CHAPTER 2

LOS ALAMOS NATIONAL LABORATORY ACTIVITIES AND FACILITIES UPDATE

2.0 LOS ALAMOS NATIONAL LABORATORY ACTIVITIES AND FACILITIES UPDATE

This chapter provides an updated description of the activities and facilities at Los Alamos National Laboratory (LANL) and how they may have changed or been modified since publication of the *Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (1999 SWEIS)* (DOE/EIS-0238) (DOE 1999a).

The *1999 SWEIS* described ongoing activities and facilities at LANL, focusing on 15 Key Facilities that housed operations which had a potential to cause significant environmental impacts, were of most interest or concern to the public, or were subject to change as a result of programmatic decisions. Since publication of the *1999 SWEIS*, several new facilities (including one new Key Facility) have been constructed, and a major wildfire (the Cerro Grande Fire of 2000, which burned approximately 7,700 acres [3,110 hectares] within LANL boundaries) has altered baseline environmental conditions at LANL, among other changes.

Chapter 2 describes the changes that have occurred at LANL since publication of the *1999 SWEIS*, highlighting the major physical and operational changes that have occurred to the overall LANL site, as well as the 49 individual Technical Areas (TAs), 15 Key Facilities, and several important non-Key Facilities. Discussions of changes to the Key and non-Key Facilities include addressing each facility's performance in implementing the *1999 SWEIS* Record of Decision (ROD) and other changes that have occurred since the publication of the *1999 SWEIS*.

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.

Chapter 2 describes activities and notable changes at the site-wide level, TA level, and Key Facility level, as appropriate, and is organized as follows. At the site-wide level, Section 2.1 presents an overview of activities, and Section 2.2 describes site-wide changes that have occurred at LANL since publication of the *1999 SWEIS*. At the TA and Key Facility level, Sections 2.3 and 2.4 describe changes that have occurred within the 49 TAs and 15 Key and other important non-Key Facilities. Section 2.5 presents an overview and summary assessment of actual impacts compared to impact projections made in the *1999 SWEIS*. The chapter and this section conclude with a summary comparison table of actual impacts and performance changes by resource or impact area to projected modified Expanded Operations Alternative impacts that were presented in the *1999 SWEIS* (in the ROD, the U.S. Department of Energy [DOE] selected the Expanded Operations Alternative, but modified the level of plutonium pit production from 50 pits per year to 20 pits per year). The table also includes a brief performance assessment by each resource or impact area of whether actual impacts have exceeded or fallen within those projected in the *1999 SWEIS*.

This chapter also sets the stage for the impacts analysis included in this new Site-Wide Environmental Impact Statement (SWEIS) by comparing LANL's operational impacts since 1999 to the operational impacts projected in the *1999 SWEIS*. This comparison of projected and actual impacts provides a benchmark for understanding the percentage of total impacts that has already occurred in those instances where impacts were aggregated for the full 10-year period of interest. In addition, this chapter updates and recharacterizes the status of the Key Facilities and activities that were first identified in the *1999 SWEIS* to establish a comprehensive LANL site operations baseline for the impact analyses presented in Chapter 5 of this SWEIS.

2.1 Overview of Los Alamos National Laboratory Activities Since Publication of the *1999 SWEIS*

Research and development activities are dynamic by their very nature, and continual change within the limits of facility capabilities, authorizations, and operating procedures is normal. All facilities at LANL, including those that are proposed, under construction, preoperational, operational, or idle, have been categorized according to hazards inherent to their actual operations or planned use. The following sections examine how these activities and facilities have changed since publication of the *1999 SWEIS*, particularly their unique associated hazards.

LANL Facilities: A Framework for Analysis

As of September 2005, LANL had more than 2,000 structures with approximately 8.6 million square feet (800,000 square meters) under roof, spread over approximately 40 square miles (25,600 acres [10,360 hectares]) (104 square kilometers) of land owned by the U.S. Government and administered by DOE and the National Nuclear Security Administration (NNSA). Most of LANL is undeveloped to provide a buffer for security, safety, and expansion possibilities for future use. Approximately half of the square footage at LANL is considered laboratory or production space; the remaining square footage is considered administrative, storage, service, and other space.

An analysis of potential environmental impacts of future operations at LANL requires detailed knowledge of the specific activities occurring at specific sites over a known span of time. This knowledge enables a careful, detailed projection of the potential effects of these activities on the surrounding environment. In order to present a logical, comprehensive evaluation of the potential environmental impacts at LANL, the *1999 SWEIS* developed a framework for analyzing the types and levels of activities performed across the entire site. This framework assisted in analyzing the impacts of activities in specific locations (TAs) and the impacts related to specific programmatic operations (Key Facilities and capabilities). The following sections will use this framework to describe the current status of the LANL TAs and Key Facilities and to identify the capabilities existing within each Key Facility. The focal point for impact analysis throughout this new SWEIS is the level of operations related to each capability within the LANL Key Facilities. Fifteen Key Facilities were identified in the *1999 SWEIS* that were determined to be critical to meeting LANL's mission assignments and that: (1) housed operations that have a potential to cause significant environmental impacts, or (2) were of most interest or concern to the public (based on comments in the SWEIS public hearings), or (3) would be more subject to change than other LANL facilities because of (DOE) programmatic decisions. Subsequent chapters presented in this SWEIS will also use this framework to outline the differences among the three alternatives evaluated and their associated potential environmental impacts. The alternatives will be evaluated in terms of activity levels within the capabilities of each Key Facility. **Figure 2–1** provides a diagram of this conceptual framework.

