research and development in nuclear and radiochemistry, geochemistry, production of medical radioisotopes, and chemical synthesis.
TA-49 (Frijoles Mesa Site)	TA-49, located near Bandelier National Monument, is used as a training area and for outdoor tests on materials and equipment components that involve generating and receiving short bursts of high-energy, broad-spectrum microwaves. A fire support building and helipad located near the entrance to the TA are operated by the U.S. Forest Service.
TA-50 (Waste Management Site)	TA-50, located near the center of LANL, is the location of waste management facilities including the Radioactive Liquid Waste Treatment Facility and the Waste Characterization, Reduction, and Repackaging Facility. The Actinide Research and Technology Instruction Center is also located in this TA.
TA-51 (Environmental Research Site)	TA-51, located on Pajarito Road in the eastern portion of LANL, is used for research and experimental studies on the long-term impacts of radioactive materials on the environment. Various types of waste storage and coverings are studied at this TA.
TA-52 (Reactor Development Site)	TA-52 is located in the north central portion of LANL. A wide variety of theoretical and computational research and development activities related to nuclear reactor performance and safety, as well as to several environmental, safety, and health activities, are carried out at this TA.
TA-53 (Los Alamos Neutron Science Center)	TA-53, located in the northern portion of LANL, includes the LANSCE. LANSCE houses one of the largest research linear accelerators in the world and supports both basic and applied research programs. Basic research includes studies of subatomic and particle physics, atomic physics, neutrinos, and the chemistry of subatomic interactions. Applied research includes materials science studies that use neutron spallation and contributes to defense programs. LANSCE has also produced medical isotopes for the past 20 years.
TA-54 (Waste Disposal Site)	TA-54, located on the eastern border of LANL, is one of the largest TAs at LANL. Its primary function is management of solid radioactive and hazardous chemical wastes, including storage, treatment, decontamination, and disposal operations.

Technical Area [a]	*Activities*
TA-55 (Plutonium Facility Complex Site)	TA-55, located in the center of LANL, is the location of the Plutonium Facility Complex and is the chosen location for the Chemistry and Metallurgy Research Building Replacement. The Plutonium Facility provides chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides into many compounds and forms. The Chemistry and Metallurgy Research Building Replacement, currently under construction, will provide chemistry and metallurgy research, actinide chemistry, and materials characterization capabilities.
TA-57 (Fenton Hill Site)	TA-57 is located about 20 miles (32 kilometers) west of LANL on land administered by the U.S. Forest Service. The primary purpose of the TA is observation of astronomical events. TA-57 houses the Milagro Gamma Ray Observatory and a suite of optical telescopes. Drilling technology research is also performed in this TA.
TA-58 (Twomile North Site)	TA-58, located near LANL's northwest border on Twomile Mesa North, is a forested area reserved for future use because of its proximity to TA-3. The TA houses a few LANL-owned storage trailers and a temporary storage area.
TA-59 (Occupational Health Site)	This TA is located on the south side of Pajarito Road adjacent to TA-3. This is the location of staff who provide support services in health physics, risk management, industrial hygiene and safety, policy and program analysis, air quality, water quality and hydrology, hazardous and solid waste analysis, and radiation protection. The Medical Facility at TA-59 includes a clinical laboratory and provides bioassay sample analytical support.
TA-60 (Sigma Mesa)	TA-60 is located southeast of TA-3. The TA is primarily used for physical support and infrastructure activities. The Nevada Test Site Test Fabrication Facility and a test tower are also located here. Due to the moratorium on testing, these buildings have been placed in indefinite safe shutdown mode.
TA-61 (East Jemez Site)	TA-61, located in the northern portion of LANL, contains physical support and infrastructure facilities, including a sanitary landfill operated by Los Alamos County and sewer pump stations.
TA-62 (Northwest Site)	TA-62, located next to TA-3 and West Jemez Road in the northwest corner of LANL, serves as a forested buffer zone. This TA is reserved for future use.
TA-63 (Pajarito Service Area)	TA-63, located in the north central portion of LANL, contains physical support and infrastructure facilities. The facilities at this TA serve as localized storage and office space.
TA-64 (Central Guard Site)	This TA is located in the north central portion of LANL and provides offices and storage space.
TA-66 (Central Technical Support Site)	TA-66 is located on the southeast side of Pajarito Road in the center of LANL. The Advanced Technology Assessment Center, the only facility at this TA, provides office and technical space for technology transfer and other industrial partnership activities.
TA-67 (Pajarito Mesa Site)	TA-67 is a forested buffer zone located in the north central portion of LANL. No operations or facilities are currently located at the TA.
TA-68 (Water Canyon Site)	TA-68, located in the southern portion of LANL, is a testing area for dynamic experiments that also contains environmental study areas.
TA-69 (Anchor North Site)	TA-69, located in the northwestern corner of LANL, serves as a forested buffer area. The new Emergency Operations Center, completed in 2003, is located here.
TA-70 (Rio Grande Site)	TA-70 is located on the southeastern boundary of LANL and borders the Santa Fe National Forest. It is a forested TA that serves as a buffer zone.
TA-71 (Southeast Site)	TA-71 is located on the southeastern boundary of LANL and is adjacent to White Rock to the northeast. It is an undeveloped TA that serves as a buffer zone for the High Explosives Test Area.
TA-72 (East Entry Site)	TA-72, located along East Jemez Road on the northeastern boundary of LANL, is used by protective force personnel for required firearms training and practice purposes.
TA-73 (Airport Site)	TA-73 is located along the northern boundary of LANL, adjacent to Highway 502. The County of Los Alamos manages, operates, and maintains the community airport under a leasing arrangement with DOE. Use of the airport by private individuals is permitted with special restrictions.
TA-74 (Otowi Tract)	TA-74 is a forested area in the northeastern corner of LANL. A large portion of this TA has been conveyed to Los Alamos County or transferred to the Department of the Interior in trust for the Pueblo of San Ildefonso and is no longer part of LANL.

TA = technical area, LANSCE = Los Alamos Neutron Science Center.
[a] Names in parentheses are common or historical names that are sometimes used to refer to the Technical Areas.

S.5.2 Key Facilities

Fifteen facilities within LANL were identified in the *1999 SWEIS* as being Key Facilities for the evaluation of potential environmental impacts of operations in the SWEIS. Facilities labeled as "Key" in both the *1999 SWEIS* and this new SWEIS house activities critical to performing mission work assigned to LANL and:

- House operations that have potential to cause significant environmental impacts; or
- Are of most interest or concern to the public based on scoping comments received; or
- Would be most subject to change as a result of programmatic decisions.

The definition of a Key Facility is not limited to a single structure, building, or TA. The number of structures constituting a Key Facility ranges from one (Material Sciences Laboratory) to more than 400 (LANSCE). Key Facilities may exist in more than one TA, as is the case with the High Explosives Processing Key Facility which consists of structures in seven TAs.

Taken together, the Key Facilities represent the greatest potential for risks of exposure to hazardous materials associated with LANL operations. The *1999 SWEIS* projections and operational experience show that the Key Facilities presented in **Figure S–4** produce:

- More than 99 percent of all radiation doses to the public;
- More than 99 percent of all radiation doses to the LANL workforce;
- More than 90 percent of all radioactive liquid waste generated at LANL; and
- More than 90 percent of all radioactive solid waste generated at LANL.

Nuclear and radiological facilities at LANL are identified by hazard category in accordance with their potential consequences in the event of an accident. At LANL, there are no Hazard Category 1 nuclear facilities; the nuclear facilities are either Hazard Category 2 or Hazard Category 3. Facilities that handle less than Hazard Category 3 threshold quantities of radioactive materials, but require identification of "radiological areas" are designated radiological facilities. All of the nuclear Hazard Category 2 and 3 facilities and most of the radiological facilities at LANL are either Key Facilities in this SWEIS or are MDAs being addressed by the environmental restoration project.

Nuclear Facility Hazards Categorization

Hazard Category 1: Hazard analysis shows the potential for significant offsite consequences.

Hazard Category 2: Hazard analysis shows the potential for significant onsite consequences.

Hazard Category 3: Hazard analysis shows the potential for only significant localized consequences.

For the impact analysis in this new SWEIS, the identity of the LANL Key Facilities was modified to incorporate decisions DOE made after 1999 that resulted in changes to LANL facilities and operations. As shown in **Table S–2**, most of the Key Facilities in the *1999 SWEIS* are also Key Facilities in this new SWEIS. The only changes to the list are the addition of the Metropolis Center as a new Key Facility, and the removal of the Pajarito Site as a Key Facility for alternatives other than the No Action Alternative.

Table S–2 Comparison of Key Facilities Between the *1999 SWEIS* and this New SWEIS

Key Facilities	*1999 SWEIS*	*New SWEIS*
Chemistry and Metallurgy Research Building	✓	✓
Sigma Complex	✓	✓
Machine Shops	✓	✓
Material Sciences Laboratory	✓	✓
Nicholas C. Metropolis Center for Modeling and Simulation		✓
High Explosives Processing	✓	✓
High Explosives Testing	✓	✓
Tritium Facilities	✓	✓
Pajarito Site (Los Alamos Critical Experiments Facility)	✓	(a)
Target Fabrication	✓	✓
Bioscience Facilities (previously called Health Research Laboratory)	✓	✓
Radiochemistry Facility	✓	✓
Waste Management Operations: Radioactive Liquid Waste Treatment Facility	✓	✓
Los Alamos Neutron Science Center	✓	✓
Waste Management Operations: Solid Radioactive and Chemical Waste Facilities	✓	✓
Plutonium Facility Complex	✓	✓

[a] The Pajarito Site remains a Key Facility under the No Action Alternative only.

S.5.3 Non-Key Facilities

The majority of LANL buildings are not Key Facilities, and house operations that are unlikely to cause significant environmental impacts, although some have been designated as nuclear or moderate hazard facilities. These buildings and structures, collectively called non-Key Facilities, are located in 30 of the 49 TAs over approximately 14,200 acres (5,750 hectares) of LANL's 25,600 acres (10,360 hectares). Some of these non-Key Facilities are operating, but several are now surplus and awaiting DD&D. Currently, there are no Hazard Category 2 or 3 nuclear facilities among the non-Key Facilities at LANL. The following list provides information about physical changes to non-Key Facilities occurring since the issuance of the *1999 SWEIS* and includes hazard category designation changes where appropriate:

- Various Chlorination Stations (TA-0, Buildings 1109, 1110, 1113, 1114; 16-560; 54-1008; 72-3; 73-9) were designated moderate chemical hazard facilities in the *1999 SWEIS*. Since then, the quantity of chlorine stored at these facilities has been reduced or eliminated, so they are no longer categorized as hazardous facilities. Ownership of several chlorination stations was conveyed to Los Alamos County.

- The Omega West Building (2-1) and reactor were completely decontaminated and demolished in September 2003.

- The Ion Beam Building (3-16) houses an accelerator that is currently in safe-shutdown mode. All radioactive sources have been removed from that building.

- All cryogenics equipment has been removed from the Condensed Matter and Thermal Physics Laboratory (Building 3-34) since 1999 and the Ion Beam M Laboratory now occupies the basement.

- The Health Physics Instrument Calibration facilities, located within the Physics Building (3-40), are no longer designated a Hazard Category 3 nuclear facility. The facilities were relocated to Buildings 36-1 and 36-214, both of which are on the radiological facilities list.

- The Source Storage Building (3-65) has been downgraded from a Nuclear Hazard Category 2 since the *1999 SWEIS*, and removed from the radiological facilities list. It is currently used for storage of materials and test kits.

- The Calibration Building (3-130), designated in the *1999 SWEIS* as a Hazard Category 3 nuclear facility, is being converted into office space with some light-laboratory areas and is no longer on the radiological facilities list.

- The Liquid and Compressed Gas Facility (Building 3-170) was reclassified to a low chemical hazard status. All toxic materials have been removed from this facility since 1999.

- Building 21-5, a laboratory, has been reclassified as a radiological facility since 1999.

- Building 21-150, Molecular Chemistry, has been removed from the radiological facilities list and is now identified as a surplus structure.

- The High Pressure Tritium Facility (Building 33-86) was decommissioned in 2002 prior to its subsequent demolition.

- Nuclear Safeguards Research Facilities (Buildings 35-2 and 35-27) were downgraded to radiological facilities in 2000 from Hazard Category 3 nuclear facilities in the *1999 SWEIS*.

- Central High Pressure Calibration Facility construction (Building 36-214) was completed in October 2001 and categorized as a radiological facility. In addition, Building 36-1, a laboratory and office building, has been categorized as a radiological facility since 1999.

- The Laboratory Building (41-4) was categorized as a radiological facility in the *1999 SWEIS*. Building 41-30 was demolished with a major portion of Building 41-4. The Ice House, Building 41-1, an underground storage vault, is categorized as a radiological facility, although no special nuclear material is now stored in the vault.

- The Sewage Treatment Plants (Building 46-340) no longer use chlorine gas for effluent disinfection, so the designation as moderate chemical hazard facilities prior to 1999 has recently been changed.

S.6 Public Involvement and Issues Identified

The NEPA process provides opportunities for public involvement. DOE's NEPA Implementing Procedures provide these opportunities during a scoping period that commences with publication of the Notice of Intent to prepare an EIS in the *Federal Register* and during the comment period for a Draft EIS. **Figure S–5** identifies the steps in the NEPA process for an EIS.

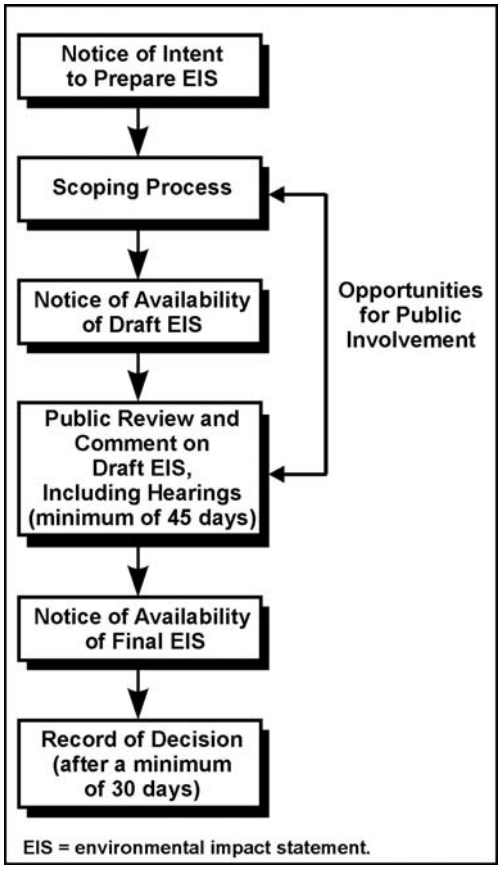

Figure S–5 National Environmental Policy Act Process

On January 5, 2005, NNSA published a Notice of Intent to prepare a Supplemental SWEIS in the *Federal Register* (70 FR 307) and advised the public that comments on the Proposed Action would be accepted until February 17, 2005. A public scoping meeting was held on January 19, 2005, in Pojoaque, New Mexico.

Approximately 225 comments were received from citizens, interested groups, local officials, and representatives of Native American Pueblos in the vicinity of LANL during the scoping process. NNSA reviewed all of the comments. Where possible, comments on similar or related topics were grouped into common categories as a means of summarizing them. After the issues were identified, they were evaluated to determine whether they were in the scope of the SWEIS. Issues found to be within the scope of the SWEIS are addressed in the appropriate chapters or appendices of this Draft SWEIS.

Multiple comments were made regarding the type of NEPA document that NNSA should prepare. There were comments calling for development of a new SWEIS rather than a supplement to the *1999 SWEIS*. Justifications for a new SWEIS included changes in operations and the environment, issuance of the Consent Order, concerns about inadequacies of the *1999 SWEIS*, contaminants in the environment, and others. Leak path factors used at LANL and calculation errors were cited as concerns affecting the quality of analyses. One commentor requested that the latest software be used to calculate risks from accidents. Regarding the scope of the document, comments included the desire to see a Reduced Operations Alternative, a Greener Alternative, and a "true No Action Alternative."

In response, NNSA prepared this SWEIS instead of a Supplemental SWEIS, as originally proposed. This SWEIS includes analysis of a Reduced Operations Alternative to assess the impacts of continued operation of LANL, with certain facilities operating at lower levels. Two alternatives that were suggested for inclusion in the new SWEIS are not analyzed. A "true No Action Alternative" (understood to mean a cessation of LANL operations) is not included, nor is a "Greener Alternative." The reasons these alternatives were considered and dismissed from further evaluation are discussed in Section S.8 of this Summary.

Commenting on the scope of the facilities to be included in the analysis, commentors stated that the operation of the Chemistry and Metallurgy Research Replacement Facility and a modern pit facility should not be analyzed as part of the No Action Alternative or potential Expanded Operations Alternative of this SWEIS, but nonetheless, the environmental impacts should be analyzed in the Supplemental SWEIS. Similar opinions were expressed about the Biosafety Level 3 Facility, while other commentors requested that operation of the Biosafety Level 3 Facility be addressed in a separate EIS. Commentors requested an accounting of potential impacts of continued storage of transuranic waste destined for the Waste Isolation Pilot Plant (WIPP) in New Mexico, as well as the impacts of any precautions taken to mitigate the potential risk posed by the waste. Some commentors requested that the SWEIS analyze environmental impacts of decontaminating and decommissioning TA-18, including the special nuclear material remaining at the site, storm water runoff, and the impacts of natural and manmade disasters.

The alternatives and impacts described in the SWEIS include the operation of the Chemistry and Metallurgy Research Replacement Facility, the continued management of transuranic waste at LANL, and the decontamination and decommissioning of TA-18, the Pajarito Site. A decision on the construction or location of a modern pit facility has not been made by NNSA; however, the potential impacts of such a facility being constructed and operated at LANL are addressed as part of the cumulative impacts in this SWEIS.

NNSA has decided that preparation of an EIS is the appropriate level of NEPA analysis for operation of the Biosafety Level 3 Facility and that the analysis should be conducted separately from this SWEIS (70 CFR 71490). The global situation with regard to bioterrorism continues to evolve. The ability to provide cutting-edge technology and resources to address the situation grows more important and increases the urgency to decide whether to operate the Biosafety Level 3 Facility.

Some of the operational issues proposed for analysis in the scoping comments included plans for the Reliable Replacement Warhead Project, work on the Robust Nuclear Earth Penetrator, consolidation of plutonium activities, “accelerated aging” studies, creation of a “nuclear campus,” production of qualified war reserve pits, enhanced test readiness, increase in directed stockpile work, waste management in Area G, industrial use areas of LANL, the Advanced Hydrotest Facility, Dual Axis Radiographic Hydrotest Facility, LANSCE upgrades, and “Work-for-Others.” This SWEIS does not address each of these programs or projects individually. Certain projects are included in the analyses to the extent that they support NNSA missions or other LANL customers and would be undertaken within the capabilities and activities described in this SWEIS.

A range of comments on environmental changes since the release of the *1999 SWEIS* were received. These included general questions on New Mexico’s drought and the impacts of the Cerro Grande Fire in 2000, especially with respect to erosion, contaminated runoff, depleted uranium released into the smoke plume during the fire, and the presence and monitoring of environmental contaminants in groundwater, surface water, soil, and biota. Recommendations were made to include monitoring strategies and data reporting in the SWEIS, as well as lessons learned at other DOE sites. This SWEIS presents updated information regarding environmental monitoring, and provides summary information regarding environmental contamination; it also

summarizes the results of a number of studies performed following the Cerro Grande Fire to determine the impacts the fire had on the movement of contaminants. In addition, this SWEIS presents a comparison of levels of environmental contamination based on composite samples of groundwater, storm water runoff, sediments, and soil as measured over the years since the Cerro Grande Fire, compared to similar sample results presented in the *1999 SWEIS*.

LANL's impact on water resources was a key issue among commentors who wanted the SWEIS to incorporate the most recent hydrogeological data available. Key hydrological issues included the presence of fast-moving contaminants such as tritium and perchlorate in groundwater and hydrological impacts on groundwater in the vicinity of the site, as well as the potential impacts on drinking water sources in the region. This SWEIS includes updated information regarding the current understanding of the hydrogeologic regime at LANL. This includes descriptions of the current understanding of groundwater at LANL based on recent studies, as well as discussions of the uncertainties that remain regarding groundwater flow and the transport of contaminants. Results from the groundwater sampling program conducted at LANL and in the vicinity of the site are also included.

Comments were also received regarding the impacts of the Clean Water Act, Federal Facilities Compliance Agreement, and DOE water rights. The new Federal Facilities Compliance Agreement requirements for monitoring are discussed in this SWEIS. Information on DOE's water rights and water usage at LANL, as well as in Los Alamos County, are also addressed.

NNSA received comments from local Native American Tribes that reflected concerns related to LANL operations and human and environmental health problems in their communities. They believe health issues were not properly addressed in the *1999 SWEIS* or ROD and would like to see a more detailed analysis. Similar comments received from the public expressed a need for the SWEIS to explore the possible health impacts of radiation other than latent cancer fatalities (LCFs), including premature aging, excess tumors (not necessarily cancerous), genetic and fetal effects, and increased cardiovascular diseases and renal failure. Tribal comments additionally expressed a need for independent monitoring studies funded by NNSA.

This SWEIS provides recent information on cancer incidence and mortality in New Mexico and in the counties around LANL. It also reports on the results of independent studies that have been conducted to evaluate potential impacts of radioactive and chemical contaminants from LANL. In assessing possible health impacts from exposure to radiation, this SWEIS conforms to the established NEPA practice of expressing the impacts as LCFs. It discusses the relationship between radiation exposure and genetic effects. The analyses in the *1999 SWEIS* of potential impacts to special receptors that could be exposed to contaminants in the soil and foodstuffs affected by LANL operations was reviewed and determined to be appropriate and technically correct. An update of these analyses based on more recent data regarding the concentrations of contaminants in the environment and foodstuffs is described in detail.

The impacts of LANL operations on cultural and ancestral sites and Tribal access to those sites are important to Native Americans. The SWEIS includes discussion of the process undertaken to ensure that cultural resources at LANL are explicitly considered and protected, particularly when new projects are undertaken. The project-specific analyses identify whether there are known cultural resources in the areas of the projects that would potentially be impacted.

Concerns were expressed about LANL's recent reduction in air monitoring. The public wanted to see the environmental impacts of reduced air monitoring activities analyzed in the SWEIS. The SWEIS discusses the air monitoring program and summarizes the results of, and rationale for, ending a portion of the program concerned with nonradioactive constituents.

One commentor wanted to see analysis of pit manufacturing removed from the SWEIS in favor of a more detailed analysis of air quality. Other commentors requested analysis of soil monitoring and contamination in the SWEIS, including impacts on downwind and downgradient communities up to 100 miles (160 kilometers) from the facility. Several commentors asked that the SWEIS address whether the effects of the *1999 SWEIS* accident scenarios or new accident scenarios have been reduced or mitigated as a result of the $345 million granted to LANL following the Cerro Grande Fire.

Potential impacts associated with normal operations at LANL, including pit manufacturing, and postulated accidents have been reanalyzed. The new analyses reflect the changes that have occurred at the site and updated methodologies and data. This includes accounting for changes in LANL's borders, forest thinning activities, restriction on travel along Pajarito Road, and using current computer codes and updated dose conversion or risk factors. The new SWEIS evaluates potential impacts to the offsite public from normal operations and accident conditions including a revisited wildfire analysis, within a region of influence defined as up to 50 miles (80 kilometers) from the site. Operational and accident impacts of LANL would be greatest within a few miles of the site boundary; extending the region of influence out to 100 miles (160 kilometers) changes the calculated results only a few percent for the accident with the highest potential for widespread impacts. Additionally, the potential impacts to a maximally exposed individual (MEI) near the site boundary are evaluated. Results of these analyses do not indicate the need to evaluate impacts beyond a distance of 50 miles (80 kilometers). Potential impacts of contaminated soils being transported downwind are evaluated in conjunction with the option of exhuming MDAs. The wildfire analysis in the SWEIS has been updated to reflect changes that have been made at the site since the Cerro Grande Fire; it includes revised assessments of fuel loadings and vulnerabilities of buildings.

An issue was raised in comments regarding the threat of terrorism at LANL. The SWEIS addresses the readiness of the LANL protective force to respond to terrorist activities. Additionally, although not attributed to terrorist actions, accident analyses evaluate the potential impacts of releases from LANL facilities as a result of catastrophic failure.

Some commentors believe recommendations made in DOE Inspector General reports regarding stabilization of nuclear materials at LANL should be incorporated into the SWEIS. One commentor wanted the SWEIS to address mitigation of environmental effects caused by the leak in a primary waste storage tank at TA-50 and the impacts of the waste backlog, the condition of the effluent released to Mortandad Canyon, and the risk to the public caused by bad welds. In addition, it was requested that the SWEIS list the administrative controls for all nuclear and hazardous materials. The analyses in the new SWEIS, in particular the accident analyses, consider a range of possible incidents that could result in the release of materials to the environment. Detailed analysis is then focused on the most significant of those accidents based on potential consequences and risks. Thus, although the above actions, accidents, or failures may not be addressed specifically, impacts from the accidents analyzed are expected to bound those that would result from other reasonably foreseeable events.

Some commentors requested a discussion of the environmental impacts of LANL cleanup, expressing strong feelings of disappointment over the lack of discussion of the subject in the *1999 SWEIS*. They requested a detailed cleanup plan and thorough analysis of its impacts, including impacts on cleanup worker health and safety, air emissions, surface and groundwater discharges, geography, and soil disturbance. Commentors also requested analysis of the impact of the Consent Order that would include NNSA's plan to separate cleanup from the main LANL management contract in 2007 and the transfer of cleanup responsibility from DOE's Office of Environmental Management to NNSA.

This SWEIS describes implementation of, and compliance with, the most recent changes in the regulatory environment at LANL. Specifically, the requirements of the Consent Order are reflected in the actions described for environmental restoration. Consequently, this SWEIS includes a project-specific analysis that evaluates the impacts of options for remediating areas of LANL in accordance with the Consent Order. The environmental impacts are assessed independent of the organization within DOE (Office of Environmental Management or NNSA) that would implement the Consent Order.

Another commentor requested that the SWEIS discuss categorical exclusions. The comment asserted that there should be a statement of why each categorical exclusion does not have a significant impact on the environment, and that the SWEIS should analyze the cumulative impacts of all such exclusions from all LANL NEPA documents. This SWEIS discusses the use of categorical exclusions in accordance with DOE NEPA Implementing Procedures (10 CFR 1021.410, Subpart D). LANL activities that are typically excluded from the need for detailed NEPA analysis are also described.

Comments related to land use and land conveyance and transfer issues were raised in the scoping comments. The key issue was how safe the land would be for use after cleanup has been completed. DOE evaluated the impacts and controls associated with the conveyance or transfer of land in the *Final Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracts Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico* (*Conveyance and Transfer EIS*) (DOE/EIS-0293), and information from that EIS is incorporated into this SWEIS

by reference. The *Conveyance and Transfer EIS* describes mitigation measures that could be taken prior to conveying or transferring a piece of property. As appropriate, easements are maintained on conveyed or transferred lands so that DOE can continue to access monitoring wells and collect samples. A commentor also suggested that the SWEIS address conveyance and transfer of additional lands. This SWEIS focuses on the impacts associated with those parcels of land that have already been or are expected to be conveyed or transferred by the end of 2007, when the authorizing legislation expires; however, it should be noted that the *Conveyance and Transfer EIS* addresses a larger suite of properties that could potentially be conveyed or transferred if additional authorization were received.

A commentor suggested redevelopment of existing areas should be undertaken when needed instead of breaking ground on undeveloped sites. Project-specific analyses are included in this SWEIS that involve construction of new facilities. As shown in the SWEIS, many of these proposed projects would occur in previously developed areas. Impacts of projects that could affect undeveloped areas are also included in the analysis.

Other issues raised in comments included LANL safety as related to seismic activity, and the Jemez Volcano, including the possible effects on LANL facilities that do not meet current seismic codes, and impacts on endangered species such as the Mexican spotted owl. The Jemez Volcano is accounted for in the accident analyses which include consideration of the potential impacts of seismic activities on facilities. Potential impacts of new construction and operations on the Mexican spotted owl and other endangered species are addressed in the project-specific analyses.

Certain groups of comments are not included in the analysis of this SWEIS. Comments regarding accountability of LANL management, the transfer of LANL management, worker turnover, and worker morale related to those changes are not recognized as being within the scope of NEPA. Similarly, historical differences in the plutonium inventory[4] are not analyzed in this SWEIS; the analysis of accidents involving plutonium is based on established limits on inventories of plutonium, or other materials, that are allowed in a building. Road closures and realignments that have already undergone NEPA evaluations are not reanalyzed in this SWEIS, but the environmental impacts of these prior analyses are incorporated where appropriate. This SWEIS provides a description of the current socioeconomic conditions in the LANL region; however, it is not possible, as requested by one commenter, to verify projected socioeconomic benefits due to the lack of available data tied specifically to LANL's economic influence over the region.