As previously noted, this chapter describes activities and notable changes at the site-wide level; the TA level; or the Key Facility level, as appropriate. For Key Facilities, specific facility performance indicators are described, including radioactive air emissions, discharges to National Pollutant Discharge Elimination System (NPDES)-permitted outfalls, and volumes of radioactive liquid and solid wastes generated. To the greatest extent possible, projects, activities, and other changes are described in the context of Key Facilities to provide the greatest level of detail. A number of events or projects that have taken place at LANL since issuance of the *1999 SWEIS* are not tied to a Key Facility, however, and therefore are better described as either site-wide or TA-related. Projects or changes that were site-wide in nature are addressed in Section 2.2; changes that occurred in a specific TA are addressed in Section 2.3; and changes and performance indicators associated with specific Key Facilities are discussed in Section 2.4.

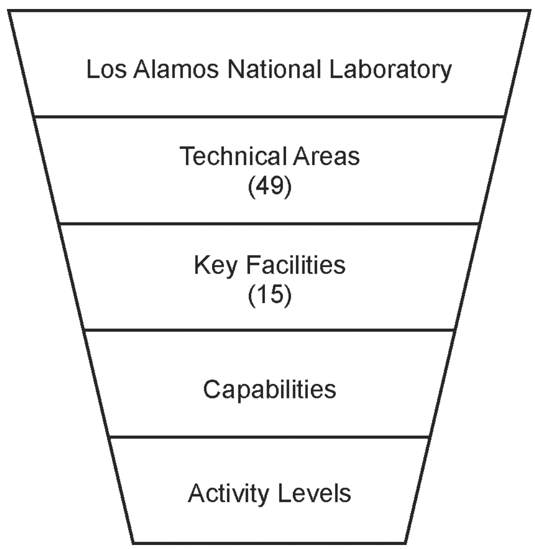


Figure 2–1 Conceptual Framework for Analysis

2.2 Site-Wide Changes at Los Alamos National Laboratory Since Publication of the *1999 SWEIS*

Major ongoing activities at LANL have been discussed in detail in *SWEIS Yearbooks* 1999 through 2005 and have been incorporated by reference. *SWEIS Yearbooks* from calendar years 1999 through 2005 provide detailed information on LANL site operations during each calendar year, and specifically address the following:

- Facility and process modifications or additions,
- Types and levels of operations during the calendar year,
- Operations data for the Key and non-Key Facilities, and
- Site-wide effects of operations for each calendar year.

The *SWEIS Yearbook – 2002* (LANL 2003h) is a special edition that was prepared to assist NNSA in evaluating the need for preparing a new SWEIS for LANL. The *SWEIS Yearbook – 2002* summarizes the data routinely collected from 1998 through 2002 and provides additional information, table summaries, and trend analyses. The *SWEIS Yearbook – 2002* also indicates LANL's programmatic progress in moving toward the projections provided in the *1999 SWEIS*.

The *1999 SWEIS* analyzed the potential environmental impacts of scenarios for future operations at LANL. The associated ROD (64 *Federal Register* [FR] 50797) was used not to predict specific operations, but to establish boundary conditions for operations. The ROD and the *1999 SWEIS* that supported it provided an environmental operating envelope both for specific facilities and for LANL as a whole. According to the ROD, if operations at LANL were to routinely exceed the operating envelope, DOE would evaluate the need for a new SWEIS. As long as overall LANL operations remain at or below the level analyzed in the *1999 SWEIS*, the environmental operating envelope remains valid. Thus, the levels of operation projected in the *1999 SWEIS* and the ROD should not be viewed as goals to be achieved, but rather as upper operational levels (LANL 2004f).

The *1999 SWEIS* and ROD projected a total of 38 facility construction and modification projects for LANL. Twenty-two projects have now been completed: six in 1998, eight in 1999, two in 2000, four in 2002, one in 2003, and one in 2004. The numbers of projects started or continued each year were 10 in 1999, 7 in 2000, and 6 in both 2001 and 2002.

A major modification project, the rerouting of effluents and elimination of NPDES outfalls, was completed in late 1999, bringing the total number of permitted outfalls down from the 55 identified in the *1999 SWEIS* to 20. During 2000, Outfall 03A-199, which serves the TA-3-1837 cooling towers, was included in the new NPDES permit issued by the U.S. Environmental Protection Agency (EPA) on December 29, 2000. This brings the total number of permitted outfalls up to 21. During 2005, only 17 of the 21 outfalls sustained effluent flows (LANL 2006g).