[4] In 1996 DOE issued the report Plutonium: The First 50 Years. This report notes that there are differences in the quantity of plutonium according to the accounting books and the quantity measured by a physical inventory. It explains that "inventory differences are not explained as losses but are explained as follows: (1) high measurement uncertainty of plant holdup (plutonium materials remaining in process tanks, piping, drains, ventilation ducts, and other locations); (2) measurement uncertainties because of the wide variations of material matrix; (3) measurement uncertainties due to statistical variations in the measurement; (4) lack of measurement technology to accurately measure material; (5) measurement uncertainties associated with waste due to material concentration and matrix factors; (6) unmeasured material associated with accidental spills; and (7) recording, reporting, and rounding errors."

The next major opportunity for public involvement is now underway, as comments are being sought regarding the information in this Draft SWEIS. After reading the Draft SWEIS, a member of the public may want to submit comments to point out potential errors in analysis, or provide new information that would change an analysis, clarify something in the Draft SWEIS, or propose a substantially different alternative or mitigation that has not been considered.

S.7 Changes at Los Alamos National Laboratory Since the *1999 SWEIS*

For the most part, operations at LANL remained within the projections made in the *1999 SWEIS*. Operations that exceeded projections, such as number of employees or amount of chemical waste generated from cleanup activities, produced a neutral or beneficial impact on northern New Mexico. A larger number of employees increases the tax base and results in a higher level of economic activity. Although the amount of chemical waste generation was higher, thereby increasing the amount of offsite transportation, it was managed without adverse impact to the LANL waste management infrastructure, and the waste was treated and disposed of in accordance with applicable regulations. Overall, data on operations during the period 1999 through 2004 indicate that LANL was still approaching the operation levels of the Expanded Operations Alternative in the *1999 SWEIS*, as modified for a lower level of pit production.

Table S–3 presents a summary of the actual impacts and performance changes by resource or impact area from 1999 through 2004 compared to the projected impacts for the modified Expanded Operations Alternative in the *1999 SWEIS*. The first column lists the resource or environmental impact areas. For each resource or impact area, the next column provides a summary description of the projected impact for the Expanded Operations Alternative as presented in the *1999 SWEIS*. The third column summarizes the actual impacts for the years 1999 through 2004 as reported in the LANL *SWEIS Yearbooks*. The final column presents an assessment of performance at the site compared to the projected performance in the *1999 SWEIS*. This comparison shows that, in general, LANL operated within the bounds projected in the *1999 SWEIS*.

Table S–3 Summary Comparison of *1999 SWEIS* [a] Projected Impacts and Actual Changes and Performance (1999 through 2004)

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
Land Resources	LANL covered 43 square miles (111 square kilometers), with about 5 percent of the site being developed. It was divided into 6 land use categories and contained 944 permanent buildings, 512 temporary structures, and 806 miscellaneous buildings. Changes to land use included TA-67, where 60 acres (24 hectares) of forested land would be cleared for a road and the land use category changed from "Explosives" to "Explosives and Waste Disposal." Area G expansion was estimated at 41 acres. The *1999 SWEIS* predicted limited land disturbance (about 100 acres [40 hectares] of previously undisturbed land) from new construction.	LANL now covers 40 square miles (104 square kilometers). Land use categories have increased from 6 to 10. The number of structures, which change often, now includes 952 permanent buildings, 373 temporary structures, and 897 miscellaneous buildings. Major projects have occupied more land than predicted. Forty-four acres (18 hectares) were leased to Los Alamos County for a research park. Environmental restoration activities have not substantially added to available land. About 4,820 acres (1,951 hectares) were designated for conveyance to Los Alamos County and transfer to the Department of the Interior for the Pueblo of San Ildefonso, of which 2,255 acres (913 hectares) have been turned over (as of the end of 2005), including nearly all lands to be transferred to the Pueblo of San Ildefonso. Conveyance of 635 acres (257 hectares) to the county has been deferred. In 2000, the Cerro Grande Fire burned 43,000 acres (17,400 hectares), including about 7,700 acres (3,110 hectares) at LANL. Direct impacts on land use included damage to or loss of 332 structures. Fire mitigation work, such as flood retention structures, affected about 50 acres (20 hectares) of undeveloped land.	Land use changes were slightly greater than those projected in the *1999 SWEIS*. Actions undertaken at LANL that were either not addressed or predicted in the *1999 SWEIS* include the conveyance of land to Los Alamos County and the transfer of land to the Pueblo of San Ildefonso; and several projects that could disturb up to 245 more acres (99 hectares) of greenfield sites than predicted in the *1999 SWEIS*. These actions, however, were addressed in separate NEPA review documents. Land use changes related to the number of buildings at LANL were within the range of impacts evaluated within the *1999 SWEIS*.
Visual Resources	LANL is primarily distinguishable in the daytime by views of its water storage towers, emission stacks, and occasional glimpses of older buildings. At elevations above LANL, the view is primarily of scattered austere buildings and groupings of several-storied buildings. LANL has relatively few nighttime security light sources compared to the nearby communities; the distinction between LANL	In many cases, new construction has reduced visually incompatible building styles and allowed for the removal of some of the more austere buildings. One new building has been built at the Los Alamos Research Park. Radio towers have been erected, but have been painted to blend with the background. The water tower at the new Emergency Operations Center has also been painted to blend with the background. Two domes have been added at TA-54, which contrast with the natural landscape and can be seen from the	Visual impacts resulting from continuing operations at LANL slightly exceeded those projected in the *1999 SWEIS*. Actions undertaken at LANL that either were not fully addressed or occurred since the *1999 SWEIS* was published include the construction of domes at TA-54, construction of new facilities (especially those that extend above the tree line), and forest thinning. Activities associated with each of these areas were addressed in separate NEPA reviews. The Cerro Grande Fire and bark beetle infestation

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
	and the nearby communities is lost to the casual observer. Projected temporary and minor impacts included changes resulting from construction and environmental restoration activities.	Pueblo of San Ildefonso sacred area, the Nambe-Española area, and areas in western and southern Santa Fe County. The Cerro Grande Fire altered views and made site facilities more visible. Since 2000, wildfire prevention activities, such as forest thinning, have reduced tree density on 7,433 acres (3,008 hectares) resulting in a more open, park-like forest, increasing the visibility of some facilities. Bark beetles have killed thousands of evergreen trees, thus opening the forest and making LANL facilities more visible.	altered the viewscape beyond that analyzed in the *1999 SWEIS* or other subsequent NEPA review documents.
Geology and Soils			
- Geology	The *1999 SWEIS* identified major seismic features at LANL. Some sections of faults at LANL constitute active and capable faults under the Nuclear Regulatory Commission nuclear facility criteria. Surface rupture from faulting in TA-3 was identified and concern regarding seismic risk to the CMR Building was identified.	LANL operations have not affected seismicity concerns—most construction was conducted at a distance from mapped faults and injection wells were not operated. Based on the seismic risk at TA-3 identified in the *1999 SWEIS*, LANL decided to move the CMR Building operations to TA-55, an area of no observed seismic faulting.	Impacts at LANL were within those projected in the *1999 SWEIS*.
- Soils	The *1999 SWEIS* identified canyon walls as areas of potential slope instability, and indicated that disturbed or unvegetated soils have a greater potential for erosion. Small quantities of contaminants from facility operations would impact LANL soils, and contaminated soil would be excavated from LANL.	LANL operations have not substantially affected slope instability or soil erosion. Construction activities were set back from canyon walls, and although localized erosion due to disturbed soils occurred at construction sites, it was mitigated by standard construction best management practices such as silt fences and flow barriers. The Cerro Grande Fire increased soil erosion at LANL. Releases from facility operations causing soil contamination have been below *1999 SWEIS* projections due to improvements in facility operating procedures.	Impacts were fewer than those projected in the *1999 SWEIS*, in part due to the removal of contaminated soils through environmental restoration activities and continued use of engineering controls at construction sites. While the Cerro Grande Fire increased soil erosion, the overall effects were mitigated through various actions such that *1999 SWEIS* productions were not exceeded.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
Surface Water			
- NPDES Outfall Volumes	Total of 55 NPDES-permitted outfalls. Total projected discharge volumes through permitted outfalls: • 278 million gallons per year (1,052 million liters per year). • 136 million gallons per year (515 million liters) from Key Facilities. • 142 million gallons (537 million liters) per year from non-Key Facilities.	NPDES-permitted outfalls decreased to 21 — including 20 industrial outfalls and 1 sanitary outfall. The total flow from all NPDES outfalls was below *1999 SWEIS* projections for 5 of 6 years; in 1999 the flow exceeded *1999 SWEIS* projections by 14 percent. Key facilities: Combined volumes have been less than *1999 SWEIS* projections; however, discharges from three Key Facilities exceeded their individual 1999 projections. • Tritium Facility: discharges exceeded annual projections each year, ranging from 0.4 to 22 million gallons per year (1.5 to 85 million liters per year), compared to *1999 SWEIS* projections of 0.3 million gallons (1.1 million liters) per year. • CMR Building exceeded projections 5 of 6 years, ranging from 0.02 to 4.5 million gallons (0.08 to 17 million liters) per year, compared to *1999 SWEIS* projections of 0.5 million gallons (1.9 million liters) per year. • High Explosives Testing Facility exceeded projections 3 years, ranging from 9 to 16.1 million gallons (34 to 61 million liters) per year, compared to *1999 SWEIS* projections of 3.6 million gallons (14 million liters) per year. Non-Key Facilities: Flow exceeded *1999 SWEIS* projections 3 out of 6 years, in part due to extrapolation from instantaneous flow measurements.	The number of NPDES outfalls were within *1999 SWEIS* projections. The number of permitted NPDES outfalls and the total flow were consistent with or below *1999 SWEIS* projections. However, the distribution of flow from individual Key and non-Key Facilities has changed from that projected in the *1999 SWEIS*. Although there appears to be a decrease in total flow from NPDES outfalls, it is largely due to a change in how flow is measured and reported. The current method adopted in 2001 uses actual flow meters in many (but not all) outfalls and measuring stations, providing more accurate information.
- NPDES Outfall Quality	Implied measure of performance is compliance with NPDES permit levels, the New Mexico Water Quality Control Commission stream standards, and DOE Derived Concentration Guides for radionuclides. As described in the *1999 SWEIS*, the Radioactive Liquid Waste Treatment Facility would be modified and the High	NPDES effluent quality met permitted levels for 99.75 percent of samples; number of events where permit levels were exceeded ranged from 0 to 16 (of about 1,100 samples per year). Exceedances resulted in preparation and implementation of corrective action plans. The Radioactive Liquid Waste Treatment Facility has improved the quality of effluent, reducing annual levels of nitrates and radionuclides. Since 2002,	Surface water quality impacts are consistent with or less than those projected in the *1999 SWEIS*. Overall quality and volume of effluents were within the levels projected in the *1999 SWEIS*.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
	Explosives Waste Treatment Facility would be constructed to improve effluent quality.	radionuclides activities have been well below the Derived Concentration Guides levels, and nitrates and fluorides concentrations were well below the standards. Volumes of effluent discharged from the outfall of the High Explosives Wastewater Treatment Facility outfall have been below *1999 SWEIS* projections since 1999.	
- Water Quality Impacts from Storm Water and Construction Sources	Water quality projected to be similar or better than recent experience. The following LANL operations were identified in the *1999 SWEIS* as impacting surface water quality: • Storm water discharges from industrial activities, with 76 industrial facilities identified on LANL site. • Construction activities disturbing greater than 5 acres (2 hectares). • Excavation or dredge and fill activities, which are permitted by the Corps of Engineers and the New Mexico Environment Department (Section 404 and 401 permits).	LANL still requires Storm Water Pollution Prevention Plans and best management practices to protect surface waters from pollutants from industrial storm water sources and construction projects. The number of industrial facilities requiring individual Storm Water Pollution Prevention Plans has ranged from 15 to 22. Storm Water Pollution Prevention Plans and best management practices are now required for all projects disturbing greater than 1 acre (0.4 hectares) of land. An increase in construction projects and dredge and fill projects was seen following the Cerro Grande Fire; however, each project was required to implement Storm Water Pollution Prevention Plans and meet 404 and 401 permit conditions to protect surface waters.	Impacts from storm flows and construction or excavation projects were within *1999 SWEIS* projections.
- Contaminant Transport	Small increases in outfall flows to watersheds were not expected to result in substantial contaminant transport offsite. Outfall discharge volumes per watershed were projected. Storm flow and sediment transport were identified as primary mechanisms for potential contaminant transport beyond LANL boundaries. The *1999 SWEIS* discussed watershed monitoring activities to track the extent of offsite contaminant movement in sediments and surface waters, including monitoring for radionuclides, metals, organics,	Several actions and best management practices were implemented to manage, control, and minimize storm water and sediment transport. On average, outflows to individual watersheds have been within projections, and trends show that outfall flows per watershed have been declining, thereby reducing the potential for contaminant transport. The number of watersheds receiving outfall flow has been reduced from 8 to 6. The annual flow discharged to the individual watersheds exceeded *1999 SWEIS* projections 10 times from 1998 to 2000 and 0 times since 2000. While radionuclides at or above background levels have been detected in sediments on- and offsite, the	Contaminant transport impacts were consistent with the *1999 SWEIS*, due to LANL programs and best management practices that manage and control storm flow and sediment transport. Increased or accelerated transport of contaminants that occurred from postfire storm flows are considered to be short-lived events that are being controlled and will diminish within the next few years.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
	polychlorinated biphenyls, and high explosives residue.	overall pattern of radioactivity in sediments has not greatly changed since the *1999 SWEIS*. Concentrations of metals, radionuclides, polychlorinated biphenyls, and high explosives residue above water quality standards have been detected during storm flows, however, these events are infrequent and short-lived. As a direct result of the Cerro Grande Fire, storm water runoff increased (2 to 4 times for average flow, and 10 to 100 times for peak flows), increasing the potential for contaminant transport. Storm events in 2001 and 2002 were found to accelerate the transport of legacy contamination (radionuclides) from Pueblo Canyon into lower watersheds and canyons.	
Groundwater			
- Water Use	The projected effect of water use over the next 10 years (extracted from the main aquifer) is an average drop in DOE well fields of up to 15 feet (4.6 meters).	The drop in the DOE well fields has continued to be 1 to 2 feet (0.3 to 0.6 meters) per year, per the Water Supply at Los Alamos 1998 to 2001 report.	Impacts of LANL water use on the regional aquifer continue to be bounded by the impacts analyzed in the *1999 SWEIS*.
- Quantity	No substantial changes to groundwater quantities were expected based on recent experience with LANL discharges having little effect on groundwater quantities.	LANL discharges have had little effect on groundwater quantities in the last 5 years.	Impacts of LANL discharges on groundwater quantities continue to be bounded by the impacts analyzed in the *1999 SWEIS*.
Air Quality			
- Nonradiological Criteria Pollutants	Ambient standards would be met. Annual emissions of criteria pollutants (tons per year): CO = 58 NO_x = 201 PM = 11 SO_2 = 0.98	Ambient standards have been met. Annual emissions for highest year, excluding years of the Cerro Grande Fire and fire mitigation activities (tons per year): CO = 35 NO_x = 93.8 PM = 5.5 SO_2 = 1.5	Annual emissions of criteria pollutants from LANL operations reported in the *Annual Emissions Inventories Through 2004* were within *1999 SWEIS* projections. As of 2004, revised reporting methods for the Title V Operating Permit Emissions Report include small exempt boilers and stand-by emergency generators in the emissions calculations; their inclusion results in SO_2 emissions higher than projected in the *1999 SWEIS*. Cerro Grande Fire and fire mitigation activities caused a temporary increase in CO, PM_{10} and SO_2 emissions above the levels analyzed in the *1999 SWEIS*.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
- Nonradiological Toxic Pollutants	A screening analysis of toxic pollutants indicated that levels of potential consequence to the public would not be exceeded for most toxic air pollutants. Further detailed analysis demonstrated that concentrations of other toxics would be below guideline values. For carcinogens, the combined lifetime incremental cancer risk due to all carcinogenic pollutants from all TAs was estimated. Major contributors to the combined cancer risk values included chloroform, formaldehyde, and trichloroethylene from TA-43 (Bioscience Facilities). The cancer risk to the public of less than 7.4×10^{-7} (1 chance in 1.4 million) was dominated by the contribution from chloroform. Although annual emissions of toxic pollutants were not reported in detail for all facilities, the details presented for TA-3, as an example, indicate emissions of 153 toxic pollutants. The *1999 SWEIS* did not address toxic emissions from combustion sources.	Reported toxic pollutant emissions have been generally less than guideline values. Carcinogenic emissions have been generally less than the *1999 SWEIS* projections. Chloroform emissions were less than 30 percent of the *1999 SWEIS* projections. TA-3 peak emissions data show that 15 additional toxic pollutants were emitted and emissions of 37 toxic pollutants exceeded *1999 SWEIS* projections. Seventy-eight toxic pollutants were not emitted that were projected.	The amounts of toxic materials used and the amounts emitted to the air continue to show considerable variation. Although the actual quantities and chemicals vary from those analyzed in the *1999 SWEIS*, the concentrations to which the public is exposed continue to be below levels of potential consequence.
- Nonradiological Construction Activities	Air quality impacts of construction activities were not quantified in the *1999 SWEIS*. However, the *1999 SWEIS* indicated that construction activities were planned in various areas and would include land disturbance. These activities would result in emissions from disturbed areas and from equipment.	Construction of new facilities, demolition, and remediation activities have resulted in short-term increases in air pollutant concentrations. These activities were mitigated as appropriate to prevent exceedance of the ambient standards.	Construction at LANL is an ongoing activity with temporary and localized air quality impacts.

Resource or Impact Area	*1999 SWEIS Projected Impacts*		*Actual Impacts and Performance Changes (1999 to 2004)*		*Assessment*
- Radiological		*Annual Average (curies per year)*	*Annual Average (curies per year)*	*Peak Year (curies)*	Annual average air emissions continue to be below levels projected in the *1999 SWEIS*, with the exception of tritium. The exceptions were due to deactivation activities at TA-21 and a single event at the Weapons Engineering Tritium Facility (TA-16).
	Actinides	0.000798	0.0000106	0.0000302	
	Fission Products	0.00014	Not reported	Not reported	
	Activation Products	16,000	2,760	5,970	
	Tritium (water vapor)	1,260	851	1,200	
	Tritium (gas)	1,920	2,050	8,740	
	Argon-41	870	18.2	29.8	
	Other Noble Gases	1,640	Not detected	Not detected	
	Uranium	0.152	0.00942	0.02	
Noise	There would be little change in noise impacts to the public from traffic or site activities, although sudden loud noises associated with explosives testing may occasionally startle members of the public and workers. There would be some increase in the frequency of impulsive noise, but these noises would be occasional and not prolonged or unusual to the community.		Construction activities at LANL are common and generally have not altered noise conditions to levels that annoy the public. The increase in workforce has not resulted in any noticeable increase in traffic noise.		Noise impacts from construction and operation were similar to those discussed in the *1999 SWEIS*.
Ecological Resources	Only 5 percent of LANL was determined to be unavailable to wildlife. There were 900 species of vascular plants and 294 species of animals in the area. There were 50 acres (20 hectares) of wetlands, 13 acres (5 hectares) of which were created or enhanced by wastewater from 38 outfalls. The site is home to 3 Federally endangered species, 2 Federally threatened species, 18 species of concern, and numerous state-listed species. Areas of Environmental Interest were established at LANL to protect threatened and endangered species. As discussed in the *1999 SWEIS*, about 100 acres (40 hectares) of undeveloped land at LANL were predicted to be disturbed by construction projects, resulting in some habitat loss. The closure of 27 outfalls was predicted to reduce wetland acreage by 8.6 acres (3.5 hectares).		In total, major projects used slightly less acreage of undeveloped land than predicted in the *1999 SWEIS*. About 5 acres (2 hectares) of the Los Alamos Research Park have been cleared, resulting in the loss of habitat. The reduction in permitted outfalls to 21 by 2003 has reduced the amount of wetlands supported by such flows. Approximately 34 acres (13.8 hectares) of wetlands occur at LANL. Impacts to ecological resources from land conveyance and transfer have resulted in a reduction in potential onsite habitat and the loss of DOE protection for threatened and endangered species, including areas of core and buffer zones within Areas of Environmental Interests. The Cerro Grande Fire burned 43,000 acres (17,400 hectares), including about 7,700 acres (3,110 hectares) of LANL. Direct impacts to ecological resources included a reduction in habitat and the loss of wildlife. Fire mitigation work, such as		Impacts to biological resources were somewhat greater than those predicted in the *1999 SWEIS*. The *1999 SWEIS* did not account for certain events that occurred after 1999, including the land conveyance and transfer. Activities associated with each of these areas were addressed in separate NEPA documents. The Cerro Grande Fire, and bark beetle infestation have altered the ecology of the site. The bark beetle infestation could impact runoff, herbaceous growth, and wildlife populations, as well as increase the potential fire hazard. Forest thinning creates a forest that appears more park-like, with an increase in the diversity of shrubs, herbs, and grasses in the understory.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
	About 25 acres (10 hectares) of the core zone of Areas of Environmental Interest and 38 acres (15 hectares) of buffer zone could be affected by new projects (some of which would be completed in the future).	flood retention structures, affected about 50 acres (20 hectares) of undeveloped land. Additionally, between 1997 and 2004, 8,233 acres (3,332 hectares) of forest were thinned to reduce wildfire potential. Thinning has both positive and negative effects on wildlife. An infestation of bark beetles has resulted in a 12 to 100 percent mortality of pine and fir trees across LANL.	
Offsite Radiological Impacts			
- Offsite Population	Affected population within 50 miles (80 kilometers) of LANL.	Population within 50 miles (80 kilometers) of LANL grew by 14 percent between 1995 and 2000.	Lower emissions than those projected in the *1999 SWEIS* resulted in lower population dose and risk.
Dose (per year)	33.09 person-rem	1.6 person-rem in peak year (2001)	
Risk (per year)	0.0165 LCFs	0.00096 LCFs in peak year (2001)	
- MEI	LANL site MEI located north-northeast of LANSCE.	No change in location for the LANL site MEI.	Dose to MEI continues to be bounded by projections in the *1999 SWEIS*.
Dose (per year)	5.44 millirem	1.84 millirem in peak year (2001)	
Risk (per year)	2.72×10^{-6} LCFs (1 chance in 370,000)	1.1×10^{-6} LCFs (1 chance in 910,000) in peak year	
Worker Health			
- Average Measurable Dose			Average dose to workers continues to be bounded by projections in the *1999 SWEIS*.
Dose (per year)	198 millirem	149 millirem in peak year (2000)	
Risk (per year)	7.92×10^{-5} LCFs (1 chance in 13,000)	8.9×10^{-5} LCFs (1 chance in 11,000) in peak year (2000)	
- Collective Dose			Collective dose to the worker population continues to be bounded by projections in the *1999 SWEIS*.
Dose (per year)	704 person-rem	240 person-rem in peak year (2003)	
Risk (per year)	0.281 LCFs	0.144 LCFs in peak year (2003)	

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
Environmental Justice	There would be no disproportionately high and adverse impacts to minority or low-income populations from LANL activities. Consultations would continue to provide opportunities for avoiding or minimizing adverse impacts to traditional cultural properties at LANL. Human health impacts associated with special pathways would not present disproportionately high and adverse impacts to minority and low-income populations.	There were no disproportionately high and adverse impacts to minority or low-income populations from LANL activities during this period. Potential impacts to sacred lands adjacent to LANL from activities at TA-54 have been of concern to the San Ildefonso Pueblo. The amount of radiological material released to the environment (curies per year) has been well within the amount projected in the *1999 SWEIS*.	Impacts have not exceeded any health, safety, and environmental regulation, standard, or guideline; nor have they been high or adverse to minority and low-income populations. Ongoing consultations with representatives of the San Ildefonso Pueblo address concerns that activities at LANL and at TA-54 could affect sacred lands. Human health impacts associated with special pathways remained below the levels projected in the *1999 SWEIS*.
Cultural Resources	Cultural resources at LANL were categorized as prehistoric, historic, and traditional cultural properties. As discussed in the *1999 SWEIS*, about 75 percent of LANL was surveyed for cultural resources. Surveys identified 1,295 prehistoric sites, 2,319 historic sites, and 54 traditional cultural properties on or near LANL. As predicted in the *1999 SWEIS*, 15 prehistoric sites associated with the expansion of Area G could be impacted. No impacts to historic sites were expected. Impacts to traditional cultural properties were not fully predictable due to the lack of information on their specific locations and nature; however, impacts could result from changes in hydrology, explosives, hazardous materials, and security measures. It was noted that consultation with affected Pueblos would accompany any potential expansion in Area G or enhancement of pit manufacturing.	The percentage of LANL surveyed for cultural resources has increased to 90 percent in 2005, and the number of known cultural resource sites increased as well. Conveyance and transfer of land resulted in cultural resources being removed from the responsibility and protection of DOE, including resources eligible for listing on the National Register of Historic Places and Native American sacred sites, remains, and traditional religious sites. A data recovery plan has been written to resolve adverse effects on tracts conveyed to the County of Los Alamos; transferred land would be held in trust by the Department of the Interior for the Pueblo of San Ildefonso and so would remain under Federal protection. Following the Cerro Grande Fire, an assessment determined that about 400 archaeological sites and historic buildings and structures were impacted by the fire. Impacts included direct loss, soot staining, spalling and cracking of stone masonry walls, and the exposure of artifacts from erosion.	Impacts to cultural resources at LANL exceeded the level predicted in the *1999 SWEIS*, which did not account for events such as land conveyance and transfer. Certain activities associated with the development of new sites and land conveyance and transfer were addressed in separate NEPA documents. The Cerro Grande Fire caused extensive damage to cultural resources at LANL.
Socioeconomics	The *1999 SWEIS* projected the need for 11,351 full-time equivalent LANL-affiliated employees. Changes in employment at LANL would change regional population, employment, personal income, and other socioeconomic measures.	By 2004, there were 13,261 LANL-affiliated employees.	Socioeconomic impacts from continued operations at LANL between 1998 and 2004 have exceeded the socioeconomic impacts projected in the *1999 SWEIS* due to the larger number of employees.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
Infrastructure			
- Electricity	LANL was projected to require 782,000 megawatt-hours of electricity per year, with a peak load demand of 113 megawatts.	Average annual usage: 371,695 megawatt-hours per year, with peak usage of 394,398 megawatt-hours in 2002. Average peak load demand: 68 megawatts, with a peak of 71 megawatts in 2003.	Annual electricity usage at LANL remained below the levels projected in the *1999 SWEIS*. Electrical usage would not exceed the annual 963,600 megawatt-hour system capacity, but could exceed the physical transmission capability (thermal rating) of the transmission lines of 110 megawatts.
- Fuel	LANL was projected to require 1.84 billion cubic feet (52.1 million cubic meters) of natural gas per year.	Average annual usage: 1.4 billion cubic feet (39 million cubic meters) per year. Peak year usage: 1.5 billion cubic feet (42 million cubic meters) (2001).	Annual natural gas usage at LANL remained below the level projected in the *1999 SWEIS*. Demand for natural gas has not exceeded the contractually limited capacity of 8.1 billion cubic feet (229 million cubic meters) per year.
- Water	LANL was projected to require 759 million gallons (2.9 million liters) of water per year.	Average annual usage: 408 million gallons (1.5 billion liters) per year. Peak year usage: 453 million gallons (1.7 billion liters) (1999).	Annual water usage at LANL remained below the level projected in the *1999 SWEIS*. Demand for water could exceed the conservation limit of approximately 542 million gallons (2 billion liters) per year under the agreement with Los Alamos County.
Environmental Restoration	The *1999 SWEIS* evaluated Environmental Restoration Program impacts in the ecological and human health risk assessments and in analyses related to the transport, treatment, storage, and disposal of waste. Other environmental restoration–related impacts addressed qualitatively in the *1999 SWEIS* included fugitive dust, surface runoff, soil and sediment erosion, and worker health and safety risks.	The environmental restoration project originally identified 2,124 potential release sites, including 1,099 regulated by the New Mexico Environment Department under RCRA and 1,025 regulated by DOE. At the end of 2005, 829 potential release sites remained to be investigated or remediated. The environmental restoration project has completed cleanup activities at many sites. No further action determinations have been made for 774 units, and 146 units have been removed from LANL's RCRA Permit. Major unplanned activities by the environmental restoration activities were undertaken in response to the Cerro Grande Fire. Environmental restoration activities resulted in beneficial impacts by reducing long-term exposures to legacy contaminants. The large quantities of waste generated by cleanup were sent to offsite facilities.	The overall impacts of environmental restoration activities and waste generated by activities at LANL remained within the qualitative projections presented in the *1999 SWEIS*.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
Waste Management and Pollution Prevention	Waste management impacts were projected in the *1999 SWEIS* for five categories of waste (low-level radioactive waste, mixed low-level radioactive waste, transuranic, mixed transuranic, and chemical wastes). Liquid radioactive wastes were evaluated separately and subcategory (sludge) quantities were projected. For low-level radioactive waste disposal at TA-54, the *1999 SWEIS* and ROD selected the preferred option of expansion into Zones 4 and 6, providing an additional 72 acres (29 hectares) of low-level radioactive waste disposal area.	In general, quantities of radioactive waste were below *1999 SWEIS* projections for all categories. Overall low-level radioactive waste generation was well below the projected level up until 2004, when the projection was exceeded due to heightened activities and new construction at non-Key Facilities. Mixed low-level radioactive waste has remained within the *1999 SWEIS* projection. For transuranic waste, the quantities were within the *1999 SWEIS* projection for 5 of the 6 years; in 2003, the transuranic waste projection was exceeded due to repackaging of legacy waste for shipment to WIPP and the receipt and storage of sealed sources by the Off-Site Source Recovery Program. Generation of mixed transuranic waste by the waste repackaging effort in 2003 exceeded the *1999 SWEIS* projection, the only exceedance for this category. The chemical waste projection was exceeded for the years 1999 through 2001, all due to environmental restoration cleanups. Numerous facility-specific variances to the *1999 SWEIS* chemical waste projections occurred over the timeframe, mostly due to one-time events such as chemical cleanouts or maintenance activities. For liquid radioactive wastes, quantities treated were within *1999 SWEIS* projections; some sludge exceeded *1999 SWEIS* projections, but was within the low-level radioactive waste management capacity. Low-level radioactive waste operations at TA-54 were conducted within the existing footprint.	The amount of waste managed at LANL was within *1999 SWEIS* projections for all waste categories with a few exceptions. Although sporadic exceedances took place, the quantities generated were within the capacity of the existing LANL waste management infrastructure. Liquid radioactive waste treatment quantities remained within *1999 SWEIS* projections.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2004)*	*Assessment*
Emergency Preparedness and Security	LANL's Comprehensive Emergency Management and Response Program that includes specialized response teams, specialized training and response agreements in cooperation with local government response agencies was described in the *1999 SWEIS*. In addition, DOE was studying a variety of options for the renovation of the emergency preparedness and security infrastructure at LANL that would include replacing a number of aging structures either individually or as part of a multi-building effort.	Until 2003, the LANL Emergency Operations Center was located within TA-59. A new Emergency Operations Center located at TA-69 was completed and began operations in 2003.	Impacts were consistent with those described in the *1999 SWEIS*, except for measures taken in response to enhanced national security concerns after the attacks of September 11, 2001.