Each *SWEIS Yearbook* reports chemical usage and calculated emissions (expressed as kilograms per year) for the Key Facilities, based on an improved chemical reporting system. The 2004 chemical usage amounts were extracted from LANL's chemical inventory rather than from the Automated Chemical Inventory System used in the past. The quantities used represent chemicals procured or brought onsite from 1999 through 2004. Information regarding actual chemical use and estimated emissions for each Key Facility is presented in Appendix A of each *LANL SWEIS Yearbook* (LANL 2003h, 2004f, 2005f, 2006g). Additional chemical use and emissions reporting data can be found in the annual Emissions Inventory Report required by New Mexico. The most recent report is *Emissions Inventory Report Summary for Los Alamos National Laboratory for Calendar Year 2005* (LANL 2006i).

With a few exceptions, the capabilities identified in the *1999 SWEIS* for LANL have remained constant since 1999. These exceptions include:

- Movement of the Nonproliferation Training/Nuclear Measurement School, which was briefly located at TA-18 and returned to TA-3 (the Chemistry and Metallurgy Research Building) in 2004, where it will stay until the Chemistry and Metallurgy Research

Building is no longer available or until a new Security Category III and IV facility is built at TA-48 as part of the Radiological Sciences Institute's Institute for Nuclear Nonproliferation Science and Technology;

- Relocation of the Decontamination Operations Capability from the Radioactive Liquid Waste Treatment Facility to the Solid Radioactive and Chemical Waste Facilities in 2001;
- Redefinition of capabilities at the Bioscience Key Facility (formerly identified as the Health Research Laboratory Key Facility); and
- Loss of Cryogenic Separation Capability at the Tritium Key Facilities in 2001 (LANL 2004f).
- Transfer of neutron tube target loading from the Tritium Key Facilities to Sandia National Laboratories in 2006 (DOE 2003b).

In addition, following the events of September 11, 2001, the U.S. Department of Homeland Security (DHS) requested that LANL be used to support its missions. Activities undertaken at LANL for DHS are primarily the same actions that were performed for DOE prior to the reassignment of programs to DHS.

All currently operating capabilities are listed and described in detail as a part of the No Action Alternative discussed in Chapter 3 of this SWEIS. Since 1998, fewer than the 96 capabilities identified for LANL in the *1999 SWEIS* have been active. During 1998, only 87 capabilities were active. The nine capabilities with no activity were Manufacturing Plutonium Components at the Plutonium Complex; both Uranium Processing and Nonproliferation Training at the Chemistry and Metallurgy Research Building; Accelerator Transmutation of Wastes at the Los Alamos Neutron Science Center (LANSCE); Biologically Inspired Materials and Chemistry, Computational Biology, and Molecular and Cell Biology at the Bioscience Facilities; and both Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities (LANL 2003h).

During 1999, 91 capabilities were active. The five inactive capabilities were Fabrication and Metallography at the Chemistry and Metallurgy Research Building; both Accelerator Transmutation of Wastes and Medical Isotope Production at LANSCE; and both Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities (LANL 2003h).

During 2000, 88 capabilities were active. The eight inactive capabilities were Fabrication of Ceramic-Based Reactor Fuels at the Plutonium Complex; Diffusion and Membrane Purification at the Tritium Facilities;[1] both Destructive and Nondestructive Assay and Fabrication and Metallography at the Chemistry and Metallurgy Research Building; both Accelerator Transmutation of Wastes and Medical Isotope Production at LANSCE; and both Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities (LANL 2003h).

[1] *In these years, no research experiments were conducted on gaseous tritium movement and penetration through materials; however, the capability was used for effluent treatment.*

During 2001, 87 capabilities were active. The nine inactive capabilities were both Manufacturing Plutonium Components and Fabrication of Ceramic-Based Reactor Fuels at the Plutonium Complex; both Cryogenic Separation and Diffusion and Membrane Purification at the Tritium Facilities;[1] both Destructive and Nondestructive Assay and Fabrication and Metallography at the Chemistry and Metallurgy Research Building; both Accelerator Transmutation of Wastes and Medical Isotope Production at LANSCE; and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities (LANL 2003h).

During 2002 and 2003, 88 capabilities were active. The eight inactive capabilities were Manufacturing Plutonium Components at the Plutonium Complex; both Cryogenic Separation and Diffusion and Membrane Purification at the Tritium Facilities;[1] both Destructive and Nondestructive Assay and Fabrication and Metallography at the Chemistry and Metallurgy Research Building; both Accelerator Transmutation of Wastes and Medical Isotope Production capabilities at LANSCE; and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities (LANL 2003h, 2004f).

During 2004, 88 different capabilities remained active. The eight inactive capabilities were Cryogenic Separation at the Tritium Facilities; both Destructive and Nondestructive Assay and Fabrication and Metallography capabilities at the Chemistry and Metallurgy Research Building; Characterization of Materials at the Target Fabrication Facility; both Accelerator Transmutation of Wastes and Medical Isotope Production capabilities at LANSCE; and both Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities (LANL 2005f).

During 2005, 79 capabilities were active. The 17 inactive capabilities were Cryogenic Separation at the Tritium Facilities; both Destructive and Nondestructive Assay and Fabrication and Metallography at the Chemistry and Metallurgy Research Building; Characterization of Materials at the Target Fabrication Facility; Accelerator Transmutation of Wastes at LANSCE; Size Reduction and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities; Radioactive Liquid Waste Pretreatment at TA-21 or in Room 60 at TA-50; and all nine TA-18 capabilities (Dosimeter Assessment and Calibration, Detector Development, Materials Testing, Subcritical Measurements, Fast-Neutron Spectrum, Dynamic Measurements, Skyshine Measurements, Vaporization, and Irradiation) (LANL 2006g).

While there were activities under nearly all capabilities, the levels of these activities were mostly below the levels projected by the ROD. For example, the LANSCE linear accelerator generated an H-beam to the Lujan Center for 4,206 hours in 2005 at an average current of 125 microamps, compared to 6,400 hours at 200 microamps as projected by the ROD. Similarly, no criticality experiments were conducted at the Pajarito Site, compared to the 1,050 experiments projected by the ROD (LANL 2006g).

From 1999 through 2005, only three of LANL's facilities operated at levels approximating those projected in the *1999 SWEIS*: the Materials Science Laboratory, the Bioscience Facilities (formerly the Health Research Laboratory), and the non-Key Facilities. The two Key Facilities (the Materials Science Laboratory and the Bioscience Facilities) are more akin to the non-Key Facilities and represent the dynamic nature of research and development at LANL. More importantly, none of these facilities are major contributors to the parameters that lead to significant potential environmental impacts. The remaining 13 Key Facilities all conducted operations at or below projected activity levels for the modified Expanded Operations Alternative of the *1999 SWEIS* (LANL 2006g).

2.2.1 Cerro Grande Fire

The period between 1999 and 2005 saw environmental change on the Pajarito Plateau. Perhaps the most widespread and pervasive change in the region was drought. The first serious manifestation of the drought was an increase in wildfire activity in the region. The first of those wildfires was the 2000 Cerro Grande Fire, which affected buildings and the landscape at LANL. The fire burned north and east across LANL and onto San Ildefonso Pueblo property. By the time the fire was fully contained, it had consumed close to 43,000 acres (17,400 hectares), of which about 7,700 acres (3,110 hectares) (27 percent of LANL land) was on LANL property. The LANL response to the Cerro Grande Fire included burned area rehabilitation and monitoring efforts, enhanced vegetation and wildlife monitoring, and implementation of the *Wildfire Hazard Reduction Project Plan* (LANL 2001b). Additionally, several flood retention structures were constructed to minimize the danger of flooding due to the loss of vegetation and to allow the vegetation to regrow. In most areas, burned trees were removed and remaining forest was thinned to reduce the wildland fire potential and to make the forest viable and self-sustaining. The following is an overview of infrastructure changes and recovery efforts at LANL since the Cerro Grande Fire. More detailed facility-specific information is provided later in this chapter.

Across LANL, structures were destroyed by the Cerro Grande Fire or were rendered uninhabitable and needed to be replaced. Large amounts of construction and demolition debris required cleanup. High intensity fires often consume standing vegetation as well as the organic soil layers and associated seed bank. In addition, a common characteristic of high burn severity is a development of hydrophobic (water-repellent) soils. Together, these factors can lead to a potential for major runoff, soil erosion, downslope flooding, and degradation of water quality. All of these factors were considered in dealing with the effects of the Cerro Grande Fire. For further information on impacts from the Cerro Grande Fire, see Chapter 4.

The effects of the Cerro Grande Fire were minimal on the following Key Facilities: the Chemistry and Metallurgy Research Building (TA-3-29), Sigma Complex (TA-3-66), the Machine Shops (TA-3-102), Materials Science Laboratory (TA-3-1698), and the Tritium Facilities. No direct fire damage occurred, and recovery was limited to cleaning or replacement of air system filters. The Cerro Grande Fire caused notable effects on the other 11 Key Facilities. The effects of the fire on each of these Key Facilities are detailed in the facility performance portions of Section 2.4.

2.2.2 Land Conveyance and Transfer

Land use at LANL is a high-priority issue. Most of the undeveloped land is either required as buffer zones for operations or is unsuitable for development due to terrain restraints. Increases in available lands as a result of cleanup performed by environmental restoration activities and demolition of vacated buildings could affect strategic planning. To date, however, environmental restoration activities have not substantially added to the amount of land available for reuse (for further information, see Chapter 4, Section 4.1.1).

In 2002, the first congressionally mandated conveyances of land to Los Alamos County and transfer of land to the Department of the Interior (to be held in trust for the Pueblo of San Ildefonso) were accomplished. As of the end of 2006, 2,259 acres (914 hectares) have been effectively removed from LANL and made unavailable for LANL operations or use. Included are about 153 acres (62 hectares) conveyed to Los Alamos County and 2,106 acres (852 hectares) transferred to the Department of the Interior (in trust for the Pueblo of San Ildefonso). In addition, these conveyances and transfers changed LANL's boundaries (see Chapter 4, Figure 4–6). An assessment of the impacts of the boundary changes showed that the decrease in distances between postulated accident release sites and receptors would have little or no impact on the estimated public and worker doses presented in the *1999 SWEIS*. For further information on land conveyances and transfers, see Chapter 4.