TA = technical area, NEPA = National Environmental Policy Act, CMR = Chemistry and Metallurgy Research, NPDES = National Pollutant Discharge Elimination System, CO = carbon monoxide, NO_x = nitrogen oxides, PM = particulate matter, SO_2 = sulfur dioxide, rem = roentgen equivalent man, LCF = latent cancer fatality, MEI = maximally exposed individual, LANSCE = Los Alamos Neutron Science Center, RCRA = Resource Conservation and Recovery Act, ROD = Record of Decision, WIPP = Waste Isolation Pilot Plant.
[a] Based on the Expanded Operations Alternative as defined in the *1999 SWEIS* and ROD (64 FR 50797).

S.8 Description of the Alternatives

The alternatives considered in this new SWEIS are the No Action Alternative, a Reduced Operations Alternative, and an Expanded Operations Alternative. Under the **No Action Alternative**, LANL operations would continue to implement the decisions made in the *1999 SWEIS* ROD, as well as decisions based on NEPA analyses completed since 1999.

No Action Alternative—Operations would continue at current levels consistent with previous decisions such as those announced in the *1999 SWEIS* ROD.

Reduced Operations Alternative—Operations would be reduced at High Explosive Processing and Testing Facilities and eliminated at LANSCE and Pajarito Site.

Expanded Operations Alternative—Actions would be implemented to upgrade or replace aging facilities and systems, improve security, and remediate obsolete buildings and contaminated lands. Selected operations would increase, including the production of plutonium pits.

Under the **Reduced Operations Alternative**, many activities would remain unchanged, but others would be eliminated or reduced. Projects that have been approved based on completed NEPA analyses would go forward under this alternative.

The **Expanded Operations Alternative** analyzed in this SWEIS reflects proposals to expand overall operational levels at LANL above those analyzed in the No Action Alternative. This alternative includes the expansion of operations at certain Key Facilities and the construction of new facilities. At this time, NNSA identifies its **Preferred Alternative** for the level of operation of LANL as the Expanded Operations Alternative. Given the uncertainty regarding the nuclear weapons missions that will be assigned to LANL in the future, NNSA might issue two or more RODs to implement its decisions. Decisions relating to site remediation and to DD&D of facilities are expected to be in the first ROD based on this SWEIS. Specifically, this includes activities that would facilitate remediation of MDAs and other contaminated sites as required by the Consent Order.

The greatest change at a Key Facility would occur at the Plutonium Facility Complex. The *1999 SWEIS* analyzed a production level of 50 pits per year in single-shift operations (or up to 80 pits per year in multiple-shift operations) as part of its Expanded Operations Alternative. However, DOE decided in 1999 to manufacture up to 20 pits per year, and announced that decision in the *1999 SWEIS* ROD. The annual production of 20 pits was identified in the Final *1999 SWEIS* as part of the Preferred Alternative, and the analysis of impacts for this alternative was developed by scaling the impacts identified for the *1999 SWEIS* Expanded Operations Alternative (which was based on an annual production rate of 80 pits) to a production rate of 20 pits per year.[5]

[5] *As part of this scaling process, the 1999 SWEIS provided quantitative adjustments of important impacts where possible to reflect the differences between an annual production rate of 80 pits (the rate used for that SWEIS's Expanded Operations Alternative) and an annual rate of 20 pits (the rate used for the Preferred Alternative and selected by the 1999 ROD). Where quantitative adjustments were not possible, a qualitative discussion of the important differences in impacts was provided.*

In this SWEIS, NNSA proposes to increase the annual manufacturing rate from 20 pits (the rate assumed for the No Action Alternative in this SWEIS) to an annual rate that would produce up to 50 certified pits at LANL under the Expanded Operations Alternative. The production of certified pits includes the activities needed to fabricate new pits, to modify the internal features of existing pits, and to recertify or requalify pits. This process could result in the production of pits that cannot be certified. NNSA intends to produce up to 50 certified pits annually to meet the near-term needs of the Stockpile Stewardship Program, and may need to produce more than 50 pits in order to obtain 50 certified pits. The Expanded Operations Alternative for this SWEIS is based on an annual production rate of 80 pits per year in order to provide NNSA with sufficient flexibility to obtain up to 50 certified pits each year. NNSA does not believe it would need to produce 80 pits per year in order to obtain 50 certified pits. In any event, the annual production rate of 80 pits analyzed in the Expanded Operations Alternative would bound the actual annual production rate at LANL. Although NNSA has proposed a new pit manufacturing facility in order to meet the long-term requirements for maintaining the anticipated nuclear weapons stockpile (*Draft Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility [Modern Pit Facility EIS]*), NNSA has not completed that EIS and therefore it has not made a decision whether it would build such a facility, and, if such a facility were built, where it would be located, the size and type of facility that would be built, or its production level.

A decision to increase pit production significantly above 20 pits annually would require NNSA to issue a new or revised ROD. Work continues toward implementing the decision to produce 20 pits per year announced in the *1999 SWEIS* ROD. NNSA expects to attain this production level in 2007. The current proposal to produce up to 80 pits per year involves reorganizing operations within the Plutonium Facility such that no new building or other addition to the "footprint" of the facility would be required. Available production space within the facility would be used more efficiently, and process efficiencies identified since 1999 would be employed. Some modifications to equipment arrangements in the Plutonium Facility might also be necessary. This approach – using only existing floor space – is not the same as the approaches analyzed in the *1999 SWEIS*, each of which would have required addition of floor space to the Plutonium Facility. In this SWEIS, NNSA is reanalyzing the potential environmental impacts of using this new approach to produce up to 80 pits per year as outlined in the Expanded Operations Alternative. As was the case for the impact analysis used in the Expanded Operations Alternative in the *1999 SWEIS* and the No Action Alternative in the *Modern Pit Facility EIS*, this SWEIS bases the analysis of impacts for its Expanded Operations Alternative on a maximum annual production rate of 80 pits using multiple shifts. The No Action Alternative for this SWEIS uses the same scaling process used to develop the Preferred Alternative for the *1999 SWEIS*.

Table S–4 provides a comparison of the principal activities associated with each alternative. The table is divided into three sections to reflect whether the proposed activities involve implementation at a site-wide (not associated with a single TA or Key Facility) or TA level, or are specific to a Key Facility. The projects that are the subject of project-specific analyses in this SWEIS could occur at any of these levels, and appear in *italics* in the table to aid in identification.

Table S–4 Summary of Actions Under Proposed Alternatives [a]

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
Site-wide Activities and Projects				
Security Needs	Site-wide	Build 2 new access control stations and realign roadways around TA-3. Upgrade and replace existing physical security system. Implement Nuclear Materials Safeguards and Security Upgrades Project, Phase II.	Same as No Action Alternative	Same as No Action Alternative, plus: Implement *Security-Driven Traffic Modifications Project* – limit access along Pajarito Corridor West; provide commuter bus parking lots, shuttle bus service, and pedestrian and vehicle bridges between TA-63 and TA-35. Auxiliary actions include constructing 2 more vehicle bridges from TA-35 to TA-60 and TA-60 to TA-61.
Remediation and Closure Activities	Site-wide	Continue remediation of potential release sites. Remediate MDA H.	Same as No Action Alternative	*Major Material Disposal Area Remediation, Canyon Cleanups and Other Consent Order Activities*: Investigate and remediate potential release sites, including MDAs as required by the Consent Order. Perform environmental monitoring as needed to support Los Alamos County Landfill closure.
Land Conveyance and Transfer	Site-wide	Transfer previously identified parcels of LANL land to the Department of the Interior in trust for San Ildefonso Pueblo, or convey to Los Alamos County and New Mexico Department of Transportation.	Same as No Action Alternative	Same as No Action Alternative
Electrical Power System Upgrade	Site-wide	Construct or modify 2 substations. Construct or modify 2 power lines.	Same as No Action Alternative	Same as No Action Alternative
Wildfire Hazard Reduction	Site-wide	Implement ecosystem-based management program for approximately 10,000 acres (4,000 hectares) through forest thinning, construction of access roads and fuel breaks, and use of prescribed fire.	Same as No Action Alternative	Same as No Action Alternative
Flood and Sediment Retention Structures	Site-wide	Remove aboveground portions of the Pajarito Canyon flood retention structure and TA-18 steel diversion wall. Grade streambed and reseed banks.	Same as No Action Alternative	Same as No Action Alternative
Trails Management Program	Site-wide	Repair, maintain, improve or close, as necessary, publicly used trails on LANL property.	Same as No Action Alternative	Same as No Action Alternative
Off-Site Source Recovery Project	TA-3, TA-18, TA-54, TA-55	Continue to receive and store excess sealed radiological sources.	Same as No Action Alternative	Same as No Action Alternative, plus: *Increase Type and Quantities of Sealed Sources Accepted for Management.*

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
Technical Area Activities and Projects				
Combustion Turbine Generators	TA-3	Install two 20-megawatt combustion turbine generators.	Same as No Action Alternative	Same as No Action Alternative
Center for Weapons Physics Research	TA-3	No activity	No activity	Construct a new *Center for Weapons Physics Research*.
Replacement Office Buildings	TA-3	Construct 3 office buildings.	Same as No Action Alternative	Construct up to 9 additional *Replacement Office Buildings*.
TA-21 DD&D	TA-21	Deactivate tritium facilities followed by surveillance and maintenance.	Same as No Action Alternative	Implement *TA-21 Structure Decontamination, Decommissioning, and Demolition Project.*
Science Complex	TA-62 or TA-3 or Research Park	No activity	No activity	Construct and operate a new *Science Complex.*
Remote Warehouse and Truck Inspection Station	TA-72	No activity	No activity	Construct and operate a new *Remote Warehouse and Truck Inspection Station.*
Key Facility Activities and Projects				
Chemistry and Metallurgy Research Building	TA-3	Continue actinide research and processing activities, characterization, analysis, testing, and fabrication. Conduct nonproliferation training. Recover, process, and store LANL's highly enriched uranium inventory. Initiate construction of CMR Replacement Facility at TA-55.	Same as No Action Alternative	Same as No Action Alternative, plus: Expand and develop new actinide processing and analysis capabilities. Increase support to the Off-Site Source Recovery Program.
Sigma Complex	TA-3	Conduct research, development, and characterization on materials fabrication from metals, ceramics, salts, beryllium, enriched uranium, depleted uranium, and other uranium isotope mixtures. Analyze and fabricate tritium reservoirs. Fabricate nonnuclear components in support of research and development: 100 hydrotests and 50 joint test assemblies. Fabricate components for up to 80 pits and 50 secondary assemblies per year.	Same as No Action Alternative	Same as No Action Alternative
Machine Shops	TA-3	Machine, weld, and assemble various materials in support of major LANL programs and projects, principally related to weapons manufacturing.	Same as No Action Alternative	Same as No Action Alternative
Material Sciences Laboratory	TA-3	Develop and improve materials formulation and chemical processing technologies, mechanical testing, research, synthesis, and characterization.	Same as No Action Alternative	Same as No Action Alternative
Nicholas C. Metropolis Center for Modeling and Simulation	TA-3	Conduct high-performance, complex computing operations at up to 50 teraops, using no more than 7.2 megawatts of electricity.	Same as No Action Alternative	Same as No Action Alternative, plus: Implement *Nicholas C. Metropolis Center for Modeling and Simulation Increase in Level of Operations*, using up to 15 megawatts of electricity and 51 million gallons (19 million liters) of water per year.

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
High Explosives Processing Facilities	TA-8, TA-9, TA-11, TA-16, TA-22, TA-37	High explosives processing activities using approximately 82,700 pounds (37,500 kilograms) of explosives and 2,910 pounds (1,320 kilograms) of mock explosives annually. Evaluate stockpile returns, develop and characterize new materials, and research waste treatment methods. Fabricate materials and parts. Conduct up to 15 safety and mechanical tests and support about 100 major hydrodynamic tests annually. Complete construction of TA-16 Engineering Complex and remove or demolish vacated structures.	Twenty percent reduction in activities and materials from the No Action Alternative	Same as No Action Alternative, plus: Increase use to 5,000 pounds (2,270 kilograms) of mock explosives, and conduct up to 500 safety and mechanical tests annually.
High Explosives Testing Facilities	TA-15 with firing sites in TA-14, TA-15, TA-36, TA-39, TA-40	Conduct approximately 1,800 experiments per year using up to 6,900 pounds (3,130 kilograms) of depleted uranium. Conduct explosives experiments and studies, dynamic experiments, and 100 major hydrodynamic tests annually. Complete construction of 15 to 25 new structures to replace about 59 structures currently used; remove or demolish vacated structures.	Twenty percent reduction in activities and materials from the No Action Alternative	Same as No Action Alternative
Tritium Facility	TA-16, TA-21	Install dynamic experimentation structure at TA-15. Perform high-pressure gas fills and processing operations for research and development and nuclear weapons systems. Perform ongoing maintenance, testing, research and development to maintain safety and reliability of gas boost systems for nuclear weapons. Tritium storage of about 35 ounces (1,000 grams). Phase out and move tritium activities from TA-21; decontaminate buildings.	Same as No Action Alternative	Same as No Action Alternative, plus: Implement *TA-21 Structure Decontamination, Decommissioning & Demolition Project.*
Pajarito Site	TA-18	Perform criticality experiments and provide training courses. Continue Security Category III and IV nuclear activities. Operate SHEBA in its security Category III configuration. Develop safeguard instrumentation and perform research and development for nuclear materials. Conduct experiments and activities to support NNSA's Second Line of Defense Program, Nuclear Nonproliferation Research and Development Testing, and Emergency Response Program activities. Receive and store radiation sources retrieved from other locations under the Off-Site Source Recovery Project.	Cease all Security Category III and IV nuclear activities, including SHEBA. Institute surveillance and maintenance of facilities. Eliminate Pajarito Site as Key Facility.	Implement *TA-18 Closure, Including Remaining Operations Relocation and Structure Decontamination, Decommissioning & Demolition*. Move Security Category III and IV material to other LANL facilities. Cease SHEBA activities.
Target Fabrication Facility	TA-35	Conduct material sciences, effects testing, characterization, and technology development for weapons production and laser fusion research. Provide products for about 12,400 laser and physics tests per year.	Same as No Action Alternative	Same as No Action Alternative

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
Bioscience Facilities	TA-43, TA-3, TA-35, TA-46	Study intact cells, cellular components, and cellular systems. Characterize and synthesize biomaterials and molecules. Analyze samples and identify pathogens in support of biodefense and national security.	Same as No Action Alternative	Same as No Action Alternative, plus: Move activities to the new Science Complex in TA-62 (or Research Park or TA-3).
Radiochemistry Facility	TA-48	Conduct research, produce medical radioisotopes, and support other LANL organizations, primarily through radiological and chemical analyses of samples.	Same as No Action Alternative	Same as No Action Alternative, plus: Perform beryllium dispersion and mitigation assessments. Implement radioactive atom trapping for fundamental and applied research. Construct a new *Radiological Sciences Institute (including Phase I - the Institute for Nuclear Nonproliferation Science and Technology).*
Waste Management Operations: Radioactive Liquid Waste Treatment Facility	TA-50	Treat transuranic and low-level radioactive liquid wastes generated at LANL facilities; manage the final disposition of the treated wastes. Construct and operate 300,000-gallon (1.1-million-liter) influent storage facility.	Same as No Action Alternative	Same as No Action Alternative, plus: Treat and manage disposition of about 66 percent more liquid transuranic waste and 25 percent more liquid low-level radioactive waste. Implement the *Radioactive Liquid Waste Treatment Facility Upgrade Project.*
Los Alamos Neutron Science Center	TA-53	Operate the 800-million electron volt linear accelerator and deliver accelerator beam to Areas A, B, and C; Weapons Neutron Research Facility; Manuel Lujan Center; Dynamic Test Facility; and Isotope Production Facility for 10 months each year. Reconfigure beam delivery and support equipment to support new facilities, upgrades, and experiments. Support contained weapons-related experiments using small to moderate quantities of explosives. Install material test station equipment in Experimental Area A and construct neutron spectroscopy facility within existing buildings.	Shut down LANSCE; all capabilities would cease except treatment of radioactive liquid waste brought from the Radioactive Liquid Waste Treatment Facility. Systems would be maintained in a condition to support future restart.	Same as No Action Alternative plus: Implement *LANSCE Refurbishment Project* for extending reliable operation of facility for next 20 to 30 years.
Waste Management Operations: Solid Radioactive and Chemical Waste Facility	TA-54, TA-50	Characterize, process, store, transport, and dispose of radioactive and chemical waste generated at LANL, including: – Prepare and ship transuranic waste to WIPP. – Prepare and ship hazardous and mixed low-level radioactive waste for offsite treatment and disposal. – Dispose of low-level radioactive waste in TA-54. – Receive 5 to 10 shipments annually of low-level radioactive waste from offsite locations.	Same as No Action Alternative	Same as No Action Alternative plus: Manage additional volumes of transuranic and low-level radioactive waste. Implement *Waste Management Facilities Transition* to include*:* – Construct New Transuranic Waste Consolidation Facility in TA-50 or TA-63. – Construct new access control station, low-level radioactive waste compactor building, and low-level radioactive waste certification building in TA-54. – Retrieve transuranic waste from belowground storage and characterize, store, and ship. Expand support of Off-Site Source Recovery Project.

Project/Facility	*Location*	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative*
Plutonium Facility Complex	TA-55	Produce 20 plutonium pits per year and disassemble and examine up to 65 plutonium pits per year. Recover, process, and store existing plutonium residue inventory. Perform plutonium (and other actinide) materials research and processing. Process up to 900 pounds (400 kilograms) of actinides per year between TA-55 and CMR Building. Provide storage of the LANL special nuclear material inventory, mainly plutonium. Continue research and development on other fuels. Fabricate and study nuclear fuels for use in terrestrial and space power systems, and power production reactors. Support Off-Site Source Recovery Project	Same as No Action Alternative	Same as No Action Alternative except: Produce up to 50 pits per year (80 pits using multiple shift operations) with minor facility modifications. Develop expanded pit disassembly capacity. Conduct plutonium research, development, and support. Process 1,800 pounds, (800 kilograms) of actinides per year, including polishing 460 pounds (210 kilograms) of plutonium oxide. Implement *Plutonium Facility Complex Refurbishment Project*, including major systems repairs and replacements to extend reliable operation of Plutonium Facility for 20 to 30 years. Construct a *TA-55 Radiography Facility*.

TA = technical area; MDA = material disposal area; DD&D = decontamination, decommissioning, and demolition; CMR = Chemistry and Metallurgy Research; SHEBA = Solution High-Energy Burst Assembly; NNSA = National Nuclear Security Administration; LANSCE = Los Alamos Neutron Science Center; WIPP = Waste Isolation Pilot Plant.

[a] *Italicized* entries indicate projects for which project-specific impact analyses are included in this SWEIS.

Alternatives Considered but Not Analyzed in Detail

Among the comments received during the scoping process were suggestions for additional alternatives that should be considered in the SWEIS. Two alternatives, a "Greener Alternative" and a "true No Action Alternative" (or shutdown alternative) were suggested during the scoping process.

A Greener Alternative was evaluated in the *1999 SWEIS*, the name and general description of which were provided by interested citizens as a result of the scoping process for that SWEIS. This alternative evaluated LANL capabilities existing at that time with an emphasis on work performed in support of basic science, waste minimization and treatment, dismantlement of nuclear weapons, nonproliferation, and other areas of national and international importance. While the Greener Alternative contained components of both the No Action and the Expanded Operations Alternatives evaluated in the *1999 SWEIS*, the operational focus was on science, waste management, and nuclear weapons dismantlement. NNSA is not evaluating a similar alternative in this SWEIS because, as stated in the *1999 SWEIS* ROD (see Appendix A), a Greener Alternative would not support the nuclear weapons mission assigned to LANL. Additionally, important aspects of the Greener Alternative evaluated in the *1999 SWEIS*, specifically optimization of work in the field of nonproliferation regarding weapons of mass destruction, as well as enhanced weapons dismantlement work, were incorporated into the No Action Alternative analyzed in this new SWEIS. Other aspects of the Greener Alternative in the *1999 SWEIS* have also been incorporated into the No Action Alternative of this SWEIS. These include enhanced work on national health research, waste minimization and environmental restoration technologies, and international nuclear safety. Therefore, NNSA is not evaluating a distinct Greener Alternative in this new SWEIS.

The alternative characterized as a "true No Action Alternative," in which all operations at LANL, including production and testing in support of stockpile stewardship, would cease is not a reasonable No Action Alternative. Thus, NNSA is not analyzing it in this SWEIS. Ceasing operations would result in a loss of support to nonproliferation efforts and research aiding the fight against terrorism. These activities are vital to national security and are among the major components of the mission assigned to LANL by NNSA. Because of the impacts on national security and safety that would be involved with ceasing operations and closing LANL, and because doing so would not allow LANL to continue supporting the missions assigned to it by NNSA, this alternative is not considered a reasonable alternative. This SWEIS updates previous EISs that have provided information supporting a number of decisions about operations at LANL. In such situations, an alternative that assumes LANL would cease all mission-related work is not reasonable.

S.9 Summary of Environmental Consequences

This section provides an overview of the impacts analyses performed for this SWEIS. It is a summary that provides an understanding of the overall consequences of each of the proposed alternatives and how the alternatives compare to each other. Section S.9.1 presents an overview for each of the resource areas, highlighting issues, concerns, or positive impacts, and includes **Table S–5** which summarizes the potential consequences of each alternative by resource area. Section S.9.2 is a summary of the cumulative impacts analysis that considers operating LANL in the context of other past, present, and reasonably foreseeable actions.

The Expanded Operations Alternative includes implementation of specific projects evaluated in the appendices to this SWEIS. However, the NNSA Administrator may make decisions on individual projects or proposed activities rather than making a single decision to implement an entire alternative. Although the summary in Section S.9.1 includes impacts from these projects, Section S.9.3 presents summaries of the environmental consequences for each of the individual proposed projects evaluated in this SWEIS. This individual treatment is intended to facilitate the decision process by providing an understanding of how each of the proposed projects could affect the overall impacts of continued operations at LANL.

S.9.1 Comparison of Potential Consequences of Alternatives for Continued Operation at Los Alamos National Laboratory

The potential environmental consequences associated with the three alternatives are summarized in this section. This summary focuses on the site and provides an overview of impacts for each resource area in order to better understand the total potential impacts of each alternative. Table S–5, located at the end of this section, presents a comparison of the environmental consequences of the three alternatives analyzed in this SWEIS.

Land Use

Under the No Action Alternative, the conveyance and transfer of land from LANL to Los Alamos County and the Department of the Interior in trust for the Pueblo of San Ildefonso and the Power Grid Upgrades Project have the potential to impact site and regional land use. Effects of these actions include reduction in the size of LANL, possible changes in offsite land use from

development following transfer, loss of recreational opportunities, and changes in site land use. Impacts would be similar under the Reduced Operations Alternative. Under the Expanded Operations Alternative, in addition to impacts of the No Action Alternative, changes to land use could occur as the result of a number of projects including the Replacement Office Buildings Project, Radiological Sciences Institute Project, TA-18 Closure Project, MDA Remediation Project, RLWTF Upgrade Project, Science Complex Project, Remote Warehouse and Truck Inspection Station Project, and the Security-Driven Transportation Modifications Project. While actions associated with these projects would in many cases be compatible with existing land use plans, there is no provision in current plans for the new bridge that could be constructed over Sandia Canyon under Auxiliary Action B of the Security-Driven Transportation Modifications Project. Although no major changes in land use would occur in most cases, the MDA remediation activities could lead to fewer restrictions on land use under the Removal Option upon completion of remedial actions.

Visual Environment

Under the No Action Alternative, possible development following the conveyance and transfer of land could degrade views of presently undeveloped areas. For many projects, impacts to the visual environment would be limited to the construction phase. Once complete, most projects would be minimally visible from offsite but more noticeable from closer vantage points; however, near views are often restricted to LANL employees. Power grid upgrades could adversely impact the view in previously undisturbed areas. Impacts under the Reduced Operations Alternative would be similar to those identified for the No Action Alternative. While in many cases impacts to the visual environment from implementation of the Expanded Operations Alternative would be similar to the No Action Alternative, a number of proposed projects would cause noticeable changes to the visual environment. The MDA remediation activities would result in the borrow pit in TA-61 being more visible, and the Security-Driven Transportation Modifications Project could, depending on the auxiliary action selected, result in new bridges being built over site canyons. Also, new buildings associated with the Replacement Office Buildings and Science Complex Projects would be readily visible from West Jemez or Pajarito Roads. The new building associated with the Remote Warehouse and Truck Inspection Station would be visible from East Jemez Road. The visual environment at both TA-18 and TA-21 would be enhanced by the removal of old buildings, and at TA-21 could change in the longer-term if development takes place. Finally, removal of the white-colored domes in TA-54, as part of the Waste Management Facilities Transition Project, would have a beneficial impact on views of the site from both near, including the Pueblo of San Ildefonso, and far.

Geology and Soils

There is little difference in the impacts on geologic resources for the No Action and Reduced Operations Alternatives; however, there is a large distinction between those two alternatives and the Expanded Operations Alternative. Under the Expanded Operations Alternative, facility construction and DD&D for the following projects would impact geologic materials: Center for Weapons Physics Research, Replacement Office Buildings, Radiological Sciences Institute, RLWTF Upgrade, TA-55 Radiography Facility, Science Complex, Remote Warehouse and Truck Inspection Station, TA-21 DD&D, Waste Management Facilities Transition, and Security-Driven Transportation Modifications. A total of approximately 3.2 million cubic yards

(2.5 million cubic meters) of soil and rock would be disturbed if all of these projects are implemented.

In addition, MDA remediation in compliance with the Consent Order would have a major impact on geologic resources. MDA remediation would require 1.2 million to 2.5 million cubic yards (0.9 million to 1.9 million cubic meters) of crushed tuff and other materials for evapotranspiration covers under the Capping Option, or 1.4 million cubic yards (1.1 million cubic meters) of backfill and surface grade materials under the Removal Option. These geologic resources would be available either at LANL or from nearby offsite sources.

Under all the alternatives, remediation of waste sites would continue to remove existing contaminants from soils and shallow bedrock at LANL. This impact would be greatest under the Expanded Operations Alternative because the largest area and volume of contaminated soil would be remediated. The use of standard construction methods and best management practices would minimize the potential for erosion and release of soils during construction and decrease the potential for erosion, slope failure, and contaminant releases after remediation is complete.