2.2.3 LANL Security Enhancements

In response to the events of September 11, 2001, security at LANL was enhanced to protect personnel, property, and program projects. One security upgrade was installation of a temporary Truck Inspection Station located at the lower end of East Jemez Road. The purpose of the station is to screen all large vehicles coming into LANL to ensure they have the proper authority to be on DOE property. The station became operational in April 2002.

Another upgrade was construction of access control stations (called vehicle access portals) on Pajarito Road. Access to most of Pajarito Road is now restricted to DOE badge holders only; at least one occupant of a motor vehicle must present a valid DOE badge. Bicyclists without a valid DOE security badge are not allowed to use Pajarito Road. Walkers, joggers, work crews, and others on foot on Pajarito Road must display a valid security badge.

Under the Security Perimeter Project, access control stations were constructed on East Jemez and West Jemez Roads to screen vehicles entering TA-3. NNSA will enact a graded closure of the core area based on security levels in effect. Currently, the general public is allowed access via the East and West Jemez Road access control stations.

2.2.4 Operational Stand Down

During a July 7, 2004, special inventory associated with an upcoming experiment, two items of Classified Removable Electronic Media were discovered missing from the Weapons Physics Directorate. An immediate search did not locate the items. It was later determined that the "missing" Classified Removable Electronic Media may never have existed. In addition to these security incidents, several safety incidents also occurred at LANL, including one involving a student researcher who was injured in a laser experiment and another involving sulfuric acid. Two days later (July 16, 2004) the Director of LANL ordered a suspension of operations to allow the workforce to reaffirm its commitment to safety and security and compliance with all policies and procedures.

The resumption efforts included reviews (called management self-assessments), corrective action plans, and LANL readiness reviews. Resumption of Level 3 (high-risk) activities additionally included conduct of an independent review by NNSA. Level 1 activities (actions that present little risk to safety and security) were 100 percent resumed as of August 18, 2004. All Level 2 (moderate-risk) operations and more than 70 percent of all Level 3 (high-risk) work resumed by the end of 2004. Resumption of all activities was accomplished by the end of January 2005 (LANL 2004n).

2.2.5 Off-Site Source Recovery Project

The Off-Site Source Recovery Project has the responsibility to identify, recover, and store excess and unwanted sealed radiological sources on behalf of NNSA in cooperation with the U.S. Nuclear Regulatory Commission (NRC). From 1979 through 1999, DOE recovered excess and unwanted radioactive sealed sources containing plutonium-239 and beryllium on a case-by-case basis as requested by NRC. Since 1999, the Off-Site Source Recovery Project has assisted NNSA in managing actinide-bearing sealed sources that have been identified as potential threats to national security. Since the issuance of the *1999 SWEIS*, the Off-Site Source Recovery Project has been operating at various times at the following Key Facilities: the Chemistry and Metallurgy Research Building, the Pajarito Site, the Solid Radioactive and Chemical Waste Facility, and the Plutonium Facility Complex. DOE has determined that many of the actinide sources are eligible for disposal at the Waste Isolation Pilot Plant (WIPP) and is in the process of characterizing, packaging, and transporting them for disposal. As of February 2008, about 15,300 sources had been brought to LANL; about 3,500 of these were subsequently sent offsite for disposition.

2.2.6 Environmental Restoration Project

DOE established an environmental restoration project in 1989 to characterize and, if necessary, remediate over 2,100 potential release sites at LANL that were known or suspected to be contaminated from historical LANL operations. Many of the potential release sites remain under DOE control; however, some are located on lands that have been conveyed to Los Alamos County or transferred to private ownership. Remediation and cleanup efforts are regulated by and coordinated between the New Mexico Environment Department (NMED) and DOE. Environmental restoration activities include drafting and finalizing characterization and remediation reports, conducting characterization and remediation field work, and formal tracking of all work performed.

On May 2, 2002, NMED issued a Determination of Imminent and Substantial Endangerment to Health and the Environment, as well as a draft order compelling investigation and cleanup of environmental contamination at LANL. After receiving public comments, NMED revised its Determination and issued a final order on November 26, 2002. On behalf of DOE and the University of California (the LANL management and operating contractor at the time), the U.S. Justice Department filed a lawsuit challenging the final order. As the LANL management and operating contractor, the University of California filed a separate lawsuit. The DOE, the State of New Mexico, and the University of California subsequently negotiated a Compliance Order on Consent (Consent Order) (NMED 2005), which was issued for public comment on September 1, 2004.

The comment period for the Consent Order closed on October 1, 2004. NMED delayed finalizing the Consent Order until surface water and watershed issues were addressed in a separate Federal Facilities Compliance Act agreement under the Clean Water Act; that agreement was signed on February 3, 2005. The final Consent Order, approved by the three parties on March 1, 2005, is now the primary document recognized as defining the regulatory requirements and schedules for environmental remediation at LANL.

The Consent Order requires a site-wide investigation and cleanup to be conducted at LANL pursuant to stipulated procedures and schedules. The Consent Order also requires the installation of wells, piezometers, and other subsurface units to provide site characteristic or environmental information; the collection and investigation of sample data; and the preparation and submittal of investigative reports for various potential release sites. Following the investigation phase for a potential release site and upon a determination by NMED that corrective measures are needed to protect human health and the environment, a corrective measures evaluation report must be prepared. After NMED authorizes a corrective measure for a potential release site, the corrective measures must be implemented. Cleanup of soil, groundwater, and surface water throughout this process must meet standards documented in Section VIII of the Consent Order. Upon completing the remedy, a remedy completion report must be prepared and submitted to NMED for approval.