Water Resources

There would be only minor impacts on surface water quality and quantity from the No Action Alternative. Under the Reduced Operations Alternative, the elimination of cooling tower effluent from LANSCE would result in a major reduction of effluent discharges to Los Alamos Canyon. The Expanded Operations Alternative could have beneficial impacts on surface water quality due to the potential removal or stabilization of contaminants at the MDAs, the installation of new treatment technologies associated with the RLWTF Upgrade Project, and the possible elimination of the RLWTF outfall to Mortandad Canyon if the auxiliary action to evaporate treated effluents were implemented. Complete DD&D of TA-21 under the Expanded Operations Alternative would eliminate two industrial effluent outfalls to Los Alamos Canyon. Removal of the flood retention structure in Pajarito Canyon under all the alternatives could impact floodplains downstream immediately following removal. None of the alternatives would likely have any other impacts on floodplains.

There would be no changes in the flow of contaminants to the alluvial or regional groundwater as a result of the No Action Alternative. Most impacts to groundwater resources identified as occurring under the No Action Alternative would also occur under the Reduced Operations Alternative. Long-term impacts might be reduced by elimination of some outfalls in the canyons. Direct and indirect impacts to groundwater as a result of proposed construction and operations under the Expanded Operations Alternative would also be similar to those described for the No Action Alternative. The effects of either an MDA Capping or Removal Option under the Expanded Operations Alternative would not appreciably affect the rate of transport of contaminants presently in the vadose zone in the near term, but would likely reduce very long-term migration of contaminants and corresponding impacts on the environment, from wastes present in the MDAs.

Air Quality

Nonradiological air pollutant emissions from operations at LANL would continue within the limits of the operating air permit under all the alternatives. Reductions in emissions would occur under the Reduced Operations Alternative from reduced high explosives processing and testing and from shutdown of LANSCE and the Pajarito Site (TA-18). A minor increase in operations emissions could occur under the Expanded Operations Alternative, but emissions would remain within the limits of the operating permit. Temporary localized increases in air pollutant emissions from construction, DD&D, and remediation activities would occur under all alternatives, but under the Expanded Operations Alternative emissions would be higher. These activities could result in exceedances of short-term ambient standards for nitrogen oxides and carbon monoxide for some projects where activities are near the site boundary or public roads unless these activities are properly controlled. Development by others of lands conveyed and transferred could result in air quality impacts.

Radiological air emissions from normal operations under the No Action Alternative would be dominated by short-lived gaseous mixed activation products emitted from LANSCE (TA-53). Under the Reduced Operations Alternative, a reduction in activity levels of some Key Facilities and the shutdown of LANSCE and the Pajarito Site (TA-18) would greatly reduce the amount of radiological air emissions. Under the Expanded Operations Alternative, some potential small increases in radiological air emissions over the No Action Alternative would result from increased activity levels and the operation of new facilities. These emissions would be dominated by operations at LANSCE. There could be temporary short-term additions to radiological air emissions if the New Mexico Environment Department selects exhumation as the corrective measure for any of the MDAs.

Noise

Under the No Action Alternative, noise impacts from operations at LANL would be similar to the impacts from recent operations, including noise from explosives testing and traffic. Under the Reduced Operations Alternative, a minor reduction in explosives testing noise would occur. Under the Expanded Operations Alternative, minor to moderate increases in traffic noise could occur from changes in traffic patterns due to increased construction, MDA remediation, DD&D activities, and increased employment at LANL. Construction, DD&D, and remediation activities would result in a minor increase in offsite noise from equipment use and traffic noise impacts to the public under the No Action and Reduced Operations Alternatives. Under the Expanded Operations Alternative, increased equipment-related noise impacts would occur from additional construction, DD&D, and remediation activities. Activities near the site boundary or increases in truck traffic noise under various MDA remediation options could result in some public annoyance. Development by others of lands conveyed and transferred could also result in noise impacts.

Ecological Resources

Under the No Action Alternative, a number of actions would result in impacts on ecological resources. For example, conveyance of land to the County could result in the loss of 770 acres (312 hectares) of habitat through possible future development. Therefore, impacts such as loss and displacement of wildlife would take place. The Wildfire Hazard Reduction Program, while resulting in short-term adverse impacts on wildlife, would have long-term benefits by returning the forest to a condition similar to that which existed in the past. Increased forest health could also benefit the Mexican spotted owl at LANL and across the region. Impacts from the Reduced Operations Alternative would generally be similar to the No Action Alternative. Under the Expanded Operations Alternative, impacts on ecological resources would be greater than those of the No Action Alternative. A number of projects could impact habitat and wildlife. Those impacts would mostly be temporary disturbances during construction and demolition, however, if all of the proposed projects were implemented, up to about 90 acres (36 hectares) of habitat would be lost. Permanent disturbances could include construction of bridges associated with the Security-Driven Transportation Modifications Project. These bridges could be built within Areas of Environmental Interest for the Mexican spotted owl and, if so, would result in the need to consult with the U.S. Fish and Wildlife Service on mitigation of potential impacts. The Mexican spotted owl would also be affected if the RLWTF were to cease discharging effluent. This would likely reduce the extent of perennial and intermittent stream reaches and associated wetland and riparian habitat thereby reducing the abundance and diversity of prey species.

Human Health

None of the alternatives would result in an increase in LCFs in the population, and all doses estimated for the MEI, a hypothetical individual located at the site boundary, would meet the regulatory limit of 10 millirem per year (40 CFR 61.92). Under the No Action Alternative, radiological air emissions from LANSCE (TA-53) would be responsible for over 70 percent of the estimated population dose of 30 person-rem per year, with emissions from the firing sites (TA-15 and TA-36) contributing approximately 20 percent. Under the No Action Alternative, the dose to the MEI would be about 7.8 millirem per year, with 7.5 millirem attributable to emissions from LANSCE. Under the Reduced Operations Alternative, estimated annual doses to the population and the MEI would be reduced by approximately 80 percent and 90 percent, respectively, compared to the No Action Alternative. This reduction would largely be due to the shutdown of LANSCE, with minor reductions from the termination of operations at the Pajarito Site and lower levels of high explosives processing and testing. Under the Expanded Operations Alternative, there would be small increases in emissions from the Plutonium Facility Complex from increased pit manufacturing activity and reduced emissions from the Pajarito Site and TA-21, resulting in slight increases in the estimated doses to the public and the MEI from routine operations compared to the No Action Alternative. In addition, there could be temporary increases in offsite doses if the Removal Option were implemented for MDA cleanup. The annual population dose could increase by about 20 percent to approximately 36 person-rem per year and the MEI dose could increase by about 5 percent to approximately 8.2 millirem per year.

On an individual worker basis, impacts to worker health would be the same across all alternatives. Application of procedures designed to ensure safe worker environments would control exposure to radiation, chemicals, and biological agents. Individual radiation doses would be maintained below the DOE limit of 5 rem per year, with a goal of limiting the dose to 2 rem per year from external exposure. Under normal operating conditions, no adverse effects from chemical or biological exposures would be expected.

The collective dose for workers would be about 281 person-rem per year under the No Action Alternative. Under the Reduced Operations Alternative, the dose would drop to 258 person-rem annually due to the cessation of TA-18 activities and the shutdown of LANSCE. Under the Expanded Operations Alternative, collective doses would differ depending on the actions taken to remediate the MDAs. If the MDA Capping Option were implemented, the collective dose would be about 408 person-rem per year. This increase in dose over the No Action Alternative is primarily associated with manufacturing up to 80 pits per year at the Plutonium Facility Complex. If the MDA Removal Option were implemented, waste in the MDAs would be removed rather than capped in place. In this case, the collective dose would be about 520 person-rem annually.

Cultural Resources

Under the No Action Alternative, potential impacts to cultural resources include conveyance or transfer of lands containing cultural resources from DOE. Further, there is potential for damage to these resources from development and adverse effects on historic buildings from demolition and remodeling. From a positive standpoint, the Trails Management Program could enhance cultural resource protection by limiting public access to certain trails or trail segments. Documentation would be required to resolve possible adverse effects from demolishing and remodeling historic buildings involved in high explosive processing and testing. Impacts from the Reduced Operations Alternative would generally be similar to those described for the No Action Alternative. Under the Expanded Operations Alternative, many impacts would also be similar to those that would occur under the No Action Alternative. Individual projects would have minimal potential to impact archaeological resources since most projects would not be located in the immediate area of archaeological sites, and those that are so situated would be protected by LANL requirements for protecting sensitive areas. Additionally, the implementation of LANL requirements would ensure that any proposed demolition or modification of existing historic buildings and structures would be in keeping with the 2005 document *A Plan for the Management of Cultural Heritage at Los Alamos National Laboratory, New Mexico*. If the auxiliary actions to build bridges across canyons as part of the Security-Driven Transportation Modifications Project were implemented, certain traditional cultural properties could be adversely affected. However, removal of the domes from Area G of TA-54 as part of the Waste Management Facilities Transition Project would have a positive effect on views from Pueblo of San Ildefonso lands.

Socioeconomics

Under the No Action Alternative, no change in the socioeconomic impacts on the region from those currently being observed would be expected. LANL is a major employer in the region and provides large socioeconomic contributions to the region. Impacts from the Reduced Operations Alternative would be similar to those associated with the No Action Alternative. However, under the Reduced Operations Alternative, direct employment at LANL would be expected to decrease by about 3.8 percent (510 jobs) due to the closure of LANSCE, the reduction in high explosives processing and testing, and the cessation of TA-18 activities. This decrease in LANL employment would also be expected to indirectly result in additional job losses in the region. The combined loss of employment due to both direct and indirect job losses would be on the order of 1,375 positions, but these losses are not expected to have a major adverse impact on the regional economy because the losses would be small in comparison to the total employment base for the region (less than 1 percent). Under the Expanded Operations Alternative, jobs would be added at LANL to support the increased workload. It is projected that up to 920 jobs by 2007 and 2,240 jobs by 2011 would be added at LANL, which would be expected to result in an indirect increase in additional jobs in the region numbering in the thousands. While the addition of these positions would be beneficial from an economic standpoint, the influx of workers would place demands on the regional infrastructure in terms of additional housing needs, schools, and community services. While the impact on Los Alamos County would currently be muted by the lack of available housing, the County is planning for additional housing that could allow more employees to live in the County. Rio Arriba and Santa Fe Counties would also be expected to grow as a result of these increases in employment at LANL. Considering LANL positions are some of the highest paying positions in the region, the benefits associated with these positions in terms of increased revenues and taxes should more than offset any perceived drawbacks. This is especially true in light of regional growth projections that show the region growing at a rate in line with LANL's projected growth rate under the Expanded Operations Alternative.

Infrastructure

Utility infrastructure demands for electricity, natural gas, and water are projected to increase in the LANL region of influence through 2011 regardless of the alternative selected in this SWEIS, mainly due to increasing demands among other Los Alamos County users who rely upon the same utility system as LANL. Total projected utility infrastructure requirements are summarized for LANL operations and for other Los Alamos County users in Table S–5. Under the No Action Alternative, the total energy and peak load requirements would require about 48 and 75 percent, respectively, of the capacity of the power pool serving the Los Alamos area. Natural gas requirements and water requirements would be approximately 27 and 93 percent, respectively, of system capacity. For the Reduced and Expanded Operations Alternatives, respectively, projected electricity requirements would be 38 and 62 percent of capacity, peak load demand would be 56 and 97 percent of capacity, natural gas requirements would be 27 and 29 percent of capacity, and water requirements would be 89 and 101 percent of capacity. Projections for natural gas demand show less variation across the alternatives since the demand is controlled mainly by space heating requirements, which are affected less than other utilities by operational levels. LANSCE operations have a major effect on LANL's demand for water and electricity. LANSCE

has historically accounted for as much as 25 percent of total water demand and 50 percent of electrical demand at LANL.

Under the Expanded Operations Alternative, peak load demand would approach the capacity of the Los Alamos Power Pool. Similarly, the Los Alamos Water Supply System's water rights could be exceeded under the Expanded Operations Alternative. This potential exists, based on the projected infrastructure requirements, for increased operations at LANL and the forecasted demands of other non-LANL users in Los Alamos County. However, completion of a new transmission line and other upgrades would help offset the deficit in peak load capacity. Also, LANL has plans to install a second new combustion turbine generator at the TA-3 Co-Generation Complex, if needed. The generator would add an additional 20 megawatts (175,200 megawatt-hours) of generating capacity beyond 2006. As for future water needs, Los Alamos County, as owner and operator of the Los Alamos Water Supply System, is currently pursuing use of the San Juan-Chama Transmountain Diversion Project to secure additional water for its customers including LANL. This would supply the Los Alamos area with up to an additional 391 million gallons (1,500 million liters) of water per year, an increase in capacity of approximately 20 percent.

Waste Management

Under the No Action Alternative, waste management impacts from LANL operations would remain within the capacity of LANL's infrastructure. Most wastes, with the exception of low-level radioactive waste, would be disposed of offsite at facilities designed for specific categories of wastes. The expansion into TA-54, Area G, Zone 4, would provide onsite disposal capacity for low-level radioactive waste from operations through 2016 and beyond. Due to the uncertainties of predicting remediation wastes, variances from projections are likely in future years. The waste management infrastructure at LANL would be adequate, in terms of staffing and facilities, to manage the quantities of waste expected to be generated under the No Action Alternative.

Under the Reduced Operations Alternative, waste management impacts from LANL operations would be similar to those under the No Action Alternative, with some reductions in waste quantities from operations due to the closure of LANSCE and the Pajarito Site, and reduced operational levels at the high explosives facilities. Wastes generated by environmental restoration and DD&D activities would be expected to be the same as under the No Action Alternative. The LANL waste management infrastructure would be capable of managing the projected quantities.

The Expanded Operations Alternative includes implementing a large number of projects involving major construction and DD&D, and increases in levels of operation at a number of the Key Facilities, so larger volumes of all waste types would be generated than under the other alternatives. Retrieval and processing of transuranic waste stored in shafts in Area G of TA-54 would also generate additional volumes of transuranic and low-level radioactive waste.

Full implementation of the MDA Removal Option is conservatively estimated to generate 22,000 cubic yards (17,000 cubic meters) of transuranic waste. Final waste volumes may be less than the maximum volume analyzed in this SWEIS since the estimates are based on the volume

of waste as excavated (including soil) and all major MDAs being removed; no credit has been taken for waste volume reduction techniques such as sorting. In this SWEIS, it is assumed that the transuranic waste would be disposed of at WIPP.

Volumes of low-level radioactive waste generated under the MDA Removal Option would exceed LANL's planned onsite disposal capacity. This SWEIS includes analysis of transporting low-level radioactive waste to offsite disposal facilities.

Transportation

Under all alternatives, radioactive, hazardous, and commercial materials would be transported onsite and to and from various offsite locations. The evaluation of impacts in this SWEIS focuses on offsite locations to or from which repeated shipments would be made. The specific locations analyzed were the Pantex Plant in Texas and the Savannah River Site in South Carolina for transport of special nuclear material, WIPP in New Mexico for the transport of transuranic wastes, the Nevada Test Site and a commercial disposal site for low-level radioactive wastes, and multiple locations for disposal of hazardous and nonhazardous waste materials.

It is unlikely that transportation of radioactive materials under any of the alternatives would cause a fatality as a result of radiation either from incident-free operations or postulated accidents. The highest risks to the public would be under the Expanded Operations Alternative if all of the large MDAs were exhumed and the Nevada Test Site was the main option for disposal of low-level radioactive waste. This alternative could result in about 120,240 shipments of radioactive materials and waste. It is estimated there could be about 3 fatalities from nonradiological traffic accidents associated with the transportation activities required to implement this alternative.

All trucks carrying radioactive materials to or from LANL would travel the section of road from LANL to Pojoaque; many of these trucks would also travel the section of road from Pojoaque to Santa Fe. The radiological risks to the population along these two sections of road are very small under all alternatives. The nonradiological accident risks (the potential for fatalities as a direct result of traffic accidents) are greater than radiological risks; but, even under the scenario involving the largest amount of transportation, the Expanded Operations Alternative with the MDA Removal Option, no fatalities would be expected along these routes.

Local traffic flows would be expected to remain at current levels under the No Action Alternative because employment would stay at current levels. Under the Reduced Operations Alternative, traffic through LANL would decline by about 4 percent, mainly as a result of the projected decrease in employment. Under the Expanded Operations Alternative, traffic would be expected to increase by up to 18 percent (averaged across all LANL entrances) due to the projected increases in employment and construction, DD&D, and remediation activities. Transportation of waste and fill material by truck for DD&D and MDA remediation could result in an acceleration of wear on local roads and could exacerbate traffic problems.

Environmental Justice

Executive Order 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*) requires every Federal agency to analyze whether its proposed actions and alternatives would have disproportionately high and adverse impacts on minority or low-income populations. Based on the analysis of impacts for other resource areas, NNSA expects few high and adverse impacts from the continued operation of LANL under any of the alternatives, and, to the extent impacts may be high and adverse, NNSA expects the impact to affect all populations in the area equally. NNSA also analyzed human health impacts from exposure through special pathways, including subsistence consumption of game animals, fish, native vegetation, surface waters, sediments, and local produce. Special pathways have the potential to be important to the environmental justice analysis because some of these pathways may be more important or viable for the traditional or cultural practices of minority populations in the area. However, analyses show the human health impacts associated with these special pathways would not present disproportionately high and adverse impacts to minority or low-income populations.

Facility Accidents

There is little difference among the alternatives for the maximum potential wildfire, seismic, or facility accident at LANL. This is because actions under each alternative do not, for the most part, affect the location, frequency, scenario, or material at risk of the postulated accidents.

In 2000, the Cerro Grande Fire burned a heavily forested canyon area to within about 0.75 miles (1.2 kilometers) of the waste storage domes in TA-54, but none were burned and there were no radiological releases from domes. Additional fuel reduction has been conducted since the Cerro Grande Fire, both to the vegetation surrounding the TA-54 area and within the domes themselves (for example, wooden pallets have been replaced with metal pallets), to further decrease the potential for a waste storage dome fire occurring as a result of a site wildfire. In the event of a wildfire that would impact LANL, and if the fire were to burn the waste storage domes at TA-54 and cause their contents to be released to the environment, the radiological releases from those waste storage domes would dominate the potential impacts to LANL workers and to the public from the fire. Should such an accident scenario occur in which the contents of the waste storage domes actually caught on fire and burned, the MEI would likely develop a fatal cancer during his or her lifetime and an additional 55 LCFs could be expected in the general area population. Any onsite worker located about 110 yards (100 meters) of the facility during such an accident would likely develop a fatal cancer during his or her lifetime. Taking into account the frequency of occurrence, the annual risks are estimated to be about 1 chance in 20 of an LCF for the MEI or for an offsite worker and an additional 3 LCFs in the offsite population. These risks assume that workers and members of the public do not take evasive action in the event of a wildfire. These risks would decrease as transuranic waste is removed from the domes and transported to WIPP for disposal. In terms of chemical risks from a wildfire, formaldehyde being released at the Bioscience Facilities in TA-43 would expose the public and noninvolved workers to the greatest risks, similar to those associated with a seismic event as discussed below.

The seismic event that presents the largest risk to the public and workers would be a postulated Performance Category-3 earthquake with a frequency of once every 2,000 years. If this accident were to occur, there would be widespread damage at LANL and across the region resulting in a large number of fatalities and injuries unrelated to LANL operations. Facilities at LANL would be affected and the public and workers at the site would be exposed to increased risks from both radiological and chemical releases. In the event of such a seismic accident, the MEI would have an increased lifetime risk of an LCF of 0.55 (1 chance in 1.8) and an additional 3 LCFs could be expected in the population; a noninvolved worker 110 feet (100 meters) from certain failed buildings would likely develop an LCF. Taking into account the likelihood of occurrence, the annual risks from a seismic event are estimated to be 1 chance in 3,600 for an MEI, 1 chance in 2,000 for the noninvolved worker, and no (0.005) additional LCFs in the offsite population. The largest chemical risk from such an event would result from a formaldehyde release from the Bioscience Facilities in TA-43, leading to life-threatening concentrations at the locations for the noninvolved worker and the nearest MEI.

The facility accident with the highest estimated radiological consequences to the offsite population would be a building fire and spill at the Decontamination and Volume Reduction System Facility. If this accident were to occur, there could be four additional LCFs in the offsite population. The accident with the highest estimated consequences to the MEI and noninvolved workers would be a fire at a waste storage dome in TA-54. If this accident were to occur, an LCF in a noninvolved worker located about 110 yards (100 meters) from the site of the accident would be likely, and there would also be a 0.50 likelihood (1 chance in 2) of an LCF in the MEI, assumed to be present at the nearest site boundary for the duration of the accident release. Taking into account the frequency of the postulated accidents, the estimated highest risk accident would be a fire at the Radioactive Assay and Nondestructive Test outdoor container storage area. The increased risk of an LCF for this accident would be 0.0009 (about 1 chance in 1,150) for the MEI, 0.006 (about 1 chance in 160) for the noninvolved worker, and 0.02 for the offsite population (a risk of 1 LCF occurring in the population over approximately 40 years of operations).

For chemical accident risks, the facility accident with the largest risk to the public is a selenium hexafluoride release from TA-54. There is an annual risk of about 1 chance in 240 that members of the public could be close enough to the facility to receive a life-threatening exposure to this chemical in the event of an accident. For a chlorine gas release outside of TA-55, there is an annual risk of about 1 chance in 15 that noninvolved workers could receive a life-threatening exposure to this chemical in the event of an accident. There is a great deal of uncertainty as to how much and which chemicals were disposed of in the MDAs; the MDA closest to the public (and thus with the potential for the greatest impacts on the public), MDA B, was chosen to bound the chemical accident impacts for MDA cleanup. Two chemicals, sulfur dioxide (a gas) and beryllium (assumed to be in powder form), were chosen based on their respective hazards to bound the impacts of chemicals possibly disposed of in the MDAs. Both of these chemicals, if present in the quantities assumed, would dissipate to below life-threatening concentrations very close to the release point but would continue to present a risk to the public due to the short distance to the nearest public access point for MDA B.

Table S–5 Summary of Resource Areas Environmental Consequences

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Land Use			
	Land Conveyance and Transfer - 1,929 acres (781 hectares) of land identified per Public Law 105-119 would be conveyed or transferred. - Development may occur on up to 826 acres (334 hectares). - Potential introduction of incompatible land uses. - Loss of recreational opportunities. *Power Grid Upgrades* - 473 acres (191 hectares) affected by upgrades. - Project generally compatible with existing land use.	Same as No Action Alternative.	Same as No Action Alternative, plus: *MDA Remediation Project* - No major changes in land use designations in most cases since surrounding land uses would retain their current classification. *Security-Driven Transportation Modifications Project* - Most development would not conflict with current land use designations. - Auxiliary Action A - Within scope of current land use plans. - Auxiliary Action B - Partially within scope of current land use plans. However, plans have no provision for a bridge over Sandia Canyon. *Replacement Office Buildings Project* - 13 acres (5.3 hectares) of undeveloped land in TA-3 would be developed consistent with land use plans. *TA-18 Closure Project* - Possible change in land use designation of TA-18 after DD&D of the Pajarito Site. *TA-21 Structure DD&D Project* - Possible change in land use designation following DD&D. *Radiological Sciences Institute Project* - 12.6 acres (5.1 hectares) of undeveloped land at or near TA-48 would be developed consistent with land use plans. *Radioactive Liquid Waste Treatment Facility Upgrade Project* - 4 acres (1.6 hectares) of undeveloped land near the border of TA-5 and TA-52 could be developed for evaporation basins. *Science Complex Project* - 5 acres (2 hectares) of undeveloped land at or near TA-62 would be developed; 15.6 acres (6.3 hectares) could undergo a change in land use plans. *Remote Warehouse and Truck Inspection Station Project* - 4 acres (1.6 hectares) of undeveloped land in TA-72 would be developed with a change in land use plans.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Visual Environment			
	Land Conveyance and Transfer - Development could degrade views of presently undeveloped tracts. *Power Grid Upgrades* - Short-term visual impacts during construction. - Adverse visual impact in undisturbed areas. - No overall change in view from Bandelier National Monument. *Disposition of Flood Retention Structures* - Temporary impacts during removal if staging areas are located near Pajarito Road. Temporary impacts during construction of the Chemistry and Metallurgy Research Replacement Facility at TA-55. Temporary impacts during construction of replacement or new buildings and long-term enhancement of visual environment from removal of old buildings for the following projects: - High Explosives Processing Facility, and - High Explosives Testing Facility.	Same as No Action Alternative.	Same as No Action Alternative, plus: *MDA Remediation Project* - Temporary visual impacts during MDA capping or removal. - Borrow pit in TA-61 would become more visible due to the large quantities of material needed under both options. *Security-Driven Transportation Modifications Project* - Temporary impacts during construction. - Pronounced impacts due to parking lots, as well as vehicle and pedestrian bridges, especially for auxiliary actions involving bridges across canyons. *Center for Weapons Physics Research* - Temporary impacts during construction. - New structures would blend with other TA-3 construction. - Appearance of TA-3, TA-35, and TA-53 would improve with demolition of vacated structures. *Replacement Office Buildings Project* - Temporary impacts during construction. - New buildings and parking lot would be visible from West Jemez Road and Pajarito Road. *TA-18 Closure Project* - Temporary impact from demolition of Pajarito Site facilities at TA-18. - Long-term enhancement of visual environment as area is restored to more natural appearance. *TA-21 Structure DD&D Project* - Enhancement of visual environment from the removal of old structures from TA. Both conveyed and nonconveyed lands could undergo development which could change visual environment. *Radiological Sciences Institute Project* - Temporary impacts during demolition and construction. *Radioactive Liquid Waste Treatment Facility Upgrade Project* - Short-term impact from construction of new treatment building in TA-50. - Permanent change to the visual environment if evaporation basins are built near the border of TA-5 and TA-52. *Waste Management Transition Project* - Beneficial impact on near and distant views from removal of white-colored domes in TA-54. - Temporary impacts during construction of structures at TA-50

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
			and TA-54. *Science Complex Project* - Under Options 1 and 2, the new facility would be readily visible from West Jemez Road and forested buffer between LANL and Los Alamos Canyon would be lost; potential impacts to Los Alamos Canyon from night lighting. Negligible impacts for Options 3. *Remote Warehouse and Truck Inspection Station Project* - Site would be readily visible from East Jemez Road; lighting could be visible from Bandelier National Monument.
Geology and Soils			
	Overall level of legacy contamination in soil should continue to decrease as a result of ongoing remediation projects including cleanup of suspected contamination at TA-21.	Same as No Action Alternative, except that the potential impact of LANL operations on soil could decrease because of the 20 percent reduction in high explosives testing activities.	Same as No Action Alternative, except: *MDA Remediation Project* - Use of large amounts of soil and rock for backfill or closure caps (up to 2.5 million cubic yards). - Positive impact from removal or containment of legacy waste. - TA-61 borrow pit would be expanded to provide additional soil and rock; other sources may be required. Temporary adverse impacts from excavation of large amounts of rock and soil during construction and DD&D, and positive impacts from removal of legacy contamination for the following projects: - *Center for Weapons Physics Research,* - *Replacement Office Buildings,* - *TA-18 Closure,* - *TA-21 Structure DD&D,* - *Radiological Sciences Institute (including the Institute for Nuclear Nonproliferation Science and Technology),* - *Radioactive Liquid Waste Treatment Facility Upgrade,* - *Waste Management Facilities Transition,* - *TA-55 Radiography Facility,* - *Science Complex,* - *Remote Warehouse and Truck Inspection Station, and* - *Security-Driven Transportation Modifications.*
Water Resources – Surface Water			
	Only minor impact on surface water quality or quantity, or floodplains from activities other than the project to remove flood retention structures. Removal of flood retention structures could result in potential impact on Pajarito floodplains. Restoration of normal flow would cause sediments to alter channel and readjust floodplains.	Same as No Action Alternative, except shutdown of LANSCE operations would result in major reductions of NPDES-permitted cooling tower discharges, particularly to Los Alamos Canyon.	Same as No Action Alternative, and: Potential long-term positive impact from MDA remediation because water quality would be protected by removal or stabilization of waste or contaminants in soil. Complete Removal Option for DD&D of TA-21 would eliminate two NPDES-permitted outfalls reducing discharges to Los Alamos Canyon.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
			Volume of water in Mortandad Canyon would be greatly reduced if the RLWTF became a zero discharge facility. Surface water quality in Mortandad Canyon would be improved in both the short term and long term.
Water Resources – Groundwater			
	Construction and DD&D activities are unlikely to affect groundwater resources. Operations-related impacts to groundwater are not likely to be significant in nature.	Long-term impacts as a result of operations might be reduced by elimination of additional outfalls.	Same as No Action Alternative, except potential positive long-term impact from MDA remediation on long-term contaminant migration.
Nonradiological Air Quality			
	Minor temporary localized increases in air emissions from construction and demolition activities. Minor increases in air emissions from operations and remediation activities, including operation of new combustion turbine generators.	Same as No Action Alternative, except for reductions in emissions from reduced high explosives processing and testing and shutdown of LANSCE and the Pajarito Site.	Higher level of emissions from increased operations and proposed construction, demolition, and remediation. Hazardous air pollutants could increase by up to 2.5 percent from the higher level of High Explosives Processing. Temporary construction-type releases of criteria pollutants would occur from MDA remediation, DD&D, and construction of new facilities.
Radiological Air Quality			
Curies per year:			
Tritium [a]	2,400	2,400	2,400 [b]
Americium-241	4.2×10^{-6}	4.2×10^{-6}	4.2×10^{-6} [c]
Plutonium [d]	0.00082	0.00082	0.00084 [c]
Uranium [e]	0.15	0.12	0.15
Particulate and vapor activation products	30	0.014	30
Gaseous mixed activation products	30,500	100 [f]	30,500 [f]
Mixed Fission Products [g]	1,650	1,650	1,650

[a] Includes both gaseous and oxide forms of tritium.
[b] Tritium emissions would decrease to 1,850 curies per year starting in 2009 following decontamination, decommissioning, and demolition of TA-21.
[c] Americium-241 emissions could increase to 1.1×10^{-5} curies per year and plutonium emissions to 0.00089 curies per year if the Decontamination and Volume Reduction System, the new Transuranic Waste Consolidation Facility, and remote-handled transuranic waste retrieval activities operated simultaneously (estimated to occur from 2012 through 2015).
[d] Includes plutonium-238, plutonium-239, and plutonium-240.
[e] Includes uranium-234, uranium-235, and uranium-238.
[f] Gaseous mixed activation products emissions would decrease by 100 curies per year starting in 2009 due to the shutdown of TA-18, resulting in zero GMAP emissions in the Reduced Operations Alternative and 30,400 curies per year in the Expanded Operations Alternative.
[g] Mixed fission products include krypton-85, xenon-131m, xenon-133, and strontium-90.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Noise			
	Operations noise levels would have little impact on the public with the exception of sporadic noise from explosives detonations and traffic noise. Temporary localized increases in noise levels would occur from construction, demolition, and remediation activities that would be expected to have little impact on the public.	Same as No Action Alternative, except minor reductions in noise levels from reduced high explosives testing and shutdown of LANSCE and Pajarito Site (TA-18).	Higher noise levels than the No Action Alternative from increased operations, construction, DD&D, and remediation activities. Increase in truck and personal vehicle traffic noise, some of which could occur during nighttime, could result in public annoyance: - Up to a 32 percent increase in traffic along DP Road affecting nearby businesses and residents. - Up to a 13 percent increase in traffic along East Jemez Road affecting residents.
Ecological Resources			
	Land Conveyance and Transfer - 770 acres (312 hectares) of habitat could be lost through development. - Transfer of resource protection responsibility could result in a less rigorous environmental protection review process. *Power Grid Upgrades* - Temporary displacement of wildlife due to construction-related activities. - Potential positive impact by providing perching sites for larger birds. *Wildfire Hazard Reduction Program* - Short-term disturbance of wildlife due to forest thinning activities. - Increased forest health could benefit the Mexican spotted owl and other species. *Disposition of Flood Retention Structures* - Temporary displacement of wildlife due to construction-related activities. - Potential minor impacts on down stream wetlands. *Trails Management Program* - Temporary disturbance of wildlife during implementation activities. Clearing of some ponderosa pine forest in TA-48 and TA-55 for construction of CMRR would cause loss or displacement of associated wildlife. Short-term impacts in TA-6, TA-22,	Same as No Action Alternative, plus: Reduction in high explosives testing would reduce the number of times animals would be subjected to stress resulting from high explosives testing.	Same as No Action Alternative, plus: *MDA Remediation Project* - Short-term disturbance and displacement of wildlife during capping or waste removal. - Loss of habitat at borrow pit in TA-61. *Security-Driven Transportation Modifications Project* - Parking lot construction and placement of pedestrian and vehicle bridges for all proposed activities would destroy up to 30 acres (12 hectares) of natural habitat. - A section of new roadway under Auxiliary Action B would destroy some natural habitat. - Under both auxiliary actions, bridge traffic over the core zone of the Sandia-Mortandad Canyon Mexican spotted owl Area of Environmental Interest has the potential to cause long-term impacts. Section 7 consultation with the U.S. Fish and Wildlife Service would be needed. *Replacement Office Buildings Project* - Temporary displacement of wildlife due to construction-related activities. - Clearing 13 acres (5.3 hectares) of mixed conifer forest in TA-3 would result in loss or permanent displacement of wildlife. *TA-18 Closure Project* - Minor impact on wildlife during demolition of Pajarito Site structures in TA-18. - Restoration of TA-18 (Pajarito Site) would create a more natural habitat and benefit wildlife, potentially including the Mexican spotted owl. *TA-21 Structure DD&D Project* - Minor disturbance of wildlife on adjacent land during

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
	and TA-40 from construction of new High Explosives Test Facility buildings and demolition of old structures would cause loss or displacement of wildlife.		demolition of structures. *Radiological Sciences Institute Project (including the Institute for Nuclear Nonproliferation Science and Technology)* - Temporary disturbance of wildlife during demolition of structures and construction in TA-48. - Clearing of 12.6 acres (5.1 hectares) of Ponderosa pine forest would cause loss or displacement of associated wildlife. *Radioactive Liquid Waste Treatment Facility Upgrade Project* - Potential reduction in availability of prey for the Mexican spotted owl if the facility becomes a zero liquid discharge facility, necessitating Section 7 consultations with the U.S. Fish and Wildlife Service. - Loss of 4 acres (1.6 hectares) of habitat if evaporation basins are constructed. *Waste Management Facilities Transition Project* - Short-term impacts on wildlife in the vicinity of TA-50 and TA-54 from new construction and demolition for new and upgraded Solid Radioactive and Chemical Waste Facilities. - Activities could occur in portions of the Mexican spotted owl or willow flycatcher areas at environmental interest. *Science Complex Project* - Temporary displacement of wildlife due to construction-related activities. - Options 1 and 2 would remove 5 acres (2 hectares) of ponderosa pine forest. - Under Option 3, less than 5 acres (2 hectares) of grassland and forest would be cleared. *Remote Warehouse and Truck Inspection Station Project* - Temporary displacement of wildlife due to construction-related activities. - 4 acres (1.6 hectares) of ponderosa pine forest and pinion-juniper woodland would be cleared.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Human Health			
Offsite Population			
Dose (person-rem per year)	30	6.4 [h]	36 [i, j]
Risk (LCFs per year)	0.018	0.0038	0.022
MEI [k]			
Dose (millirem per year)	7.8	0.79 [h]	8.2 [i, j]
Risk (LCFs per year)	4.7×10^{-6}	4.7×10^{-7}	4.9×10^{-6}
Workers			
Dose (person-rem per year)	281	258	408 to 520 [l]
Risk (LCFs per year)	0.17	0.15	0.24 to 0.31 [l]
[h] Starting in 2009, TA-18 (Pajarito Site) would not be contributing to radiological air emissions, thereby reducing the MEI and population doses. [i] Population dose and MEI dose include 6.2 person-rem and 0.42 millirem respectively, attributable to MDA remediation. This dose could be less depending on the MDAs being remediated, whether an MDA is being capped or contamination removed, the number of MDAs being remediated at one time, and other factors. [j] Starting in 2009, TA-18 (Pajarito Site) and TA-21 would not be contributing to radiological air emissions, thereby reducing the MEI and population doses. [k] Under the No Action Alternative and the Expanded Operations Alternative, the LANL site-wide MEI would be located near LANSCE. Under the Reduced Operations Alternative, the LANL site-wide MEI would be located near the firing sites at TA-36. [l] The range for the Expanded Operations Alternative reflects the contribution from the two MDA remediation options. The lower value is for the Capping Option, the higher value is for the Removal Option.			
Cultural Resources			
	Land Conveyance and Transfer - Potential damage to cultural resources and impacts on protection of and accessibility to Native American sacred sites from conveyance or transfer of cultural resources out of the responsibility and protection of DOE. Potential damage on conveyed or transferred parcels due to future development. *Trails Management Program* - Enhanced protection of cultural resources. Potential adverse effects from demolition and remodeling of historic buildings in High Explosives Processing and Testing Facilities. Documentation would be required to resolve adverse effects.	Same as No Action Alternative.	Same as No Action Alternative plus: Removal of white-colored domes under the *Waste Management Facilities Transition Project* would have a positive impact on views from traditional cultural properties. To varying degrees, impacts on archaeological sites or historic structures eligible or potentially eligible for listing on the National Register of Historic Places could result from the following projects. These resources would be protected as appropriate and documentation would be developed as required to resolve adverse effects. Construction, modification, or renovation projects and associated DD&D for the following new or existing projects: *-Security-Driven Transportation Modifications,* *-Center for Weapons Physics Research,* *-Replacement Office Buildings,* *-Radiological Sciences Institute (including the Institute for Nuclear Nonproliferation Science and Technology),* *-Radioactive Liquid Waste Treatment Facility Upgrade,* *-LANSCE Refurbishment,* *-Waste Management Facilities Transition,* *-TA-55 Radiography Facility,*

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
			-*Science Complex*, and -*Remote Warehouse and Truck Inspection Station*. DD&D projects for the following: - *TA-18 Closure Project,* - *TA-21 Structure DD&D*
Socioeconomics			
	LANL Employment		
	Projected to stay at 2004 levels.	Projected to decrease by 510 employees from 2004 levels. These cuts would be expected to result in the loss of about 865 indirect jobs in the region.	Projected to increase by 2.3 percent per year so that from 2007 to 2011 an additional 920 to 2,240 employees would work at LANL and another 1,560 to 3,800 jobs would be created indirectly. This growth rate is consistent with the projected regional growth rate.
	Housing		
	No new housing units needed specific to changes in LANL employment level.	Additional housing units would become available in the tri-county area as a result of the projected decrease in LANL's employment level. These would be expected to offset the need for additional housing units in the region since the population would still be expected to grow, although at a slower rate (about 1.3 percent versus 2.3 percent).	Additional housing units would be required in the Tri-County area as a result of the projected increase in LANL's employment level along with the projected increase in the region's population; further growth would be expected.
	Workforce		
	Completion of previously approved construction projects is expected to draw workers already in the region who historically work from job-to-job.	Same as No Action Alternative.	An increase in the number of construction projects would be expected to draw workers already in the region who historically work from job-to-job.
	Local Government Finance		
	Annual gross receipts tax yields would be expected to remain at current levels in real terms.	Annual gross receipts tax yields directly and indirectly associated with LANL employment could decrease by about 1.4 percent.	Annual gross receipts tax yields directly and indirectly associated with LANL employment are projected to increase by between 2.6 and 5.8 percent from 2007 through 2011 over 2004 levels in real terms.

	No Action Alternative	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
	Services		
	The demand for services such as police, fire, and hospital beds would be expected to remain at current levels on a proportional basis compared to LANL employment. Regional population is projected to increase even if LANL employment remains flat, so there would be an increase in the demand for regional services but the increased demand would not be driven by LANL growth.	Demand for services would be expected to decrease in proportion to the number of out-of-work LANL-related employees leaving the region. However, regional population would still be projected to increase even if LANL employment was to decrease by the small levels envisioned in this alternative compared to the No Action Alternative.	Demand for services would be expected to increase in proportion to the number of additional LANL-related jobs added to the region. The associated number of additional school age children would be between 1,000 and 2,600 in the tri-county area, resulting in an estimated increase in needed public school funding from the State of $8 million in 2007 to $21 million in 2011.
Site Infrastructure			
LANL Site and Other Los Alamos County Users Total Per Alternative (annual)	Electricity requirements: 632,000 megawatt-hours total (486,000 megawatt-hours for LANL); 48 percent of system capacity. Electric Peak Load: 112 megawatts total (92.3 megawatts for LANL); 75 percent of system capacity. Natural Gas Demand: 2,213,000 decatherms total (1,195,000 decatherms for LANL); 27 percent of system capacity. Water Demand: 1,682 million gallons total (388 million gallons for LANL); 93 percent of system capacity. *Project Effects:* - Ongoing electrical power system upgrades would have a positive incremental impact on site electrical energy and peak load capacity. - Potential for increased natural gas consumption from increased capacity at the TA-3 Co-Generation Complex. Note: Values are rounded.	Electricity Requirements: 497,000 megawatt-hours total (350,000 megawatt-hours for LANL); 38 percent of system capacity. Electric Peak Load: 84.5 megawatts total (64.9 megawatts for LANL); 56 percent of system capacity. Natural Gas Demand: 2,190,000 decatherms total (1,171,000 decatherms for LANL); 27 percent of system capacity. Water Demand: 1,605 million gallons total (310 million gallons for LANL); 89 percent of system capacity. *Project Effects:* Same as the No Action Alternative.	Electricity Requirements: 814,000 megawatt-hours total (668,000 megawatt-hours for LANL); 62 percent of system capacity. Electric Peak Load: 145 megawatts total (125 megawatts for LANL); 97 percent of system capacity. Natural Gas Demand: 2,320,000 decatherms total (1,301,000 decatherms for LANL); 29 percent of system capacity. Water Demand: 1,816 million gallons total (522 million gallons for LANL); 101 percent of system capacity. *Project Effects:* - Increases in electrical energy, peak load, and water demands over the No Action Alternative due to increased operational levels at the Metropolis Center and LANSCE (see above).

Waste Type	*No Action Alternative*	*Reduced Operations Alternative*	*Expanded Operations Alternative (Preferred Alternative)*
Waste Management (for 10-year period 2007 through 2016)			
Transuranic Waste			
Contact-handled (cubic yards) [m]	3,500 to 5,900	3,500 to 5,900	5,400 to 33,000
Remote-handled [n] (cubic yards)	–	–	12 to 62
Low-Level Radioactive Waste [n, o]			
Bulk low-level radioactive waste (cubic yards)	38,000	38,000	194,000 to 881,000
Packaged low-level radioactive waste (cubic yards)	33,000 to 118,000	33,000 to 99,000	81,000 to 173,000
High activity low-level [n] radioactive waste (cubic yards)	–	–	0 to 347,000
Remote-handled low-level [n] radioactive waste (cubic yards)	–	–	470 to 1,700
Mixed low-level radioactive waste (cubic yards)	1,800 to 2,700	1,800 to 2,700	4,000 to 183,000
Construction/Demolition Debris [p] (cubic yards)	197,000	197,000	656,000 to 736,000
Chemical waste [q] (pounds)	19,000,000 to 37,000,000	19,000,000 to 37,000,000	65,000,000 to 129,000,000
Liquid transuranic waste (gallons per year)	30,000	30,000	50,000
Liquid low-level radioactive waste (at TA-50) (gallons per year)	4,000,000	4,000,000	5,000,000
Liquid low-level radioactive waste (at TA-53) (gallons per year)	140,000	5,000 [r]	140,000

[m] Operations waste volumes are assumed to be contact-handled transuranic waste and packaged low-level radioactive waste, although small volumes of remote-handled or high-activity waste could be generated.

[n] These waste types are generated during retrieval of waste from MDAs under the Expanded Operations Alternative. Nominal volumes generated under other alternatives are accounted for in other waste categories.

[o] The subcategories of low-level radioactive waste do not necessarily meet precise definitions, but are used to assist in the analysis of transportation and disposal options and impacts.
- Bulk low-level radioactive waste = wastes that can be transported in large volumes in soft-sided containers.
- Packaged low-level radioactive waste = typical low-level radioactive waste packaged in drums or boxes.
- High activity low-level radioactive waste = waste exceeding 10 CFR 61.55 Class A concentrations (greater than 10 nanocuries per gram of transuranic nuclides) and therefore not accepted at certain facilities.
- Remote-handled low-level radioactive waste = waste with a dose rate exceeding 200 millirem per hour at the surface of the container.

[p] Demolition waste includes uncontaminated wastes such as steel, brick, concrete, pipe, and vegetative matter from land clearing.

[q] Chemical waste includes wastes regulated under the Resource Conservation and Recovery Act, Toxic Substances Control Act, or state hazardous waste regulations. The large increase under the Expanded Operations Alternative is primarily due to high volumes of waste associated with MDA remediation.

[r] Under the Reduced Operations Alternative, operations at the LANSCE facility would cease. Approximately 5,000 gallons (20,000 liters) of radioactive liquid waste per year from TA-50 would continue to be treated at TA-53.

Note: Due to rounding, values may not equal sum of individual contributions.
To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359; gallons to liters, multiply by 3.78533.

	No Action Alternative	*Reduced Operation Alternative*	*Expanded Operations Alternative (Preferred Alternative)*	
Transportation (for 10-Year Period 2007-2016)				
Incident Free				
Public Radiation Exposure *Dose (person-rem) / Risk (LCFs):*			**MDA Capping Option**	**MDA Removal Option**
Total	49 / 0.030	44 / 0.027	74 / 0.044	271 / 0.16
LANL to Pojoaque	1.55 / 0.00093	1.44 / 0.00086	2.32 / 0.0014	7.62 / 0.0046
Pojoaque to Santa Fe	2.54 / 0.0015	2.35 / 0.0014	3.80 / 0.0023	12.5 / 0.0075
Worker Radiation Exposure: (transport drivers) *Dose (person-rem) / Risk (LCFs):*	147 / 0.088	131 / 0.079	230 / 0.138	884 / 0.53
Transportation Accidents				
Population: - Radiological *Risk (LCFs)*	0.00016	0.00014	0.00023	0.0016
- Nonradiological *Traffic Fatalities* [s]	0	0	1	3
Local Traffic				
Average Daily Traffic at Entry Points	42,300	40,700	up to 49,200	
[s] Nonradiological traffic accidents include all traffic accidents involving both radioactive and nonradioactive materials and waste shipments. Values presented are the nearest whole number.				
Environmental Justice				
	No disproportionately high and adverse impacts on minority or low-income populations. Human health impacts from exposure through special pathways (including subsistence consumption of fish and wildlife) would not present disproportionately high and adverse impacts to minority or low-income populations.	Same as No Action Alternative.	Same as No Action Alternative.	
Facility Accidents (highest risk accidents presented)				
Wildfire – Radiological (Waste Storage Domes at TA-54 – assumed frequency 1 in 20 years)				
Offsite Population Dose (person-rem) Risk (LCFs per year) **MEI** Dose (rem) Risk (LCFs per year) **Noninvolved Worker** Dose (rem) Risk (LCF per year)	 91,300 2.7 1,930 0.05 8,730 0.05	Same as No Action Alternative.	Same as No Action Alternative.	

	No Action Alternative	*Reduced Operation Alternative*	*Expanded Operations Alternative (Preferred Alternative)*	
Wildfire – Chemical (Releases formaldehyde at TA-43 – assumed frequency 1 in 20 years)				
- Concentrations above which life-threatening health effects could result (ERPG-3 [t] limit)	25 parts per million	Same as No Action Alternative		3 (3.26)
- ERPG-3 distance	97 yards			
- Distance to the site boundary	13 yards			
Site-Wide Seismic Event – Radiological (PC-3 seismic event – assumed frequency 1 in 2,000 years)				
Offsite Population				
Total Dose (person-rem)	17,429	Same as No Action Alternative	Same as No Action Alternative	
Risk (LCF per year)	0.005			
MEI				
Maximum Dose (rem)	462			
Risk (LCF per year)	0.0003			
Noninvolved Worker				
Maximum Dose (rem)	2,150			
Risk (LCF per year)	0.001[u]			
Site-Wide Seismic Event – Chemical (PC-3 seismic event releases formaldehyde at TA-43 – assumed frequency 1 in 2,000 years)				
- Concentrations above which life-threatening health effects could result (ERPG-3 [t] limit)	25 parts per million	Same as No Action Alternative		3 (3.26)
- ERPG-3 distance	120 yards			
- Distance to the site boundary	13 yards			
Facility Accident (RANT outdoor container storage area fire – assumed frequency 1 in 100 years)				
Offsite Population				
Dose (person-rem)	3,970	Same as No Action Alternative	Same as No Action Alternative	
Risk (LCF per year)	0.02			
MEI				
Dose (rem)	71.5			
Risk (LCF per year)	0.0009			
Noninvolved Worker				
Dose (rem)	532			
Risk (LCF per year)	0.006			
Facility Chemical Release (Selenium hexafluoride at TA-54 – assumed frequency 1 in 240 years)				
- Concentrations above which life-threatening health effects could result (ERPG-3 [t] limit)	5 parts per million	Same as No Action Alternative		3 (3.26)
- ERPG-3 distance	962 yards			
- Distance to the site boundary	537 yards			

[t] ERPG-3 is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.
[u] The maximum risk (considering consequence and probability) to the noninvolved worker comes from the PC-2 seismic event which has a frequency of 1 in 1,000.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; MDA = material disposal area; LANSCE = Los Alamos Neutron Science Center; NPDES = National Pollutant Discharge Elimination System; RLWTF = Radioactive Liquid Waste Treatment Facility; CMRR = Chemistry and Metallurgy Research Replacement Facility; rem = roentgen equivalent man; LCF = latent cancer fatality; MEI = maximally exposed individual; ERPG = Emergency Response Planning Guideline; PC = performance category; RANT = Radioactive Assay and Nondestructive Test.

Note: To convert gallons to liters, multiply by 3.7854; cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359.

S.9.2 Summary of Cumulative Impacts

In accordance with Council on Environmental Quality regulations, a cumulative impact analysis includes "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR Part 1508.7). The cumulative impact analysis for this SWEIS includes (1) an examination of cumulative impacts presented in the *1999 SWEIS*; (2) impacts since the *1999 SWEIS* was issued, presented in this SWEIS; and (3) a review of the environmental impact of past, present, and reasonably foreseeable actions for other Federal and non-Federal agencies in the region.

Reasonably foreseeable actions that are likely to occur at LANL are described under the Expanded Operations Alternative. Additional DOE or NNSA actions potentially impacting LANL include the possible siting of a modern pit facility at LANL (DOE/EIS-0236-S2), consolidation of nuclear operations related to production of radioisotope power systems (DOE/EIS-0373D), and the conveyance and transfer of land at LANL to Los Alamos County and the Department of the Interior in trust for the Pueblo of San Ildefonso (DOE/EIS-0293).

The impacts associated with the production of a maximum of 450 pits per year are estimated in the draft EIS for a modern pit facility. The impacts evaluated in this SWEIS are based on pit production for as many as 80 pits per year. Because pits would be produced at either a modern pit facility or in existing, albeit updated, facilities at LANL, the impacts associated with pit production are overestimated in this cumulative impacts section.

Consolidation of DOE Office of Nuclear Energy, Science and Technology plutonium-238 activities at the Idaho National Laboratory proposed in the *Draft Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems* (DOE/EIS-0373D) (*Consolidation EIS*) would reduce plutonium-238 operations at LANL. Regardless of the decision on the *Consolidation EIS*, some plutonium-238 operations would continue at LANL. Therefore, very small changes in the impacts from plutonium-238 activities at LANL would be realized.

If current plutonium-238 operations were to continue at the LANL Plutonium Facility Complex, as described under the *Consolidation EIS* No Action Alternative, manufacturing of up to approximately 50 pits per year (80 pits per year using multiple shift operations) could still be accomplished within the LANL Plutonium Facility Complex. This would be accommodated by consolidating a number of plutonium processing and support activities (such as analytical chemistry and materials characterization at the Chemistry and Metallurgy Research Replacement Facility). The impact of the 80-pit-per-year production and plutonium-238 processing (at levels far above the level of plutonium-238 processing identified in the *Consolidation EIS*) has already been evaluated in both the LANL *1999 SWEIS* and this new SWEIS. Therefore, there would be no additional cumulative effect from these activities.

An EIS analyzing the potential environmental impacts of operation of a BSL-3 Facility is in preparation. At its current stage of development definitive data for inclusion in the cumulative impacts analysis are not available for this draft SWEIS. However, information about the facility and its potential operations can be evaluated at a general level that is adequate to assess potential contributions to cumulative impacts.

The BSL-3 Facility in TA-3 is a single-story 3,200-square foot (300-square meter) stucco building. It houses two BSL-3 laboratories, a BSL-2 laboratory, and support facilities including offices, a locker room, and showers. Construction is complete, but no operations have been conducted in the facility. Operation of this facility is anticipated to result in, at most, minimal incremental impacts on all resource areas. Utility use would be much less than most other LANL facilities and it would not affect overall utility demand at LANL or in the region. Air emissions would be passed through high-efficiency particulate air filters and would not affect the air quality of the region. Liquid and solid wastes from operational areas would be thermally or chemically destroyed prior to discharge or disposal. Liquid waste would be discharged to the LANL sanitary sewage system where it would be commingled and treated prior to discharge and would have minimal impact on local and regional water quality. Small amounts of radiological materials would be used as tracers resulting in the generation of small quantities of radioactive waste. Relatively small amounts of other regulated wastes would also be generated. These quantities of waste would be easily managed within the LANL waste management infrastructure and would have a negligible impact on transportation.

Reasonably foreseeable actions for the region surrounding LANL were also reviewed and included in the analysis. Interviews were conducted with personnel in planning departments in the surrounding counties, and from the regional Bureau of Land Management and Santa Fe National Forest offices to collect information on activities that might affect cumulative impacts. Available documentation was also reviewed for activities that could contribute to cumulative impacts.

Each resource area in this SWEIS was reviewed for potential cumulative impacts and the analyses are summarized in the following paragraphs. The level of detail provided for each resource area is commensurate with the extent of the potential cumulative impacts. Some resources were not provided with a detailed analysis based on minimal or very localized impacts from LANL operations and a judgment that cumulatively there would be no appreciable impacts on these resources.

The following paragraphs summarize cumulative impacts for LANL and the surrounding region of influence. The maximum cumulative impacts for all resource areas would occur if the decisions to implement the Expanded Operations Alternative in this SWEIS and locate the 450-pit per year modern pit facility at LANL were made.

Land Use, Visual Environment, Ecological Resources, and Cultural Resources

Cumulative impacts on land use, visual environment, ecological resources, and cultural resources are largely due to the conveyance and transfer of land to Los Alamos County and the Department of the Interior in trust for the Pueblo of San Ildefonso as required under Public Law 105-119. Up to 826 acres (334 hectares) of land could be developed after the transfer. For example,

Los Alamos County has indicated there are proposals to develop approximately 1,000 new residences on land adjacent to LANL and to develop land for light industry along the Los Alamos Canyon rim across from the airport. This could change the current land use and increase cumulative impacts on visual, ecological, and cultural resources.

Geology and Soils

For geology and soils, the primary impacts are due to proposed closure of the MDAs under the Expanded Operations Alternative in compliance with the Consent Order. If the waste at the MDAs is confined in-place (MDA Capping Option), the final covers would require up to 2.5 million cubic yards (1.9 million cubic meters) of crushed tuff for fill and additional rock, gravel, topsoil, and other bulk materials for surface grading and erosion control. These materials would be obtained from both LANL resources and the quarries and mines in the surrounding counties. While the quantity of materials would be large, there are sufficient resources in the region to meet the demand.

Water Resources

Reasonably foreseeable activities in the region have the potential to affect surface water and groundwater in combination with past and present activities, as well as those proposed at LANL in this SWEIS. Mitigation measures implemented by Federal agencies during fire and vegetation management projects and modification of water control structures installed after the Cerro Grande Fire would minimize impacts on surface water quality and quantity. Additional groundwater depletion projected as a result of potential new residential development within Los Alamos County could be somewhat offset by reduced depletion of the regional aquifer following implementation of the City of Santa Fe's water diversion project and reduced pumping of the Buckman Well Field. Monitoring of the quality and quantity of the regional aquifer would be needed to evaluate the rate and direction of contaminant movements, as well as to track the amount of water available for use.

Air Quality

The cumulative concentrations of all criteria pollutants from operations are expected to remain well below Federal and State ambient air quality standards.

Construction, excavation, and remediation activities could result in temporary increases in air pollutant concentrations at the site boundary and along roads to which the public has access. These impacts would be similar to the impacts that would occur during the construction of a housing project or a commercial complex. Emissions of fugitive dust from these activities would be controlled with water sprays and other engineering and management practices as appropriate. The maximum ground-level concentrations offsite and along roads to which the public has regular access would be below the ambient air quality standards, except for possible short-term concentrations of nitrogen oxides and carbon monoxide for certain projects that occur near the site boundary. The impact on the public would be expected to be minor.

The contribution to cumulative air quality impacts from offsite construction and operation activities was also evaluated. The maximum impacts from construction activities (including fugitive dust) for oil and gas development in the region are evaluated in the *Farmington Proposed Resource Management Plan and Final EIS* and were shown to occur very close to the source, with concentrations decreasing rapidly with distance. Therefore, it is expected that offsite air emissions from disturbance and construction would not contribute substantially to cumulative impacts at LANL.

Impacts of inert pollutants (pollutants other than ozone and its precursors) were found to be generally limited to a few miles downwind from the source. For emissions from the oil and natural gas well fields, the distance where the nitrogen dioxide concentrations dropped below their significance levels was 15.6 to 24.9 miles (25 to 40 kilometers). Therefore, it is expected that emissions from the operation of offsite facilities would not contribute substantially to cumulative impacts at LANL.