During 2005, LANL drafted and finalized numerous characterization and remediation plans and reports for NMED in accordance with the Consent Order, including the Interim Facility-Wide Groundwater Monitoring Plan. In addition, accelerated characterization and remediation activities were implemented at sites that could be affected by upcoming infrastructure construction projects. For example, in 2005, LANL's Canyons Project focused on investigations in Mortandad and Pajarito Canyons to evaluate the nature and extent of contamination in sediment, biota, and groundwater (among other goals). Completed characterization and remediation plans and reports are listed in the *2005 SWEIS Yearbook*, as are ongoing field activities (LANL 2006g).

Environmental restoration may generate a large amount of waste during cleanup activities, which are scattered over the entire LANL site. The *1999 SWEIS* forecast that environmental restoration activities would contribute 60 percent of the chemical wastes, 35 percent of the low-level radioactive waste, and 75 percent of the mixed low-level radioactive waste generated at LANL over the 10-year period from 1996 through 2005. The LANL environmental restoration program originally identified 2,124 potential release sites, including 1,099 potential release sites which were subsequently listed in Model VIII of the LANL Hazardous Waste Facility Permit, which was issued by EPA in March 1990, and 1,025 potential release sites that were not listed in Module VIII. Based on prior "no further action" approvals and consolidation of sites, only 829 potential release sites remained at the end of 2005. Approximately 774 units have been approved for no further action, including 146 units that have been removed from LANL's Hazardous Waste Facility Permit (LANL 2006g). Some of the major completed remediation activities are shown in **Table 2–1**. In addition, during 2005, LANL received certificates of completion (which replace the former no further action determinations) from NMED for eight sites (LANL 2006g).

Table 2–1 Major Remediation Activities Completed Since the *1999 SWEIS*

Location	*Decommissioning Activity*	*Year*
TA-16-387	Cleanup of flash pad at TA-16	2000
TA-16-394	Closure of burn tray at TA-16	2000
TA-00	Cleanup of contaminated sediments in the South Fork of Acid Canyon	2001
TA-21, TA-51, and TA-54	Characterization and removal of inactive septic tanks	2002
TA-16	MDA P clean closure	2002
TA-53	Remediation of surface impoundment at TA-53	2002
TA-3	Support for several planned construction projects	2003, 2005
TA-21	"Cold dump" cleanup	2003
TA-21	Cleanup of contaminated soils and sediments below outfall in TA-21 (SWMU-21-011 [K])	2003
TA-61	Removal of French drain at Omega West	2003
TA-33	Cleanup of a former drum storage area (SWMU 33-013)	2005

TA = technical area, MDA = material disposal area, SWMU = solid waste management unit.
Sources: LANL 1999c, 2000f, 2001e, 2002e, 2003h, 2004f, 2005f, 2006g.

Waste quantities generated since issuance of the *1999 SWEIS* ROD generally have been below the projections made in the *1999 SWEIS*, with the exception of mixed low-level radioactive waste generated in 2000 and chemical wastes generated in 2000 and 2001. Projections were exceeded in those years due to recovery efforts from the Cerro Grande Fire. In addition, in 1999, the chemical waste projections were exceeded due to disposal of extensive amounts of soil during the cleanup of material disposal area (MDA) P.

The major concern following the Cerro Grande Fire pertaining to LANL's environmental restoration activities was the threat of erosion at burned-over potential release sites and the movement of contaminants downstream. The LANL environmental restoration organization began an assessment of the 600 potential release sites within the burn area to accomplish the following:

- *Evaluate and stabilize sites touched by fire*. The Potential Release Site Assessment Team determined that over 300 potential release sites were touched by fire. Assessments for these sites were completed by May 2000, and erosion control measures (called best management practices) were needed for 91 of the 300 potential release sites. These best management practice installations were completed in July 2000, and included contour raking, placement of water barriers (straw wattles), diversion of stream channels, and other measures to divert surface water from the potential release sites (LANL 2001g).

- *Conduct baseline sampling to characterize postfire, preflood conditions (before seasonal rains) in fire-impacted watersheds*. The Contaminant Transport Team completed a Baseline Characterization Sampling Plan in June 2000. Preflood fieldwork, including collection of sediment, surface water, and alluvial groundwater samples, was completed in July 2000. Postflood fieldwork was carried out in August and September 2000, as necessary.

- *Evaluate, stabilize, or remove sites subject to flooding*. The Accelerated Actions Team identified 77 potential release sites in fire-impacted canyons that were potentially vulnerable to postfire flooding. The majority of these sites were in Los Alamos Canyon (TA-2 and TA-41) and Pajarito Canyon (TA-18 and TA-27) and included outfalls, storm drains, septic systems, and other structures (including those associated with the Omega West Reactor at TA-2). Few of the sites assessed actually required corrective actions, except for several in TA-2 where excavation, soil removal, and site restoration activities were completed during July and August 2000.