In contrast, the maximum effects of volatile organic compounds and nitrogen oxide emissions on ozone levels usually occurs several hours after these compounds are emitted and many miles from their sources. A number of mitigation measures for activities occurring in the region are designed to reduce the cumulative air quality impacts from gas and oil wells and pipelines. One of the more successful mitigation measures requires that new and replacement wellhead compressors limit their nitrogen oxide emissions to less than 10 grams per horsepower-hour, and each pipeline compressor station limit its total nitrogen oxide emissions to less than 1.5 grams per horsepower-hour. This measure is intended to substantially reduce the level and extent of emissions that form ozone throughout the region and reduce visibility impacts on Class I Areas such as Bandelier National Monument.

Human Health

For human health, the dose to the general public from all anticipated airborne emissions at LANL (Expanded Operations Alternative with the addition of a modern pit facility) could be as much as 36 person-rem per year. The dose to the offsite MEI from all anticipated airborne emissions at LANL (Expanded Operations Alternative with the addition of a modern pit facility) could be as much as 8.2 millirem per year. The Clean Air Act limits airborne doses to 10 millirem per year to any individual member of the public. No additional LCFs would be expected at these dose levels.

Collective worker doses would increase substantially if a facility producing 450 pits annually were located at LANL at the same time that the MDA Removal Option was being implemented. Collective worker dose would increase from about 280 person-rem per year under the No Action Alternative to an average of 1,080 person-rem per year due to the number of workers involved. Worker dose would decrease by about 110 person-rem annually after the MDA remediation work was complete. At a collective dose of 1,080 person-rem per year, less than 1 (0.71) LCF would be expected. Individual worker dose would be maintained as low as reasonably achievable (ALARA) and within applicable regulatory limits.

Infrastructure

The cumulative peak load electrical capacity and the water use capacity would be exceeded for the combined LANL Expanded Operations Alternative and a modern pit facility. Planned upgrades to the electrical system should be sufficient to offset the deficit in peak load capacity and ensure that electric energy is available when needed for future operations. For water use, Los Alamos County is currently pursuing additional water rights to supply its water customers including LANL. LANL water requirements have been decreasing compared to the demand in 1999, and are far below projections included in the *1999 SWEIS*. In the near term, no infrastructure capacity constraints are anticipated, and LANL demands on infrastructure resources are below projected levels and within site capacities. Potential shortfalls in available capacity will need to be addressed if increased site requirements are realized.

Waste Management

Cumulative generation of all waste types is expected to be substantial, largely due to future remediation of MDAs and DD&D of facilities, and the potential operation of a modern pit facility. Although this would be the case under all alternatives, the quantities of wastes projected under the Expanded Operations Alternative would be significantly greater than those projected under the other alternatives. Sufficient disposal capacity, both on- and offsite, for all waste types would be available except under the Expanded Operations Alternative with the MDA Removal Option and the operation of a modern pit facility. In this scenario the projected low-level radioactive waste volume (1.5 million cubic yards [1.1 million cubic meters]) would exceed the onsite disposal capacity, and the projected transuranic waste volume (48,000 cubic yards [37,000 cubic meters]) would significantly exceed the volume (27,500 cubic yards [21,000 cubic meters]) attributed to LANL in the *Waste Isolation Pilot Plan Disposal Phase Final Supplemental Environmental Impact Statement*. Therefore, additional resources, including new facilities, could be required to augment existing waste management capabilities.

Transportation

The total cumulative worker dose from 100 years of radioactive materials shipments (general transportation, historical DOE shipments, and reasonably foreseeable actions as estimated in the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*) and shipments associated with the LANL SWEIS alternatives is estimated to be a maximum of 361,030 person-rem, which would be expected to result in 217 LCFs. The total cumulative dose to the general public was estimated to be a maximum of 340,130 person-rem, which would be expected to result in 204 excess LCFs. The total estimated traffic fatalities associated with accidents involving radioactive material and waste transports would be a maximum of 103.

LANL alternatives are expected to result in no more than 3 traffic fatalities over 10 years of operations and no worker or public cancer deaths (LCFs), and therefore would not contribute substantially to cumulative impacts. For perspective, in 2004, there were 522 traffic fatalities in New Mexico, 58 of which occurred in the three counties neighboring LANL (Los Alamos, Rio Arriba, and Santa Fe Counties).

Traffic could increase on county roads from increased development of both housing and light industry as a result of the conveyance and transfer of lands to Los Alamos County and the Department of the Interior in trust for the San Ildefonso Pueblo, increased truck shipments under the Expanded Operations Alternative, and projected increases in the LANL workforce under the Expanded Operations Alternative combined with the possibility that a modern pit facility might be located at LANL. Under this scenario, daily traffic could increase by up to 30 percent. Approximately 17 percent of the increase would be associated with increased vehicle trips under the Expanded Operations Alternative, and 13 percent would be due to operation of a modern pit facility.

Development of land transferred under the *Land Conveyance and Transfer EIS* could result in an increase in traffic in the vicinity of the airport and TA-21, based on current Los Alamos County plans to develop light industry on these tracts. This action, combined with the increased traffic associated with DD&D activities at TA-21, could cause excessive traffic loads on NM 502.

S.9.3 Summaries of Potential Consequences from Project-specific Analyses

This SWEIS contains evaluations of the environmental impacts of projects proposed for implementation under the Expanded Operations Alternative. They include projects to replace or refurbish existing structures and their related capabilities, DD&D of old structures and remediation of environmental contamination, modifications to site infrastructure, and expansion of site capabilities. This section summarizes the potential impacts of implementing each of the proposed projects.

The sliding-scale approach is used in this SWEIS for evaluating environmental consequences. This approach implements the Council on Environmental Quality instruction to "focus on significant environmental issues" (40 CFR 1502.1) and discuss impacts "in proportion to their significance" (40 CFR 1502.2[b]). For some of the project-specific analyses it was determined that there would be no or only minor impacts for some resource areas. Consequently, these resource areas are not analyzed in detail. In the following tables, these resource areas are identified as having "no or negligible impacts."

General temporary construction-related impacts would be expected to occur for most of the projects summarized in this section during construction and DD&D activities. After project completion, these impacts would cease and the area would return to normal. These impacts are described once in the following bullets and noted as "typical construction-related impacts," but not discussed in detail in the project summaries:

- Physical disturbances to areas under or in the vicinity of construction and DD&D projects would disrupt land use, affect the visual environment, and disturb the soils and geology, the latter primarily from excavation activities.

- Water resources, primarily surface water quality, could be temporarily affected by runoff from construction and DD&D sites. Best management practices would be required and would mitigate most of these impacts.

- Air quality impacts would be increased by emissions of criteria air pollutants, primarily carbon monoxide and oxides of nitrogen from vehicles and heavy equipment and particulate matter from soil disturbance.

- Noise levels could rise from the increased number of personal vehicles, trucks hauling materials and waste to and from construction sites, and heavy equipment involved in the activities. Most noise would be localized, but if a project were near a LANL site boundary, offsite populations could be disturbed.

- Loss of habitat from land disturbance and increased noise and light are potential adverse ecological impacts from construction and DD&D activities. Impacts could be minimized by not working during nesting seasons for sensitive species, using special lighting, protecting areas of concern, and working only during certain times of the day or year.

- Construction workers would be subject to accidents typical of any construction site. Adverse effects could range from relatively minor (such as lung irritation, cuts, or sprains) to major (such as lung damage, broken bones, or fatalities). To prevent serious exposures and injuries, all site construction contractors would be required to submit and adhere to a Construction Safety and Health Plan and undergo site-specific hazard training. Appropriate personal protection measures would be a routine part of construction activities, such as use of personal protection equipment such as coveralls, respirators, gloves, hard hats, steel-toed boots, eye shields, and ear plugs or covers. Workers would also be protected by other engineered and administrative controls.

- Increased consumption of fuels, water, and electricity would occur during construction and DD&D.

Summary of Impacts for the Center for Weapons Physics Research Project

The Center for Weapons Physics Research would be a complex of four buildings in TA-3 with approximately 350,000 square feet (32,500 square meters) of floor space, approximately 30 percent of which would be laboratory space (primarily laser). This facility would be available to consolidate staff currently located in TA-3 and other LANL locations in newer, more efficient and modern space. A number of structures would need to be demolished to make room for the Center for Weapons Physics Research, and a number of buildings vacated by staff moving to the new facility would also undergo DD&D. A building potentially eligible for listing on the National Register of Historic Places could be impacted, as well as the Administration Building which has been determined to be eligible. Proposed activities would require documentation to resolve adverse effects. Only minor impacts would be expected from construction and operation of this facility. There would be some improvement in the overall appearance of areas in which aging buildings and temporary structures would be demolished. **Table S–6** summarizes the potential impacts of implementing this project.

Table S–6 Summary of Impacts for the Center for Weapons Physics Research Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impacts. *Visual Environment* – Demolition of vacated structures would improve the overall appearance of TA-3, TA-35, and TA-53.
Geology and Soils	Temporary construction- and DD&D-related impacts. Approximately 499,000 cubic yards of rock and soil would be disturbed during construction.
Water Resources	No or negligible impacts.
Air Quality and Noise	*Air Quality* – Temporary construction- and DD&D-related impacts. Little or no change in emissions from operations. *Noise* – Temporary construction- and DD&D-related impacts.
Ecological Resources	No or negligible impacts.
Human Health	Temporary construction-related impacts and accident potential for workers. Potential worker exposure to radiological contamination and asbestos during DD&D. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. Positive impact on relocated staff from improved working conditions.
Cultural Resources	Possible impact on building potentially eligible for listing on the National Register of Historic Places and the Administration Building, which has been determined to be eligible. Proposed activities would require documentation to resolve adverse effects.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Only negligible impact on LANL utility capacity, requirements would be similar to or less than the facilities being replaced.
Waste Management	*Construction* – 1,600 cubic yards of construction debris. *DD&D* – 17,000 cubic yards low-level radioactive waste; 187,000 cubic yards solid waste including demolition debris; and 313,000 pounds of chemical waste.
Transportation	Transportation of construction materials and wastes and demolition wastes (some radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impacts.
Facility Accidents	No or negligible impacts.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359.

Summary of Impacts for the Replacement Office Buildings Project

The TA-3 Replacement Office Buildings would consolidate staff and activities currently located in temporary or aging permanent buildings into more efficient and safer structures. The complex would include the construction of 11 two-story buildings, 1 three-story building, and related parking structures. The Wellness Center and a warehouse would be demolished to accommodate this project.

There would be no major environmental impacts from construction, operation, and DD&D of existing buildings for the Replacement Office Buildings Project. Most construction would be in a developed portion of TA-3, however, a portion of the project area would require use of about 13 acres (5.3 hectares) of currently undeveloped land. Protection of cultural resources and potential accommodation for the Mexican spotted owl during construction could be required. **Table S–7** summarizes the potential impacts of implementing this project.

Table S–7 Summary of Impacts for the Replacement Office Buildings Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – Consistent with future land use plans; about 13 acres of undeveloped land would be disturbed. *Visual Environment* – New buildings and parking lot would be visible from West Jemez Road and Pajarito Road.
Geology and Soils	Temporary construction-and DD&D-related impacts. Approximately 369,000 cubic yards of rock and soil would be disturbed during construction.
Water Resources	Temporary construction- and DD&D-related impacts.
Air Quality and Noise	*Air Quality* – Temporary construction-and DD&D-related impacts. No change in emissions from operations. *Noise* – Temporary construction- and DD&D-related impacts.
Ecological Resources	Temporary construction-related impacts; loss of 13 acres of habitat.
Human Health	Temporary construction- and DD&D-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment.
Cultural Resources	Possible impact on an historic trail potentially eligible for listing on the National Register of Historic Places. Proposed activities could require documentation to resolve adverse effects.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Only negligible impact on LANL utility capacity, requirement would be similar to or less than the facilities being replaced.
Waste Management	*Construction* – 1,800 cubic yards of construction waste. *DD&D* –31 cubic yards low-level radioactive waste and 6,900 cubic yards demolition debris.
Transportation	No or negligible impacts.
Environmental Justice	No or negligible impacts.
Facility Accidents	No or negligible impacts.

DD&D = decontamination, decommissioning, and demolition.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; acres to hectares, multiply by 0.40469.

Summary of Impacts for the Radiological Sciences Institute Project, Including Phase I – the Institute for Nuclear Nonproliferation Science and Technology

The proposed project would involve the DD&D of 52 obsolete structures scattered over 6 TAs, and the construction of the Radiological Sciences Institute in TA-48, which would include as many as 13 new facilities. Phase I would include construction of five buildings associated with the Institute for Nuclear Nonproliferation Science and Technology. This facility would include Security Category I and II laboratories and vaults, other laboratory space, a secure radiochemistry laboratory, and associated offices and support facilities.

DD&D activities and transportation would result in the largest potential impacts. DD&D activities are expected to generate large quantities of debris, including some radioactively-contaminated debris. With the exception of low-level radioactive waste, most DD&D waste would be transported to appropriate offsite facilities. Transportation impacts would include the temporary disruption of traffic on Pajarito Road during construction, increased local traffic during operations, and the movement of large amounts of DD&D waste. **Table S–8** summarizes the potential impacts of implementing this project.

Table S–8 Summary of Impacts for the Radiological Sciences Institute Project, Including Phase I – the Institute for Nuclear Nonproliferation Science and Technology

Resource Area	*Impact Summary*
Land Resources	*Land Use* – Some currently designated Reserve and Experimental Science areas would be redesignated in the future as Nuclear Materials Research and Development; 12.6 acres of undeveloped land would be disturbed. *Visual Environment* – Minor impact from new development in TA-48 to west of existing buildings.
Geology and Soils	Temporary construction-related impacts. Approximately 802,000 cubic yards of rock and soil would be disturbed during construction. Excavation of welded tuff could necessitate blasting. Negligible impacts anticipated from DD&D activities.
Water Resources	Temporary construction-related impacts. DD&D of older contaminated structures could reduce potential for future surface water and groundwater contamination.
Air Quality and Noise	*Air Quality* – Temporary construction- and DD&D-related nonradiological impacts and potential for release of radionuclides in contaminated soils in vicinity of proposed building location. Little or no change in emissions from operations. *Noise* – Temporary construction- and DD&D-related impacts could include blasting.
Ecological Resources	Temporary construction-related impacts. Loss of 12.6 acres of habitat.
Human Health	Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. No additional LCFs in general population or to the MEI from radiological doses from facility construction or operation and associated DD&D.
Cultural Resources	Possible impact on two archaeological sites determined to be eligible for the National Register of Historic Places and on potentially eligible historic buildings, including the Radiochemistry Building. Documentation to resolve adverse effects on the archaeological sites would be required before beginning construction of the Radiological Sciences Institute and could be required before demolition of any of the potentially important historic structures.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Only negligible impact on LANL utility capacity, requirements would be similar to or less than the facilities being replaced.
Waste Management	*Construction* – 2,800 cubic yards of construction debris and associated solid waste. *DD&D* – 1,100 cubic yards transuranic waste; 93,000 cubic yards low-level radioactive waste; 1,000 cubic yards mixed low-level radioactive waste; and 74,000 cubic yards demolition debris and 1,304,000 pounds of chemical waste.
Transportation	Transportation of construction materials and wastes, and demolition wastes (some of which would be radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impacts.
Facility Accidents	Postulated facility accident with the highest impacts would result in an LCF risk of 1 in 12,000 for a noninvolved worker and 1 in 77,000 for the MEI; there would be no excess LCFs expected in the exposed population.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality; MEI = maximally exposed individual.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359; acres to hectares, multiply by 0.40469.

Summary of Impacts for Radioactive Liquid Waste Treatment Facility Upgrade Project

This project has been proposed to improve the operation and reliability of the RLWTF in TA-50. Three options have been proposed to upgrade the facility, each involving DD&D of part of the existing facility. Under Option 1, a new treatment building for liquid low-level radioactive and transuranic waste would be constructed west of the existing facility in a parking area, and the East Annex would be demolished. Under Option 2, two new treatment buildings (one for low-level radioactive liquid waste and one for transuranic liquid waste) would be constructed, one to the west and one to the north of the existing facility. The East Annex, the North Annex, and a

transformer located on the north side of the existing facility would be demolished to accommodate the new construction. Option 3 is identical to Option 2, except that the existing facility would be renovated for reuse; the most DD&D would be required under this option. An auxiliary action of installing a pipeline and constructing evaporation basins to treat effluent could occur with any of the options.

Potential impacts from each of the options would be similar. Demolition of the East Annex and the transuranic influent storage tanks would likely produce considerable low-level radioactive waste and some transuranic waste. There is also the potential to release radioactive or other hazardous constituents from contaminated soils and contaminated structural materials, but proper procedures would be followed to minimize their release. **Table S–9** summarizes the potential impacts of implementing this project. Implementing the auxiliary action to construct evaporation basins would result in a change in the land use category and the permanent loss of habitat of about 4 acres (1.6 hectares) of currently undeveloped land. Use of the evaporation basins would improve surface water quality by eliminating a discharge that has the potential to contribute to the movement of existing environmental contamination.

Table S–9 Summary of Impacts for the Radioactive Liquid Waste Treatment Facility Upgrade Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – If the option to construct evaporation basins were implemented, the land use designation of about 4 acres of land for the area of the basins would change from Reserve to Waste Management. *Visual Environment* – The new treatment buildings would not result in a change to the overall visual character of the area within TA-50, but the area proposed for construction of the evaporation basins is currently undeveloped and wooded and the change would be noticeable from areas west of LANL.
Geology and Soils	Temporary construction- and DD&D-related impacts. Permanent removal of contaminated soil to accommodate new facilities. Up to 174,000 cubic yards of rock and soil could be disturbed, assuming construction of the evaporation basins.
Water Resources	Potential positive impact on effluent water quality and quantity due to more stringent discharge requirements and improved processing.
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. Potential for increased radioactive emissions during DD&D. Minimal impact expected from operation. *Noise* –Minor construction equipment and traffic noise impact to workers.
Ecological Resources	Temporary construction- and DD&D-related impacts. Loss of about 4 acres of habitat if evaporation basins are built, and potential reduction in availability of prey for the Mexican spotted owl, requiring Section 7 consultation with the U.S. Fish and Wildlife Service.
Human Health	Temporary construction-related impacts and accident potential for workers. Potential worker exposure to radiological contamination during DD&D. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. During operations, worker health and safety would be improved because of improved reliability and design and less maintenance on new systems. Emissions do not have a distinguishable effect on the projected dose to the public.
Cultural Resources	Possible impact on several historic buildings, including the RLWTF, potentially eligible for listing on the National Register of Historic Places. Proposed activities could require documentation or excavation to resolve adverse effects.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Utility requirements are expected to increase but to stay within LANL utility capacity.
Waste Management	*Construction* – 620 cubic yards of construction debris. *DD&D* – 300 cubic yards of transuranic waste; 11,400 cubic yards of low-level radioactive waste; 220 cubic yards mixed low-level radioactive waste; 1,800 cubic yards of demolition debris; and 212,000 pounds of chemical waste.
Transportation	Temporary disruption of local traffic during construction and DD&D. Transportation of construction materials and wastes and demolition wastes (some of which would be radioactive) would not be expected to result in any fatalities or excess LCFs.

Resource Area	Impact Summary
Environmental Justice	No or negligible impacts.
Facility Accidents	No or negligible impacts.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; RLWTF = Radioactive Liquid Waste Treatment Facility; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359; acres to hectares, multiply by 0.40469.

Summary of Impacts for Los Alamos Neutron Science Center Refurbishment Project

The LANSCE Refurbishment Project would include renovations and improvements to the existing facility in TA-53 to increase its reliability and extend its operating life. Impacts from implementation would be minimal. There would potentially be minimal indirect effects on utility usage and air emissions from increased usage of the facilities after the project was complete. **Table S–10** summarizes the potential impacts of LANSCE Refurbishment Project activities.

Table S–10 Summary of Impacts for the LANSCE Refurbishment Project

Resource Area	Impact Summary
Land Resources	*Land Use* – No or negligible impacts. *Visual Environment* – No or negligible impacts.
Geology and Soils	No or negligible impacts.
Water Resources	Project implementation would result in a small increase in nonradiological cooling water discharge from increased facility usage.
Air Quality and Noise	*Air Quality* – Negligible to minor impacts during refurbishment. Operations would result in increased nonradiological air emissions from increased facility usage. *Noise* – Potential temporary increase in onsite noise levels during refurbishment.
Ecological Resources	No or negligible impacts.
Human Health	Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and use of personal protective equipment. Operations impacts may increase as a result of increased accelerator usage. However, the maximum dose to the MEI as a result of emissions would be limited to 7.5 millirem per year.
Cultural Resources	Possible impact on several historic buildings potentially eligible for listing on the National Register of Historic Places and the LANSCE Accelerator Building, which has been determined to be eligible. Documentation to resolve adverse effects would be required before making modifications to the accelerator building and could be required before modifications or demolition of any of the other potentially important historic structures.
Socioeconomics and Infrastructure	*Socioeconomics* – No impacts identified. *Infrastructure* – Negligible utility requirements during refurbishment. Project implementation could result in increased utility demands from increased facility usage. Peak load demand could approach current capacity but ongoing improvements to LANL's electric power infrastructure should alleviate this concern.
Waste Management	Small quantities of low-level radioactive waste, mixed low-level radioactive waste, chemical waste, and nonhazardous solid waste would be generated during refurbishment.
Transportation	No or negligible impacts.
Environmental Justice	No or negligible impacts.
Facility Accidents	No or negligible impacts.

MEI = maximally exposed individual, LANSCE = Los Alamos Neutron Science Center.

Summary of Impacts for the Radiography Facility Project

The proposed Radiography Facility would be constructed at TA-55 to eliminate the need for transporting nuclear items to different locations in LANL during the examination process. The three options for the new facility are to construct a new building within TA-55, build an addition to Building 55-41, or renovate Building 55-41 to fit the needs of the new facility. All three options would include some DD&D of existing structures. Minor impacts from construction and DD&D would be expected from each option. One of the buildings that could be affected by this project is potentially eligible for listing on the National Register of Historic Places, and would be protected as appropriate. Demolition or building modification could require documentation to resolve adverse effects. Radiography operations would use engineering and administrative controls to ensure workers would not be exposed to high radiation fields. Implementation of the project would reduce the number of onsite trips for nuclear components, resulting in fewer road closures and improved traffic flow. **Table S–11** summarizes the potential impacts for the proposed option.

Table S–11 Summary of Impacts for the TA-55 Radiography Facility Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impacts. *Visual Environment* – No or negligible impacts.
Geology and Soils	Temporary construction-related impacts. Up to 8,500 cubic yards of soil and rock would be disturbed.
Water Resources	No or negligible impacts.
Air Quality and Noise	*Air Quality* – Temporary construction- and DD&D-related impacts. *Noise* – Temporary construction- and DD&D-related impacts.
Ecological Resources	No or negligible impacts.
Human Health	*Construction and DD&D* – Temporary construction-related impacts and accident potential for workers. Potential worker exposure to radiological contamination during DD&D. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. *Operations* – Operations would involve high radiation fields. Worker health would be protected by facility design, radiation control procedures, and personal protective equipment.
Cultural Resources	Possible impact on Nuclear Materials Storage Building, which is potentially eligible for listing on National Register of Historic Places. Demolition or building modification could require documentation to resolve adverse effects.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Only negligible impact on LANL utility capacity.
Waste Management	*Construction and DD&D* – About 8,000 cubic yards of solid waste would be generated during demolition of Building 55-41 and construction of the new building.
Transportation	Implementation of project would reduce onsite nuclear material transport.
Environmental Justice	No or negligible impacts.
Facility Accidents	Accident impacts are bounded by those analyzed for the TA-55 Plutonium Facility Complex.

DD&D = decontamination, decommissioning, and demolition, TA = technical area.
Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Summary of Impacts for Plutonium Facility Complex Refurbishment Project

The TA-55 Plutonium Facility Complex Refurbishment Project would upgrade the electrical, mechanical, safety, and other selected facility systems to improve overall reliability to ensure continued operations. The project would be implemented in phases as a series of subprojects. All work would be performed inside the existing TA-55 complex. Several subprojects could have positive impacts on the environment. These include replacement of the chiller, which

would result in fewer emissions of ozone-depleting substances; implementation of the Steam System Subproject, which would reduce emissions of criteria pollutants; several subprojects that would improve the safety basis of the complex; and improvement in stack mixing and emissions monitoring resulting from the implementation of the Stack Upgrade and Replacement Subproject. Implementation of the project would result in small amounts of radioactive and chemical waste that would be accommodated by the LANL waste management infrastructure. **Table S–12** summarizes the potential impacts from these activities.

Table S–12 Summary of Impacts for the Plutonium Facility Complex Refurbishment Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – Temporary construction-related impacts of previously disturbed areas. *Visual Environment* – No impacts identified.
Geology and Soils	Temporary construction-related impacts.
Water Resources	No impacts identified.
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. Potential reduction in air emissions from upgrades and installation of new equipment. *Noise* – Temporary construction-related impacts confined to LANL site in and near TA-55, except for potential very small increase in traffic noise.
Ecological Resources	No or negligible impacts.
Human Health	Temporary construction-related impacts and accident potential for workers. Potential worker exposure to radiological contamination during refurbishment activities. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment. No radiological risks to members of the public identified from construction or normal operations.
Cultural Resources	No or negligible impacts.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Only negligible impact on LANL utility capacity.
Waste Management	*Construction and DD&D* – 340 cubic yards transuranic waste; 1,300 cubic yards low-level radioactive waste; 220 cubic yards mixed low-level radioactive waste; 2,700 cubic yards demolition debris; and 2,000 pounds chemical waste.
Transportation	Transportation of construction materials and wastes and demolition wastes (some of which would be radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impacts.
Facility Accidents	A number of the higher priority subprojects involve upgrades that would substantially improve the safety basis of the Plutonium Facility Complex.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.4536.

Summary of Impacts for the Science Complex Project

The proposed Science Complex, a state-of-the-art multidisciplinary facility used for light laboratory and offices, would consist of two buildings and one supporting parking structure. The Science Complex would be constructed at one of three proposed sites: in TA-62, west of the Research Park area; in the Research Park in the northwest portion TA-3; or in the southeast portion of TA-3.

Construction of the Science Complex at the TA-62 site or the Research Park site would disturb about 5 acres (2 hectares) of undeveloped land. Each of the locations would require some modification of site infrastructure such as extending natural gas pipelines. The Research Park option would likely require rerouting of additional utilities currently located in or near the project area. **Table S–13** summarizes the potential impacts of Science Complex Project activities.

Table S–13 Summary of Impacts for the Science Complex Project

Resource Area	Impact Summary		
	Northwest TA-62 Option	***Research Park Option***	***South TA-3 Option***
Land Resources	*Land Use* – 5 acres of undeveloped land would be permanently disturbed; the land use plans for 15.6 acres would be changed. *Visual Environment* – Views from neighboring properties and roadways would be altered by construction of the proposed structures and from night lighting. Forested buffer between LANL and Los Alamos Canyon would be lost.	*Land Use* – Impacts similar to Northwest TA-62 Site. *Visual Environment* – Impacts similar to Northwest TA-62 Site.	*Land Use* – Negligible impacts identified. *Visual Environment* – No impacts identified.
Geology and Soils	Temporary construction-related impacts. Approximately 865,000 cubic yards of soil and rock would be disturbed.		
Water Resources	Temporary construction-related impacts.		
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. *Noise* – Temporary construction-related impacts. Minor increased noise levels from operation.		
Ecological Resources	Temporary construction-related impacts; loss of up to 5 acres of habitat.		
Human Health	Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment.		
Cultural Resources	Possible impact on two archaeological sites determined to be eligible for the National Register of Historic Places. Proposed activities would require documentation to resolve adverse effects.	No impacts identified.	No impacts identified.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Addition of a natural gas line and tie-in to sanitary sewage system would be required. Only negligible impact on LANL utility capacity.	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Would likely require rerouting of many utilities currently located on the site and extension of a sewer trunk line.	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Addition of a natural gas line and tie-in to sanitary sewage system would be required.
Waste Management	*Construction* – Approximately 3,300 cubic yards of construction debris would be generated.		
Transportation	Once complete, impacts would include an estimated 5,790 vehicle trips on the average weekday (2,895 vehicles entering and exiting in a 24-hour period).	Impacts similar to Northwest TA-62 Site.	Impacts would be greater than for the Northwest TA-62 Site due to location of site within the planned Security Perimeter Road and higher traffic flows on Diamond Drive relative to those on West Jemez Road. Construction traffic impacts would also be greater due to travel on Diamond Drive.
Environmental Justice	No or negligible impacts.		
Facility Accidents	Risk of an LCF for a Science Complex occupant from a CMR Building accident: 1 chance in 560,000 per year.	Risk of an LCF for a Science Complex occupant from a CMR Building accident: 1 chance in 240,000 per year.	Risk of an LCF for a Science Complex occupant from a CMR Building accident: 1 chance in 60,000 per year.