Fire rehabilitation and flood mitigation efforts are ongoing at LANL and will continue until areas prone to erosion are stabilized. Sites that had controls installed continue to be inspected and maintained as part of the LANL stormwater program (LANL 2005c).

In 2004, LANL submitted the Los Alamos and Pueblo Canyons Investigation Report to NMED to address, among other things, the results of the Cerro Grande Fire on concentrations of contaminants of potential concern in canyon media. The report found that, for contaminants released from LANL solid waste management units and areas of concern, the human health risks were below NMED's and DOE's target levels for present and foreseeable future land uses, and that adverse ecological effects had not been observed in terrestrial and aquatic systems in the watershed (LANL 2006g).

2.3 Technical Areas Changes Since the *1999 SWEIS*

LANL is divided into 49 separate TAs, including TA-0 (which comprises leased space within the Los Alamos townsite) (see **Figure 2–2**) and TA-57 at Fenton Hill. These TAs compose the basic geographic configuration of LANL. While the number of structures changes with time (there is frequent addition or removal of temporary structures and miscellaneous buildings), the current breakdown is about 952 permanent buildings, 373 temporary structures (trailers and transportables), and 897 miscellaneous structures such as sheds and utility structures. Together, these structures contain approximately 8.6 million square feet (800,000 square meters). Collectively, between 2001 and 2004, 360,000 gross square feet were removed from all TAs through a variety of funding initiatives. Structures at LANL include such constructed items as meteorological towers, water tanks, manholes, small storage sheds, and electrical transformers. Portions of LANL's resources are specialized facilities that have been built and maintained at LANL over the last 50 years. **Table 2–2** provides a brief overview of current activities conducted at each of LANL's TAs.

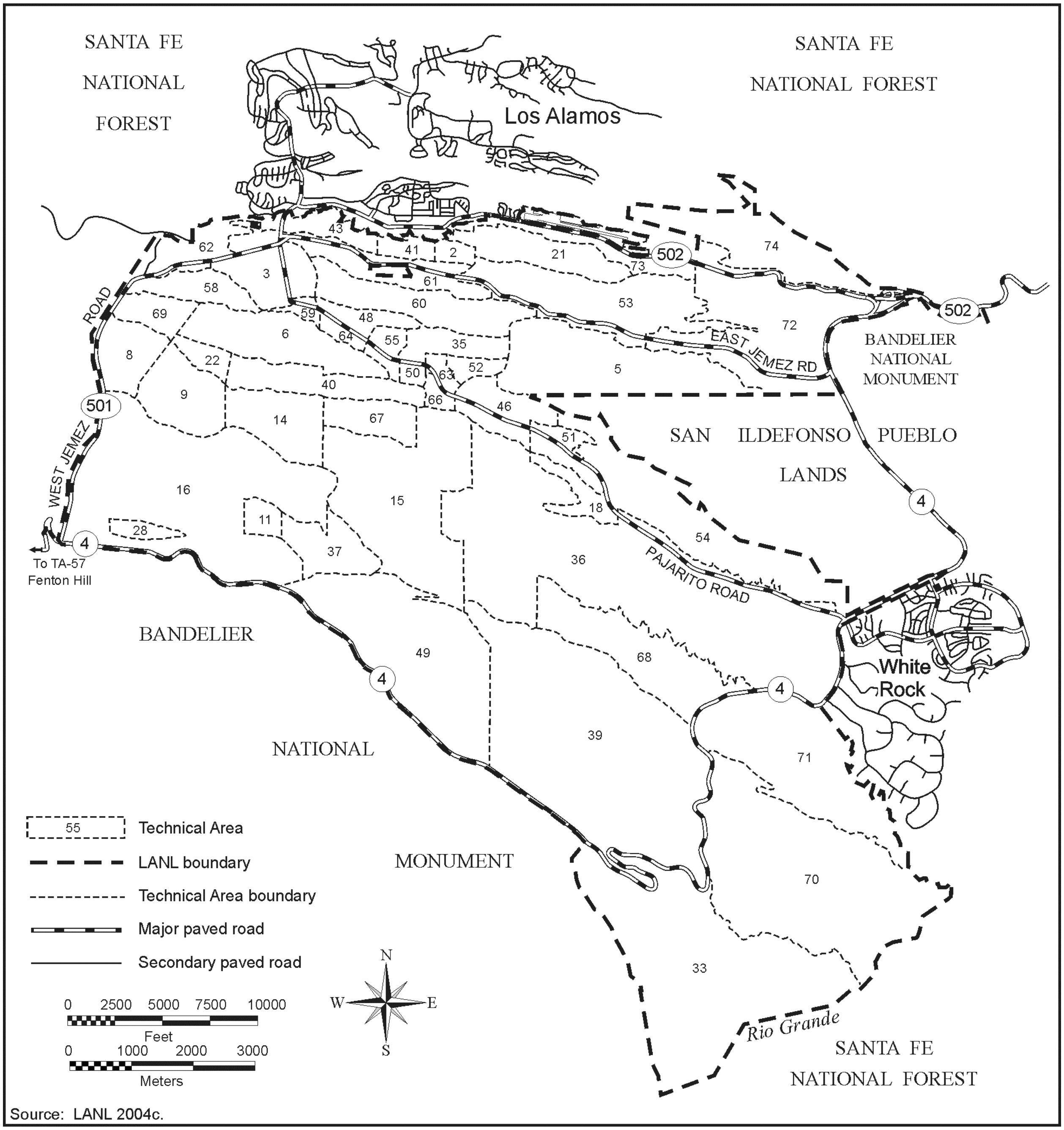


Figure 2–2 Technical Areas at Los Alamos National Laboratory

Table 2–2 Overview of Los Alamos National Laboratory Technical Areas and Activities [2]