TA = technical area, LCF = latent cancer fatality, CMR = Chemistry and Metallurgy Research.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; acres to hectares, multiply by 0.40469.

Summary of Impacts for Remote Warehouse and Truck Inspection Station Project

The Remote Warehouse and Truck Inspection Station Project would relocate shipment receiving, warehousing, and distribution functions from TA-3 to a site in TA-72. In addition, the Truck Inspection Station would be relocated from its current location on the northwest corner of NM State Route 4 and East Jemez Road to the new location. Impacts resulting from this project would be minor, although the proposed facilities would be constructed in a relatively undeveloped area with desirable aesthetic qualities. Some screening of the proposed facilities would be possible using selective tree cutting and strategic placement of the facilities, but the view would be permanently altered to one that is typical of a more developed area. Nearby sensitive archaeological sites and National Historic Landmarks would be protected from construction and operation activities and increased visitation by installation of fencing around the perimeter of the Remote Warehouse and Truck Inspection Station. **Table S–14** summarizes the potential impacts for this project.

Table S–14 Summary of Impacts for the Remote Warehouse and Truck Inspection Station Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* –Land use designation would change from Reserve to Physical/Technical Support; 4 acres of undeveloped land would be disturbed**.** *Visual Environment* – Views would change from primarily natural landscape to include developed area. Lighting could be visible from Bandelier National Monument.
Geology and Soils	Temporary construction-related impacts. Approximately 90,000 cubic yards of soil and rock would be disturbed during construction.
Water Resources	Temporary construction-related impacts.
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. *Noise* – Temporary construction-related impacts. Possible noticeable noise along East Jemez Road during operations.
Ecological Resources	Temporary construction-related impacts; loss of 4 acres of habitat.
Human Health	Temporary construction-related impacts and accident potential for workers. Impacts would be mitigated through safe work practices, procedures, and personal protective equipment.
Cultural Resources	Possible impact on three nearby archaeological sites potentially eligible for listing on the National Register of Historic Places and two National Historic Landmarks. Proposed activities could require documentation to resolve adverse effects. Fencing around perimeter of project site would aid in protecting these sensitive sites.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Addition of a natural gas line and means of sanitary sewage treatment, conveyance, or disposal would be required. Only negligible impact on LANL utility capacity.
Waste Management	Approximately 610 cubic yards of construction debris would be generated.
Transportation	Changes to geometry of East Jemez Road. Potential reduction of traffic in and around TA-3.
Environmental Justice	No or negligible impacts.
Facility Accidents	No or negligible impacts.

TA = technical area.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; acres to hectares, multiply by 0.40469.

Summary of Impacts for TA-18 Closure Project, Including Remaining Operations Relocation, and Structure Decontamination, Decommissioning, and Demolition

This proposed project would relocate the Security Category III and IV capabilities and materials remaining in TA-18, and conduct DD&D of the buildings and structures at TA-18. The removal

of buildings and structures at TA-18 (Pajarito Site) would provide positive local visual impacts, as would the eventual return of the area to its natural state, which would blend with other undisturbed portions of LANL. Buildings of historic importance and other cultural sites are located in TA-18. These cultural resources would be protected during DD&D activities as required. **Table S–15** summarizes the potential impacts of these activities.

Table S–15 Summary of Impacts for the Technical Area 18 Closure Project, Including Remaining Operations Relocation and Structure Decontamination, Decommissioning, and Demolition

Resource Area	*Impact Summary*
Land Resources	*Land Use* – DD&D could result in an overall change in the land use designation from Nuclear Materials Research and Development to Reserve. *Visual Environment* – Potential positive impact from removal of old buildings.
Geology and Soils	Temporary DD&D-related impacts.
Water Resources	DD&D would remove facilities from a floodplain.
Air Quality and Noise	*Air Quality* – Temporary DD&D-related impacts. *Noise* – Temporary DD&D-related impacts.
Ecological Resources	Temporary DD&D-related impacts; restoration of the site could create a more natural habitat and benefit wildlife.
Human Health	The primary source of potential impacts on workers and members of the public would be associated with the release of radiological contaminants during DD&D. Potential impacts would be much less than during past operations and would be mitigated using confinement and filtration methods.
Cultural Resources	Three archaeological sites found at TA-18 (a rock shelter, a cavate complex, and the Ashley Pond cabin) have been determined to be eligible for listing on the National Register of Historic Places, and there are other eligible and potentially eligible buildings within the TA. Proposed activities would require documentation to resolve adverse effects, and these buildings would be protected during DD&D activities as required. The DD&D of other structures could have a positive impact on the appearance of the TA.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – No or negligible impacts.
Waste Management	Waste generated from the disposition of the buildings and structures is estimated to be 4,600 cubic yards of low-level radioactive waste; 5 cubic yards of mixed low-level radioactive waste; 17,000 cubic yards of demolition debris; and 90,000 pounds of chemical waste.
Transportation	Transportation of wastes would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impacts.
Facility Accidents	No or negligible impacts.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilometers, multiply by 0.45359.

Summary of Impacts for TA-21 Structure Decontamination, Decommissioning, and Demolition Project

All or a portion of the buildings and structures at TA-21 would undergo DD&D under this project. Two options are proposed: the Complete DD&D Option would result in the removal of essentially all structures within TA-21; the Compliance Support Option would result in removal of only those structures necessary to support remediation activities.

Onsite and offsite visual impacts would be improved with the removal of some or all of the buildings and structures at TA-21. DD&D activities would affect buildings and structures potentially eligible for listing on the National Register of Historic Places, so documentation to resolve adverse effects could be required. Implementation of this project at the same time that

TA-21 MDA remediation is underway would result in local traffic impacts along DP Road and in the Los Alamos townsite. **Table S–16** summarizes the potential impacts of these activities.

Table S–16 Summary of Impacts for the Technical Area 21 Structure Decontamination, Decommissioning, and Demolition Project

Resource Area	*Impact Summary*	
	Complete DD&D Option	***Compliance Support Option***
Land Resources	*Land Use* – The remainder of the western portion of the area would be available for conveyance to Los Alamos County. The eastern part of the TA would remain a part of LANL for the foreseeable future. *Visual Environment* – Temporary DD&D-related impacts. Long-term impacts would be positive with the removal of old industrial buildings.	*Land Use* – Currently unconveyed portions of TA-21 would remain under control of DOE. Land use designations would remain unchanged. *Visual Environment* – Temporary construction- and DD&D-related impacts. Over the long-term, the view of the TA from State Route 502 and from higher elevations to the west would still include portions of the current mix of 50-year-old structures.
Geology and Soils	Temporary DD&D-related impacts.	Temporary DD&D-related impacts.
Water Resources	Improvement in overall water resources from discontinuing processes and associated water use and eliminating two outfalls.	Little or no impact on water resources.
Air Quality and Noise	*Air Quality* – Temporary DD&D impacts. Operational emissions would be relocated or cease. *Noise* – Temporary DD&D-related impacts.	*Air Quality* – Nonradioactive air pollutant emissions from the three natural gas-fired boilers in Building 21-0357 and the vehicle exhaust and emissions from activities in the maintenance facilities would remain. *Noise* – Temporary DD&D-related impacts.
Ecological Resources	Temporary DD&D-related impacts. Activities would occur in a portion of the Mexican spotted owl Area of Environmental Interest buffer zone.	
Human Health	East Gate MEI would receive 2×10^{-4} millirem over the life of the project.	
Cultural Resources	DD&D of buildings and structures at TA-21 would have direct effects on 15 NRHP-eligible historic buildings and structures (and 1 potentially eligible building) associated with the Manhattan Project and Cold War years at LANL.	
Socioeconomics and Infrastructure	*Socioeconomics* – Temporary modest increase in employment due to DD&D activities. *Infrastructure* – No or negligible impacts.	
Waste Management	DD&D would generate 1 cubic yard of transuranic waste; 35,000 cubic yards of low-level radioactive waste; 65 cubic yards mixed low-level waste; 48,000 cubic yards solid waste; and 440,000 pounds of chemical waste.	Approximately 60 percent less solid debris would be generated under this Option than the Complete DD&D Option.
Transportation	Transportation of construction materials and wastes and demolition wastes (some radioactive) would not be expected to result in any fatalities or excess LCFs. Local traffic impacts associated with DD&D activities would be exacerbated by MDA remediation occurring at the same time.	
Environmental Justice	No or negligible impacts.	
Facility Accidents	No or negligible impacts.	

TA = technical area; DD&D = decontamination, decommissioning, and demolition; MEI = maximally exposed individual; NRHP = National Register for Historic Places; LCF = latent cancer fatality; MDA = material disposal area.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359.

Summary of Impacts for Waste Management Facilities Transition Project

This project would DD&D certain aboveground facilities in TA-54, Areas G and L, to facilitate closure of those areas; construct additional waste management facilities; and remove waste stored underground in pits and shafts in Area G and prepare and ship this waste for disposal. New waste management facilities would include a retrieval facility to assist with removing high-activity remote-handled transuranic waste from certain shafts, new low-level radioactive waste

facilities in TA-54, and a new Transuranic Waste Consolidation Facility in TA-50 or TA-63 to store and process transuranic waste.

The waste storage domes in MDA G would be removed as part of this project. Their removal would have a beneficial impact on both near and distant views. Since these domes are visible from the lands of the Pueblo of San Ildefonso, their removal would improve the views from traditional cultural properties. Accommodations for the Mexican spotted owl and willow flycatcher during removal, construction, and DD&D activities could be required. Eventual removal of stored wastes in Area G would reduce the dose to the facility-specific MEI by eliminating the point source at the Decontamination and Volume Reduction System Facility; the location of the new Transuranic Waste Consolidation Facility would make the emission point further from the LANL site boundary. Worker doses could also eventually decrease after 2015, once these activities in Area G are completed. **Table S–17** summarizes the potential impacts of these activities.

Table S–17 Summary of Impacts for the Waste Management Facilities Transition Project

Resource Area	***Impact Summary***
Land Resources	*Land Use* – Temporary construction-related impacts. *Visual Environment* – Positive impact due to removal of the white-colored domes in TA-54.
Geology and Soils	Temporary construction- and DD&D-related impacts would occur in previously disturbed areas; impacts would be minor. Up to 169,000 cubic yards of soil and rock would be disturbed.
Water Resources	Minor impacts to surface water and groundwater. New facilities would use mitigative techniques to minimize impacts of spills.
Air Quality and Noise	*Air Quality* – Temporary construction impacts. Operational emissions would be mitigated using engineering controls, such as filtration systems, and monitored. Emissions from new facilities would not exceed those currently measured at the Decontamination and Volume Reduction System. Long-term point source and area emissions in Area G would decrease by the end of 2015. *Noise* – Temporary construction-related impacts.
Ecological Resources	Temporary construction-related impacts; activities could occur in portions of either the willow flycatcher or the Mexican spotted owl Area of Environmental Interest. Actions to avoid or mitigate impacts may be needed if species are found to be present near the work areas.
Human Health	Minimal radiological impacts to offsite population. Reduced impacts to MEI. Removal of transuranic waste would reduce area sources of radiological exposure in Area G, potentially decreasing worker exposures after 2015.
Cultural Resources	Removal of the white-colored domes would reduce visual impacts on nearby traditional cultural properties.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Infrastructure demands would not exceed current LANL site capabilities.
Waste Management	Construction waste would include 500 cubic yards of construction debris. DD&D waste would include 30,000 cubic yards of low-level radioactive waste; 8 cubic yards of mixed low-level radioactive waste; 54,000 cubic yards of solid waste including demolition debris; and 591,000 pounds of chemical waste.
Transportation	Transportation of construction materials and wastes and demolition wastes (some radioactive) would not be expected to result in any fatalities or excess LCFs.
Environmental Justice	No or negligible impacts.
Facility Accidents	Impacts of a release at the proposed Transuranic Waste Consolidation Facility or new transuranic waste storage buildings at TA-50 or TA-63 would be less than those that could occur at TA-54 from current operations.

TA = technical area; DD&D = decontamination, decommissioning, and demolition; MEI = maximally exposed individual; LCF = latent cancer fatality.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; pounds to kilograms, multiply by 0.45359.

Summary of Impacts for Major Material Disposal Area Remediation, Canyon Cleanups, and Other Consent Order Actions[6]

The environmental impacts that could result from implementation of the Consent Order depend on decisions yet to be made by the New Mexico Environment Department. To bound the range of possible consequences of implementing different corrective measures, two action options have been evaluated: (1) a Capping Option, in which specific MDAs are stabilized in-place and other potential release sites are remediated, and (2) a Removal Option, in which the waste and contamination within the MDAs are removed and other potential release sites are remediated. These options are for analytical purposes only and do not necessarily represent what NNSA would propose to the New Mexico Environment Department as corrective measures. Other smaller cleanup and remediation activities would also occur at LANL. The impacts of remediating other potential release sites would be small relative to those for MDA remediation and are assumed to be encompassed by the identified impacts.

The Removal Option would result in far greater near-term impacts than the Capping Option. Both options would involve major ground-disturbing activities that would require use of heavy equipment and hauling of materials and wastes. Temporary construction impacts such as increases in noise levels and emissions of criteria pollutants and particulate matter would be expected. Because these activities would be widespread and continue over a number of years, MDA remediation activities would have a larger impact than other proposed projects. Under the Removal Option, extremely large quantities of wastes would be generated, including low-level radioactive waste and transuranic waste. The estimated quantities of low-level radioactive waste and transuranic waste would exceed the disposal capacity currently planned for LANL and the current LANL WIPP allocation. Therefore, additional waste disposal capacity for both types of waste would have to be identified.

The Removal Option would result in over 100,000 shipments of radioactive and nonradioactive wastes potentially requiring transport to offsite disposal facilities. These shipments could lead to two to three traffic fatalities over a 10-year period from nonradiological (truck collision) accidents. Operational accidents postulated for the Removal Option could result in radiological or chemical exposures and risks to noninvolved workers, the MEI, and the population within a 50-mile (80-kilometer) radius. Although sulfur dioxide is not known to be present in MDA B, an accident was postulated in which a quantity of the gas is released. This postulated accident could result in concentrations of sulfur dioxide in excess of the *Emergency Response Planning Guideline* (ERPG-3) out to 111 feet (34 meters). The MDA B MEI distance is 148 feet (45 meters). The ERPG-2 distance would be approximately 270 feet (80 meters). **Table S–18** summarizes the potential impacts of these options.

[6] *NNSA is not legally obligated to include the Consent Order impact analysis, but for purposes of this SWEIS only, NNSA is including this information in support of collateral decisions that NNSA must make to facilitate Consent Order implementation.*

Table S–18 Summary of Impacts for Major Material Disposal Area Remediation, Canyon Cleanups, and Other Consent Order Actions

Resource Area	*Capping Option*	*Removal Option*
Land Resources	*Land Use* – Temporary commitment of land may be required to support remediation. Future use of the MDAs would remain restricted since capping would stabilize rather than remove existing contamination. *Visual Environment* – Temporary adverse impacts would result from capping activities. Borrow pit in TA-61 would become more visible.	*Land Use* – Temporary commitment of land may be required to support remediation. Decontamination would provide expanded opportunities for future utilization of some lands. *Visual Environment* – Temporary adverse impacts would result from removal activities. Borrow pit in TA-61 would become more visible.
Geology and Soils	Up to 2.5 million cubic yards of soil and rock would be required for capping; most material would be available from LANL sources. Covers for the MDAs would be contoured and provided with runon and runoff control measures. Contamination within the subsurface of the MDAs and in the immediate vicinities would be fixed in-place except for contaminated gases or vapors.	Up to 1.4 million cubic yards of soil and rock would be required for fill and cover material; most would be available from LANL sources. Complete removal of the MDAs would eliminate susceptibility of the buried materials to erosion or other geological processes. Existing soil contamination in the vicinity of the MDAs would be greatly reduced, and contaminated soil or gas would also be largely eliminated.
Water Resources	Few, if any impacts to surface water or groundwater from site investigations. Final MDA covers would minimize surface water run-on, runoff, and erosion, and could protect surface and groundwater resources.	Few, if any, impacts to surface or groundwater from site investigations. There would be much less contamination in soils and sediments that could present a risk to water quality.
Air Quality and Noise	*Air Quality* – Minor to moderate impacts from releases of airborne pollutants caused by heavy equipment used in remediation and trucks hauling materials. Increased potential for particulate matter release from TA-61 borrow pit. *Noise* – Minor to moderate increase in traffic noise associated with remediation.	*Air Quality* – Larger releases of airborne pollutants than Capping Option from additional vehicles and heavy equipment. Comparable particulate matter release. The potential for long-term release of volatile organic compounds from the MDAs would be greatly reduced, if not eliminated. *Noise* – Temporary increase in noise in vicinity of remediation. Minor to moderate increase in traffic noise associated with remediation.
Ecological Resources	Temporary localized, construction-type impacts during site investigations and remediation. Possible loss of habitat at the TA-61 borrow pit.	
Human Health	Radiological and nonradiological risks to workers would be minor. There would be no risk to the public during MDA capping, while future risks would be reduced.	Radiological and nonradiological risks to workers would be increased. There would be small risk to the public during MDA removal, while future risks would be greatly reduced.
Cultural Resources	No archaeological resources are located within any of the MDAs. Few or no risks to cultural resources at potential release sites. All work would be coordinated with LANL personnel responsible for preservation of cultural resources.	
Socioeconomics and Infrastructure	*Socioeconomics* – Marginal increases in employment, personal income, and other economic measures. *Infrastructure* – Marginal increases in utility usage.	*Socioeconomics* – Increases anticipated in employment, personal income, and other economic measures. *Infrastructure* – Increases in utility infrastructure demands.
Waste Management	280 cubic yards transuranic waste; 20,000 cubic yards low-level radioactive waste; 1,800 cubic yards mixed low-level radioactive waste; 47,000 cubic yards solid waste; and 50 million pounds chemical waste. Sufficient capacity would exist at LANL to dispose of the low-level radioactive waste.	22,000 cubic yards transuranic waste; 1,000,000 cubic yards low-level radioactive waste; 180,000 cubic yards of mixed low-level radioactive waste; 130,000 cubic yards of solid waste; and 97 million pounds of chemical waste. This volume of low-level radioactive waste would likely require use of some offsite disposal capacity.
Transportation	Increase in shipments of waste and bulk materials on onsite and offsite roads would not be expected to result in any LCFs among workers or the public from radiation exposure during waste transport, nor traffic fatalities from accidents.	Very large increase in shipments of waste and bulk materials on onsite and offsite roads would not be expected to result in any LCFs among workers or the public from radiation exposure during waste transport, but would have the potential to result in traffic fatalities.
Environmental Justice	No disproportionately high and adverse impacts on minority or low-income populations.	

Resource Area	Capping Option	Removal Option
Facility Accidents	Low risks of accidents involving radioactive or hazardous materials.	Postulated facility accident with the highest radiological impacts would result in an LCF risk of 1 in 210 for a noninvolved worker; 1 in 1,500 for the MEI; and 1 in 220 for the population within a 50-mile radius. Postulated facility accident with the highest chemical impacts would result in concentrations of sulfur dioxide exceeding ERPG-3 out to 111 feet; ERPG-2 out to 270 feet.

MDA = material disposal area, TA = technical area, LCF = latent cancer fatality, MEI = maximally exposed individual, ERPG = Emergency Response Planning Guideline.
Note: To convert feet to meters, multiply by 0.3048; pounds to kilograms, multiply by 0.45359; cubic yards to cubic meters, multiply by 0.76456.

Summary of Impacts for Security-Driven Transportation Modifications Project

This proposed project would restrict, according to the security level, privately-owned vehicles along portions of the Pajarito Corridor West between TA-48 and TA-63. The project would involve constructing new roadways, parking lots, pedestrian and vehicle bridges, and security check points. Auxiliary actions are also considered that would construct bridges across Mortandad and Sandia Canyons. **Table S–19** summarizes the potential impacts of these activities.

The most consequential impacts from implementing this project would be on the visual environment and the Mexican spotted owl. The removal of open and forested land under the Proposed Action would add to the overall developed appearance of the Pajarito Corridor West as viewed from nearby and higher elevations to the west. The construction of both vehicle and pedestrian bridges across Ten Site Canyon under the Proposed Project, and Mortandad and Sandia Canyons under the auxiliary actions, would be major changes to the landscape. While careful site selection and bridge design would help mitigate visual impacts, the bridges would nevertheless alter the natural appearance of the canyons as viewed from both nearby and distant locations. The potential exists for the proposed bridges to adversely affect views of the three canyons from nearby traditional cultural properties. Bridges constructed across Mortandad and Sandia Canyons would pass through Areas of Environmental Interest for the Mexican spotted owl, and the light and noise from traffic could create adverse effects. Thus, this project has the potential to adversely impact the Mexican spotted owl and consultation with the U.S. Fish and Wildlife Service may be required.

Summary of Impacts for Nicholas C. Metropolis Center for Modeling and Simulation Increase in Level of Operations

This project would expand the computing capabilities of the Metropolis Center to support, at a minimum, a 100-teraops capability, and could approach 200 teraops. This action would consist of the addition of mechanical and electrical equipment, including chillers, cooling towers, and air-conditioning units. **Table S–20** summarizes the potential impacts of these activities.

Table S–19 Summary of Impacts for the Security-Driven Transportation Modifications Project

Resource Area	Impact Summary	
	Proposed Project	***Auxiliary Actions***
Land Resources	*Land Use* – Development of portions of the Pajarito Corridor West would be within current land use plans. *Visual Environment* – Temporary construction impacts. Permanent pronounced changes to views from parking lots and pedestrian and vehicle bridges across Ten Site Canyon.	*Land Use* – The route for Auxiliary Action A would represent a change in land use but would be within the scope of the LANL Comprehensive Site Plan. The route for Auxiliary Action B would be partially within current land use plans. *Visual Environment* – Permanent pronounced changes to views from proposed bridges over Mortandad and Sandia Canyons.
Geology and Soils	Temporary construction-related impacts. Approximately 238,000 cubic yards of soil and rock would be disturbed during construction. Up to 26,000 cubic yards of soil and rock would be disturbed in both auxiliary actions are implemented.	
Water Resources	Temporary construction-related impacts.	
Air Quality and Noise	*Air Quality* – Temporary construction-related impacts. Minor increase in vehicle emissions during operation. *Noise* – Temporary construction-related impacts. Minor increase in traffic noise in vicinity of new roads and bus routes during operation.	*Air Quality* – Temporary construction-related impacts. Minor increase in vehicle emissions during operation. *Noise* – Temporary construction-related impacts. Minor increase in traffic noise in vicinity of new roads and bus routes during operation.
Ecological Resources	Temporary construction-related impacts. Up to 30 acres of habitat loss from parking lot and bridge construction. Proposed construction falls within Areas of Environmental Interest buffer zone for the Mexican spotted owl.	Temporary construction-related impacts. Proposed Auxiliary Action A construction falls within Areas of Environmental Interest core and buffer zones for the Mexican spotted owl. Proposed Auxiliary Action B construction falls within Areas of Environmental Interest buffer zones for the Mexican spotted owl, and would remove 1.3 acres of habitat. Potential adverse impact on owls from traffic noise and light.
Human Health	No or negligible impacts.	
Cultural Resources	Proposed bridges could adversely affect views of Ten Site Canyon from nearby traditional cultural properties.	Further detailed analysis would be required once the exact bridge locations are determined to ensure protection of prehistoric and historic sites located to the east and west of the proposed bridge corridor. Proposed bridges could adversely affect views of Mortandad and Sandia Canyons from nearby traditional cultural properties.
Socioeconomics and Infrastructure	*Socioeconomics* – No impacts identified. *Infrastructure* – Temporary construction-related impacts. Some existing utilities might require relocation or rerouting.	
Waste Management	Approximately 1,206 cubic yards of construction debris.	Approximately 160 cubic yards under Auxiliary Action A, and 110 cubic yards under Auxiliary Action B, of construction debris.
Transportation	Some temporary and intermittent disruption of traffic during construction of new roads and bridges. Traffic patterns would be permanently altered, but impacts would be minor.	
Environmental Justice	No or negligible impacts.	

Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Table S–20 Summary of Impacts for Nicholas C. Metropolis Center for Modeling and Simulation Increase in Level of Operations

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impacts. *Visual Environment* – No or negligible impacts.
Geology and Soils	No or negligible impacts.
Water Resources	Discussed in infrastructure.
Air Quality and Noise	No or negligible impacts.
Ecological Resources	No or negligible impacts.
Human Health	No or negligible impacts.
Cultural Resources	No or negligible impacts.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – Water usage would expand to 51 million gallons per year, which would not exceed available water supply capacities. Electrical demand would increase to 15 megawatts, which would not exceed available electrical supply capacities.
Waste Management	No or negligible impacts.
Transportation	No or negligible impacts.
Environmental Justice	No or negligible impacts.
Facility Accidents	No or negligible impacts.

Note: To convert gallons to liters, multiply by 3.785.

The level to which operations could increase would be limited by the amount of electricity (15 megawatts) and water (51 million gallons [193 million liters] per year) needed to support the increased capabilities. Because each new generation of computing capability machinery continues to be designed with increased computational speed and enhanced efficiency in cooling water and electrical requirements, it is anticipated that higher computing capabilities could be achieved within these limitations. Should the Sanitary Effluent Recycling Facility become operational and effective in supplying the Metropolis Center with cooling water, less water would be required from LANL's water supply system.

Summary of Impacts for Increase in Type and Quantity of Sealed Sources Managed at LANL by the Off-Site Source Recovery Project

This proposed project would allow for expansion of the types and quantities of sealed sources that could be managed at LANL by the Off-Site Source Recovery Project. The only impacts resulting from these activities would result from exposure to the radioactive sources during normal operations and postulated accidents. Under normal conditions, the sealed sources would be completely contained and would contribute only to direct radiation exposure. Proper shielding and radiation control procedures would minimize worker exposure. Noninvolved workers and the public would not be expected to receive any measurable dose during normal operations.

For purposes of analysis, potential bounding accident scenarios were assessed for an aircraft crash with fire at Area G at TA-54, and a seismic event with fire at Wing 9 of the Chemistry and Metallurgy Research Building. Consequences of the Wing 9 event were also calculated for a release emanating from TA-48 because the Radiological Sciences Institute that would be built in TA-48 would provide a replacement for the Chemistry and Metallurgy Research Building Wing 9 hot cell. None of these accidents would result in a fatal dose to the noninvolved worker, the MEI, or the population within a 50-mile (80-kilometer) radius. The highest LCF risk to the population would result from the Wing 9 of the Chemistry and Metallurgy Research Building

accident with consequences calculated at TA-3. This postulated accident could result in an increase in LCF risk of approximately 1 chance in 6 million for the noninvolved worker, 1 chance in 70 million for the MEI, and 1 chance in 600 for the population within a 50-mile (80-kilometer) radius.

Potential mitigation measures could include placing sealed sources at locations where they would not be susceptible to damage from an aircraft crash, fire, or seismic event (kept underground); or instituting lower limits for maximum allowable source radioisotope activity in shipping containers, the TA-54 dome, and Wing 9 of the Chemistry and Metallurgy Research Building. **Table S–21** summarizes the potential impacts from increasing the scope of the Off-Site Source Recovery Project at LANL.

Table S–21 Summary of Impacts for Increase in Type and Quantity of Sealed Sources Managed at Los Alamos National Laboratory by the Off-Site Source Recovery Project

Resource Area	*Impact Summary*
Land Resources	*Land Use* – No or negligible impacts. *Visual Environment* – No or negligible impacts.
Geology and Soils	No or negligible impacts.
Water Resources	No or negligible impacts.
Air Quality and Noise	*Air Quality* – No or negligible impacts. *Noise* – Temporary construction-related impacts from construction and burial activities.
Ecological Resources	No or negligible impacts.
Human Health	Involved worker doses would be maintained below their regulatory and administrative limits through use of shielding, safe work practices, procedures, and personal protective equipment. Noninvolved workers and the public would not be expected to receive any measurable doses during normal operations.
Cultural Resources	No or negligible impacts.
Socioeconomics and Infrastructure	*Socioeconomics* – No or negligible impacts. *Infrastructure* – No impacts identified.
Waste Management	No or negligible impacts.
Transportation	No or negligible impacts.
Environmental Justice	No or negligible impacts.
Facility Accidents	Postulated accidents could result in an increase in LCF risk to the noninvolved worker, the MEI, and population within 50-mile radius. Highest LCF risk to population would be from a CMR Building Wing 9 accident.

LCF = latent cancer fatality, MEI = maximally exposed individual, CMR = Chemistry and Metallurgy Research.
Note: To convert miles to kilometers, multiply by 1.6093.

S.10 Glossary

actinide—Any member of the group of elements with atomic numbers from 89 (actinium) to 103 (lawrencium) including uranium and plutonium. All members of this group are radioactive.

activation products—Nuclei, usually radioactive, formed by the bombardment and absorption in material with neutrons, protons, or other nuclear particles.

ambient—Surrounding.

archaeological sites (resources)—Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

as low as is reasonably achievable (ALARA)—An approach to radiation protection to manage and control worker and public exposures (both individual and collective) and releases of radioactive material to the environment to as far below applicable limits as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit but a process for minimizing doses to as far below limits as is practicable.

Best Management Practices—Structural, nonstructural, and managerial techniques, other than effluent limitations, to prevent or reduce pollution of surface water. They are the most effective and practical means to control pollutants that are compatible with the productive use of the resource to which they are applied. Best Management Practices are used in both urban and agricultural areas. Best Management Practices can include schedules of activities; prohibitions of practices; maintenance procedures; treatment requirements; operating procedures; and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

borrow—Excavated material that has been taken from one area to be used as raw material or fill at another location.

carbon monoxide—A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion.

carcinogen—An agent that may cause cancer. Ionizing radiation is a physical carcinogen; there are also chemical and biological carcinogens, and biological carcinogens may be external (such as viruses) or internal (such as genetic defects).

Clean Air Act—This Act mandates and provides for enforcement of regulations to control air pollution from various sources.

Clean Water Act of 1972, 1987—This Act regulates the discharge of pollutants from a point source into navigable waters of the United States in compliance with a National Pollutant Discharge Elimination System permit, and regulates discharges to or dredging of wetlands.

***Code of Federal Regulations* (CFR)**—All Federal regulations in effect are published in codified form in the CFR. References to the CFR usually take the form of XX CFR YY, where XX refers to Title (major division) and YY refers to Part (section).

collective dose—The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem or person-sievert.

criteria pollutants—An air pollutant that is regulated by National Ambient Air Quality Standards. The U.S. Environmental Protection Agency must describe the characteristics and potential health and welfare effects that form the basis for setting, or revising, the standard for each regulated pollutant. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter, less than or equal to 10 micrometers (0.0004 inch) in diameter, and less than or equal to 2.5 micrometers (0.0001 inch) in diameter. New pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available. (See National Ambient Air Quality Standards.)

cultural resources— Archaeological materials (artifacts) and sites that date to the prehistoric, historic, and ethnohistoric periods and that are currently located on the ground surface or buried beneath it; standing structures and/or their component parts that are over 50 years of age and are important because they represent a major historical theme or era, including the Manhattan Project and the Cold War era and structures that have an important technological, architectural, or local significance; cultural and natural places, select natural resources, and sacred objects that have importance for American Indians; American folklife traditions and arts; "historic properties" as defined in the National Historic Preservation Act; "archaeological resource" as defined in the Archaeological Resources Protection Act; and "cultural items" as defined in the Native American Graves Protection and Repatriation Act.

cumulative impacts—The impacts on the environment that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person who undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

curie—A unit of radioactivity equal to 37 billion disintegrations per second (37 billion becquerels); also a quantity of any radionuclide or mixture of radionuclides having 1 curie of radioactivity.

decommissioning—Retirement of a facility, including any necessary decontamination and dismantlement.

decontamination—The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination, from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

decontamination, decommissioning, and demolition (DD&D) – actions taken at the end of the useful life of a building or structure to reduce or remove substances that pose a substantial hazard to human health or the environment, retire it from service, and ultimately eliminate all or a portion of the structure.

dose (radiological)—A generic term meaning absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or committed equivalent dose, as defined elsewhere in this glossary. It is a measure of the energy imparted to matter by ionizing radiation. The unit of dose is the rem or rad.

emission—A material discharged into the atmosphere from a source operation or activity.

endangered species—Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR 424). The lists of endangered species can be found in 50 CFR 17.11 for wildlife, 50 CFR 17.12 for plants, and 50 CFR 222.23(a) for marine organisms. (See threatened species.)

environmental impact statement (EIS)—The detailed written statement required by the National Environmental Policy Act (NEPA) section 102(2)(C) for a proposed major Federal action significantly affecting the quality of the human environment. A U.S. Department of Energy (DOE) EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality National Environmental Policy Act regulations in 40 CFR 1500-1508 and DOE NEPA regulations in 10 CFR 1021. The statement includes, among other information, discussions of the environmental impacts of the Proposed Action and all reasonable alternatives, adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources.

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

fission products—Nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragments' radioactive decay.

floodplain—The lowlands and relatively flat areas adjoining inland and coastal waters and the flood prone areas of offshore islands. Floodplains include, at a minimum, that area with at least a 1.0 percent chance of being inundated by a flood in any given year.

The *base floodplain* is defined as the area that has a 1.0 percent or greater chance of being flooded in any given year. Such a flood is known as a 100-year flood.

The *critical action floodplain* is defined as the area that has at least a 0.2 percent chance of being flooded in any given year. Such a flood is known as a 500-year flood. Any activity for which even a slight chance of flooding would be too great (such as storage of highly volatile, toxic, or water-reactive materials) should not occur in the critical action floodplain.

The *probable maximum flood* is the hypothetical flood considered to be the most severe reasonably possible flood, based on the comprehensive hydrometeorological application of maximum precipitation and other hydrological factors favorable for maximum flood runoff (such as sequential storms and snowmelts). It is usually several times larger than the maximum recorded flood.

genetic effects—Inheritable changes (chiefly mutations) produced by exposure to ionizing radiation or other chemical or physical agents of the parts of cells that control biological reproduction and inheritance.

groundwater—Water below the ground surface in a zone of saturation.

hazardous chemical—Under 29 CFR 1910, Subpart Z, hazardous chemicals are defined as "any chemical which is a physical hazard or a health hazard." Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed employees. Hazardous chemicals include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

hazardous material—A material, including a hazardous substance, as defined by 49 CFR 171.8, that poses a risk to health, safety, and property when transported or handled.

hazardous waste—A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20-24 (ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.31-33.

historic structure—A building or other structure constructed after AD 1593 (but most typically in the Los Alamos area constructed after about AD 1900).

isotope—Any of two or more variations of an element in which the nuclei have the same number of protons (and thus the same atomic number), but different numbers of neutrons so that their atomic masses differ. Isotopes of a single element possess almost identical chemical properties, but often different physical properties (for example, carbon-12 and -13 are stable; carbon-14 is radioactive).

latent cancer fatalities (LCFs)—Deaths from cancer occurring some time after, and postulated to be due to, exposure to ionizing radiation or other carcinogens.

low-income population—Low-income populations, defined in terms of Bureau of the Census annual statistical poverty levels (Current Population Reports, Series P-60 on Income and Poverty), may consist of groups or individuals who live in geographic proximity to one another or who are geographically dispersed or transient (such as migrant workers or American Indians), where either group experiences common conditions of environmental exposure or effect. (See environmental justice and minority population.)

low-level radioactive waste—Waste that contains radioactivity but is not classified as high-level waste, transuranic waste, spent nuclear fuel, or byproduct material as defined by Section 11e (2) of the Atomic Energy Act of 1954, as amended. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level radioactive waste, provided the concentration of transuranic waste is less than 100 nanocuries per gram.

material disposal area (MDA)—An area used any time between the beginning of Los Alamos National Laboratory operations in the early 1940s and the present for disposing of chemically, radioactively, or chemically and radioactively contaminated materials.

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

maximally exposed individual (transportation analysis)—A hypothetical individual receiving radiation doses from transporting radioactive materials on the road. For the incident-free transport operation, the maximally exposed individual would be an individual stuck in traffic next to the shipment for 30 minutes. For accident conditions, the maximally exposed individual is assumed to be an individual located approximately 33 meters (100 feet) directly downwind from the accident.

megawatt—A unit of power equal to 1 million watts. Megawatt thermal is commonly used to define heat produced, while megawatt-electric defines electricity produced.

millirem—One-thousandth of 1 rem.

minority population—Minority populations exist where either: (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than in the general population or other appropriate unit of geographic analysis (such as a governing body's jurisdiction, a neighborhood, census tract, or other similar unit). "Minority" refers to individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. "Minority populations" include either a single minority group or the total of all minority persons in the affected area. They may consist of groups of individuals living in geographic proximity to one another or a geographically dispersed/transient set of individuals (such as migrant workers or American Indians), where either group experiences common

conditions of environmental exposure or effect. (See environmental justice and low-income population.)

mitigate—Mitigation includes: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

mixed waste—Waste that contains both nonradioactive hazardous waste and radioactive waste, as defined in this glossary.

National Environmental Policy Act (NEPA) of 1969—This Act is the basic national charter for protection of the environment. It establishes policy, sets goals (Section 101), and provides means (Section 102) for carrying out policy. Section 102(2) contains "action-forcing" provisions to ensure that Federal agencies follow the letter and spirit of the act. For major Federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of the National Environmental Policy Act requires Federal agencies to prepare a detailed statement that includes the environmental impacts of the Proposed Action and other specified information.

National Pollutant Discharge Elimination System—A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the U.S. Environmental Protection Agency, a state, or, where delegated, a tribal government on an Indian reservation. The National Pollutant Discharge Elimination System permit lists either permissible discharges, the level of cleanup technology required for wastewater, or both.

National Register of Historic Places—The official list of the Nation's cultural resources that are worthy of preservation. The National Park Service maintains the list under direction of the Secretary of the Interior. Buildings, structures, objects, sites, and districts are included in the National Register for their importance in American history, architecture, archaeology, culture, or engineering. Properties included on the National Register range from large-scale, monumentally proportioned buildings to smaller-scale, regionally distinctive buildings. The listed properties are not just of nationwide importance; most are significant primarily at the state or local level. Procedures for listing properties on the National Register are found in 36 CFR 60.

nitrogen oxides—Refers to the oxides of nitrogen, primarily nitrogen oxide and nitrogen dioxide. These are produced in the combustion of fossil fuels and can constitute an air pollution problem. Nitrogen dioxide emissions contribute to acid deposition and formation of atmospheric ozone.

noise—Undesirable sound that interferes or interacts negatively with the human or natural environment. Noise may disrupt normal activities (hearing, sleep), damage hearing, or diminish the quality of the environment.

normal operations—All normal (incident-free) conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.

Notice of Intent (NOI)—Public announcement that an environmental impact statement will be prepared and considered. It describes the Proposed Action, possible alternatives, and scoping process, including whether, when, and where any scoping meetings will be held. The NOI is usually published in the *Federal Register* and local media. The scoping process includes holding at least one public meeting and requesting written comments on issues and environmental concerns that an environmental impact statement should address.

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

Nuclear Regulatory Commission (NRC)—The Federal agency that regulates the civilian nuclear power industry in the United States.

nuclear weapon—The general name given to any weapon in which the explosion results from the energy released by reactions involving atomic nuclei, either fission, fusion, or both.

nuclear weapons complex—The sites supporting the research, development, design, manufacture, testing, assessment, certification, and maintenance of the Nation's nuclear weapons and the subsequent dismantlement of retired weapons.

onsite—The term denotes a location or activity occurring within the boundary of a DOE complex site.

outfall—The discharge point of a drain, sewer, or pipe as it empties into the environment.

particulate matter (PM)—Any finely divided solid or liquid material, other than uncombined (pure) water. A subscript denotes the upper limit of the diameter of particles included. Thus, PM_{10} includes only those particles equal to or less than 10 micrometers (0.0004 inches) in diameter; $PM_{2.5}$ includes only those particles equal to or less than 2.5 micrometers (0.0001 inches) in diameter.

perennial stream—A stream that flows throughout the year.

permeability—In geology, the ability of rock or soil to transmit a fluid.

person-rem—A unit of collective radiation dose applied to populations or groups of individuals; that is, a unit for expressing the dose when summed across all persons in a specified population or group. One person-rem equals 0.01 person-sieverts. (See collective dose.)

pit—The central core of a primary assembly in a nuclear weapon typically composed of plutonium-239 and/or highly-enriched uranium and other materials.

plutonium—A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially by neutron bombardment of uranium. Plutonium has 15 isotopes with atomic masses ranging from 232 to 246 and half-lives from 20 minutes to 76 million years.

plutonium-238—An isotope with a half-life of 87.74 years used as the heat source for radioisotope power systems. When plutonium-238 undergoes radioactive decay, it emits alpha particles and gamma rays. Plutonium-238 may fission if exposed to neutrons. The likelihood of plutonium-238 undergoing fission is dependent upon many factors including the number and energy of neutrons, temperature, plutonium-238 purity and shape, and the presence and proximity of other elements.

plutonium-239—An isotope with a half-life of 24,110 years that is the primary radionuclide in weapons-grade plutonium. When plutonium-239 decays, it emits alpha particles. Plutonium-239 may fission if exposed to neutrons. The likelihood of plutonium-239 undergoing fission is dependent upon many factors including the number and energy of neutrons, temperature, plutonium-239 purity and shape, and the presence and proximity of other elements.

radioactive waste—In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or byproduct material is subject to regulation as radioactive waste under the Atomic Energy Act. Also, waste material that contains accelerator-produced radioactive material or a high concentration of naturally occurring radioactive material may be considered radioactive waste.

radioactivity—

Defined as a *process*: The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation.

Defined as a *property*: The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

radioisotope or radionuclide—An unstable isotope that undergoes spontaneous transformation, emitting radiation. (See isotope.)

Record of Decision (ROD)—A document prepared in accordance with the requirements of 40 CFR 1505.2 and 10 CFR 1021.315 that provides a concise public record of the U.S. Department of Energy's (DOE) decision on a Proposed Action for which an environmental impact statement was prepared. A ROD identifies the alternatives considered in reaching the decision; the environmentally preferable alternative; factors balanced by DOE in making the decision; and whether all practicable means to avoid or minimize environmental harm have been adopted, and, if not, the reason why they were not.

rem (roentgen equivalent man)—A unit of dose equivalent. The dose equivalent in rem equals the absorbed dose in rad in tissue multiplied by the appropriate quality factor and possibly other modifying factors. Derived from "roentgen equivalent man," referring to the dosage of ionizing radiation that will cause the same biological effect as one roentgen of x-ray or gamma-ray exposure. One rem equals 0.01 sieverts. (See absorbed dose and dose equivalent.)

Resource Conservation and Recovery Act, as Amended—A law that gives the U.S. Environmental Protection Agency the authority to control hazardous waste from "cradle to grave" (from the point of generation to the point of ultimate disposal), including its

minimization, generation, transportation, treatment, storage, and disposal. The Resource Conservation and Recovery Act also sets forth a framework for the management of nonhazardous solid wastes. (See hazardous waste.)

risk—The probability of a detrimental effect of exposure to a hazard. Risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of that event (in other words, the product of these two factors). However, separate presentation of probability and consequence is often more informative.

scope—In a document prepared pursuant to the National Environmental Policy Act of 1969, the range of actions, alternatives, and impacts to be considered.

scoping—An early and open process, including public notice and involvement, for determining the scope of issues to be addressed in an environmental impact statement (EIS) and for identifying the significant issues related to a Proposed Action. The scoping period begins after publication in the *Federal Register* of a Notice of Intent to prepare an EIS. The public scoping process is that portion of the process where the public is invited to participate. The U.S. Department of Energy's scoping procedures are found in 10 CFR 1021.311.

security—An integrated system of activities, systems, programs, facilities, and policies for the protection of Restricted Data and other classified information or matter, nuclear materials, nuclear weapons and nuclear weapons components, and/or U.S. Department of Energy contractor facilities, property, and equipment.

sediment—Soil, sand, and minerals washed from land into water that deposit on the bottom of a water body.

seismicity—The frequency and distribution of earthquakes.

seismic—Pertaining to any Earth vibration, especially an earthquake.

soils—All unconsolidated materials above bedrock. Natural earthy materials on the Earth's surface, in places modified or even made by human activity, containing living matter, and supporting or capable of supporting plants out of doors.

stockpile—The inventory of active nuclear weapons for the strategic defense of the United States.

stockpile stewardship program—A program that ensures the operational readiness (safety and reliability) of the U.S. nuclear weapons stockpile by the appropriate balance of surveillance, experiments, and simulations.

surface water—All bodies of water on the surface of the Earth and open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

threatened species—Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries

Service following the procedures set out in the Endangered Species Act and its implementing regulations (50 CFR 424). (See endangered species.)

total effective dose equivalent—The sum of the effective dose equivalent from external exposures and the committed effective dose equivalent from internal exposures.

transuranic—Refers to any element whose atomic number is higher than that of uranium (atomic number 92), including neptunium, plutonium, americium, and curium. All transuranic elements are produced artificially and are radioactive.

transuranic waste—Radioactive waste that is not classified as high-level radioactive waste and that contains more than 100 nanocuries (3700 becquerels) per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years.

tuff—A fine-grained rock composed of ash or other material formed by volcanic explosion or aerial expulsion from a volcanic vent.

uranium—A radioactive, metallic element with the atomic number 92; one of the heaviest naturally occurring elements. Uranium has 14 known isotopes, of which uranium-238 is the most abundant in nature. Uranium-235 is commonly used as a fuel for nuclear fission. (See natural uranium, enriched uranium, highly enriched uranium, and depleted uranium.)

volatile organic compounds—A broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures, such as benzene, chloroform, and methyl alcohol. With regard to air pollution, any organic compound that participates in atmospheric photochemical reaction, except for those designated by the U.S. Environmental Protection Agency Administrator as having negligible photochemical reactivity.

Waste Isolation Pilot Plant (WIPP)—A U.S. Department of Energy facility designed and authorized to permanently dispose of defense-related transuranic waste in a mined underground facility in deep geologic salt beds. It is located in southeastern New Mexico, 42 kilometers (26 miles) east of the city of Carlsbad.

wetland—Wetlands are "... those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3).

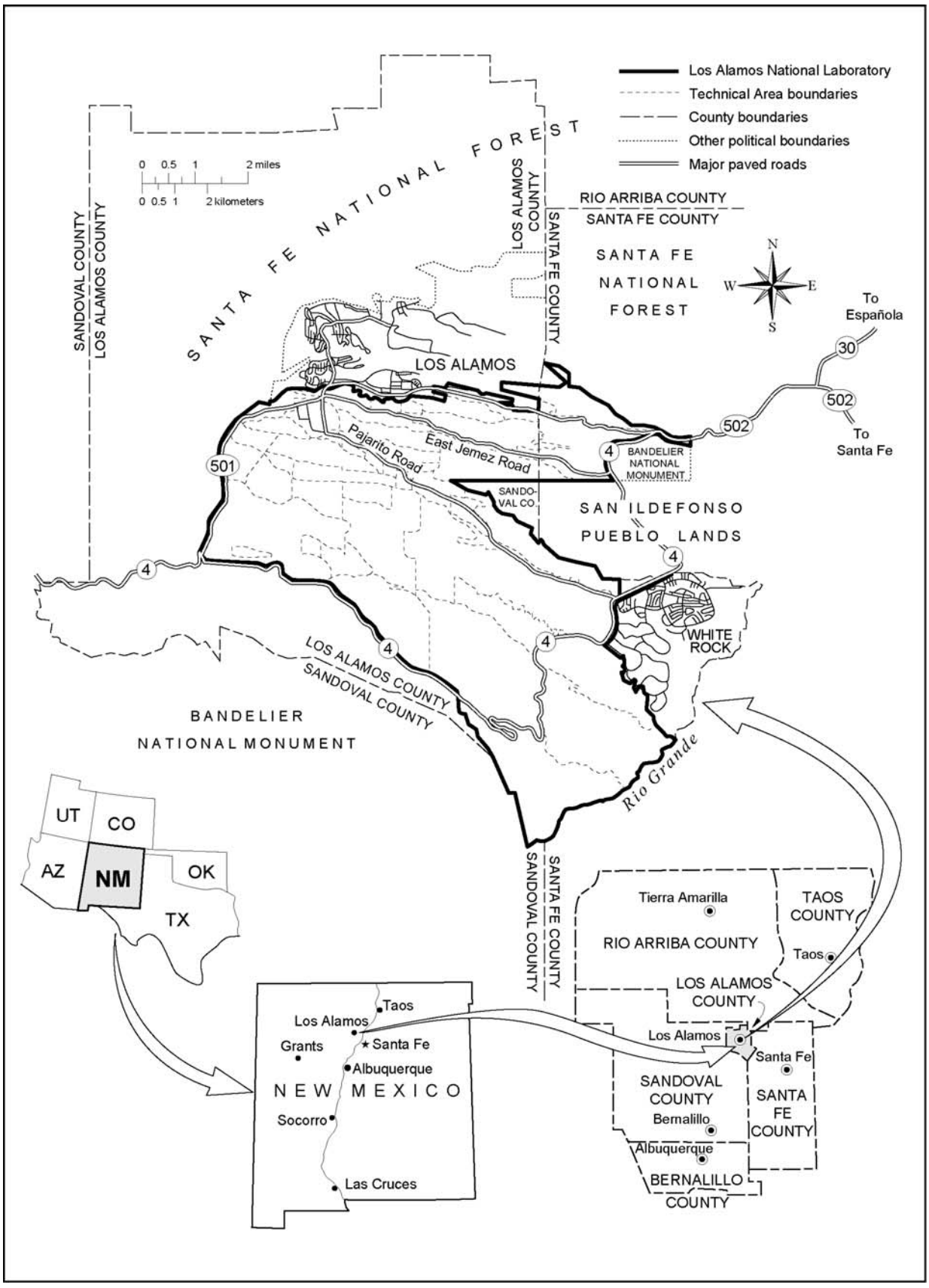

Figure S–1 Location of Los Alamos National Laboratory Site

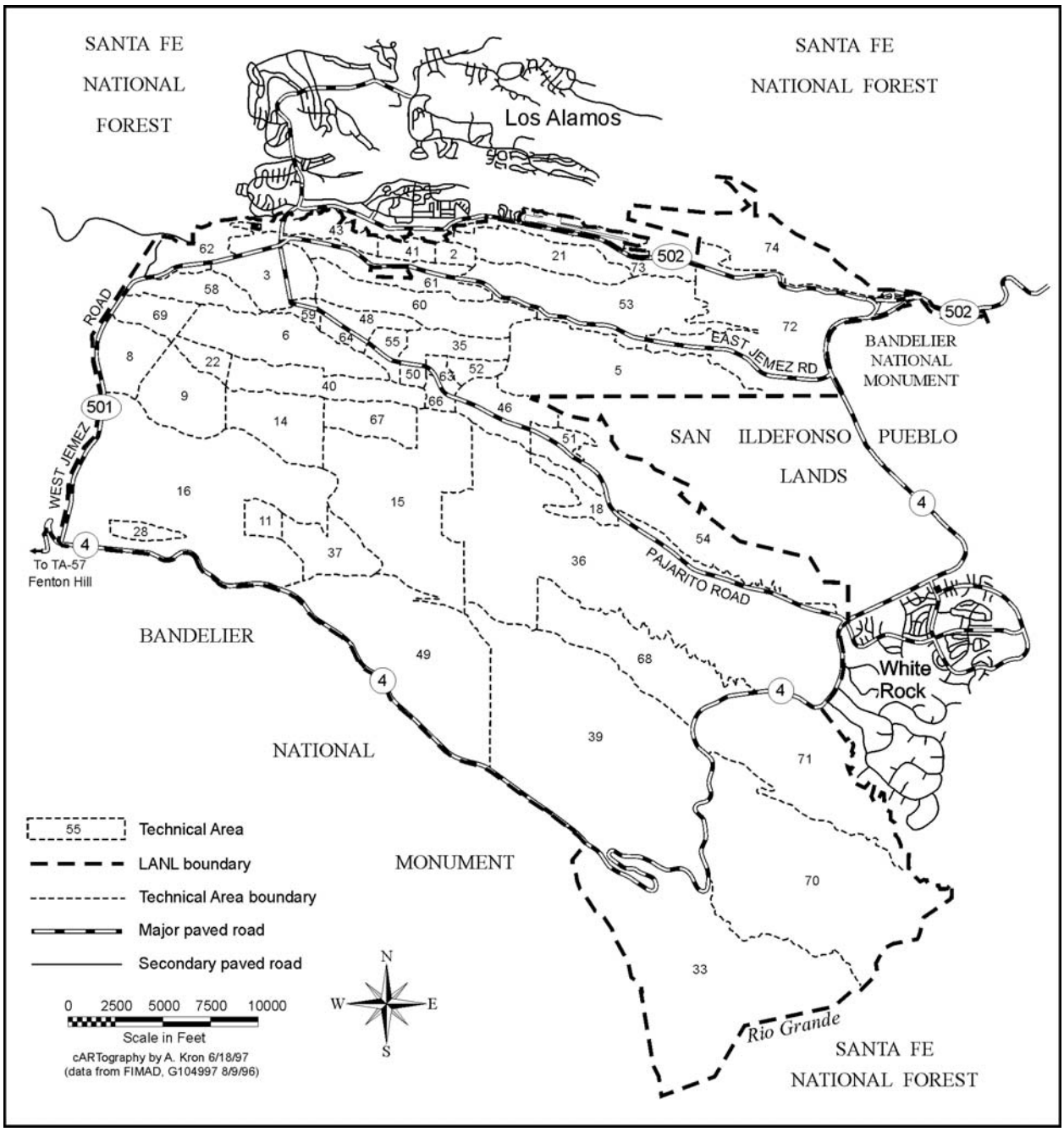

Figure S–3 Technical Areas at Los Alamos National Laboratory

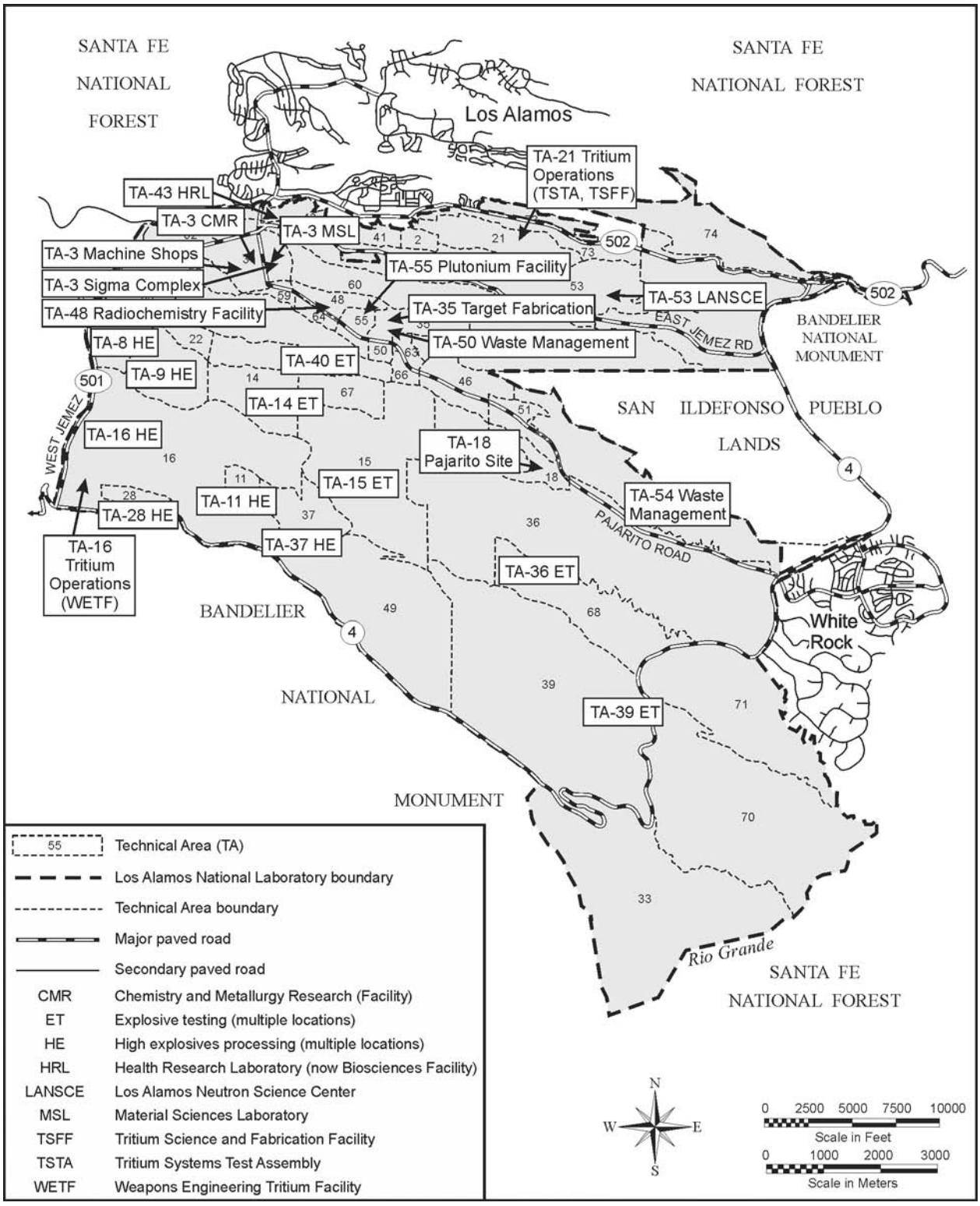

Figure S–4 Locations of Key Facilities