Technical Area	*Activities*
TA-0 (Offsite Facilities)	This TA designation is assigned to structures leased by DOE and NNSA that are located outside LANL's boundaries. There are approximately 58 LANL facilities with this designation, with about 235,000 square feet (22,000 square meters) of space. The University of California and the Community Reading Room; the Bradbury Science Museum; the White Rock Environment, Safety, and Health Training Center; and other various office suites are located in the Los Alamos townsite and White Rock.
TA-2 (Omega Site or Omega West Reactor)	This TA encompasses approximately 4 acres (1.6 hectares) in Los Alamos Canyon. It once contained a building that housed an 8-megawatt nuclear research reactor, the Omega West Reactor. The reactor and all support buildings and ancillary structures have been demolished.
TA-3 (Core Area or South Mesa Site)	This TA is LANL's main TA, housing approximately half of LANL's employees and total floor space. It is the entry point to LANL, and is located on South Mesa. It houses most of the administrative and public access activities, as well as a mixture of laboratory activities including experimental sciences, biological work, work with special nuclear material, materials synthesis, metallic and ceramic processing and fabrication, theoretical and computational research and physical support operations. TA-3 contains major facilities such as the Chemistry and Metallurgy Research Building; the Sigma Complex; the Machine Shops; the Materials Science Laboratory; the Nicholas C. Metropolis Center for Modeling and Simulation (Metropolis Center); and the Los Alamos Research Park. The Chemistry and Metallurgy Research Building capabilities will be moved to TA-55 as a part of the Chemistry and Metallurgy Research Building Replacement Project. It is also the location proposed for operating the existing Biosafety Level 3 Facility.
TA-5 (Beta Site)	This largely uncleared TA is located between East Jemez Road and the San Ildefonso Pueblo and contains physical support facilities, an electrical substation, test wells, several archaeological sites, and environmental monitoring and buffer areas.
TA-6 (Two-Mile Mesa Site)	Located in the northwestern part of LANL, this TA is mostly undeveloped and contains a meteorological tower, gas cylinder staging buildings, and aging vacant buildings that are awaiting authorization for disposal.
TA-8 (GT-Site [Anchor Site West])	This TA, located between West Jemez Road and Anchor Ranch Road, is a testing site where all modern nondestructive dynamic testing techniques are maintained to ensure the quality of materials in items ranging from test weapons components to high-pressure dies and molds. The principal techniques used at this site include radiography (x-ray machines with a potential of up to 1,000,000 volts and a 24-megaelectronvolts betatron), 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 site, and new organic compounds are investigated for possible use as explosives. Storage and stability problems are also studied.
TA-11 (K-Site)	TA-11 is a remote TA. Facilities at this site are used for testing explosives components and systems, including vibration analysis and drop-testing materials and components under a variety of extreme physical environments. These 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)	Located in the northwestern part of LANL, this TA is one of 14 firing areas. Most operations are remotely controlled and involve detonations, certain types of high explosives machining, and permitted burning. Tests are conducted on explosives charges to investigate fragmentation impact, explosives sensitivity, and thermal responses of new high explosives. This site is currently permitted to treat waste through open detonation or open burning under the Resource Conservation and Recovery Act (RCRA).

[2] Names in parentheses are common or historical names that are sometimes used to refer to the Technical Areas.

Technical Area	***Activities***
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. The Pulsed High Energy Radiation Machine Emitting X-Rays Facility, a multiple-cavity electron accelerator capable of producing a very large flux of x-rays, was disabled in 2004. The machine was decommissioned in 2007, and decontamination and demolition will occur in the future. TA-15 is also used to investigate weapons functioning and systems behavior in nonnuclear testing.
TA-16 (S-Site)	TA-16, located in the western part of LANL, is the site of the Weapons Engineering Tritium Facility, which is a state-of-the-art tritium processing facility, and the High Explosives Wastewater Treatment Facility. The TA's high explosives research, development, and testing capabilities include high explosives processing; powder manufacturing; casting, machining, and pressing; inspection and radiography of high explosives components to guarantee integrity and ensure quality control; test device assembly; and chemical analysis. There are also some biological laboratories here.
TA-18 (Pajarito Site)	This TA is located in Pajarito Canyon about 4 miles (6 kilometers) southeast of TA-3. The Los Alamos Critical Experiment Facility, a general-purpose nuclear experiments facility, is housed on this site along with other experimental facilities. Currently, the primary focus of the Los Alamos Critical Experiment Facility is the design, construction, research, development, and application of critical experiments, as well as training related to criticality safety and radiation detection and instrumentation applications. In December 2002, NNSA decided to relocate all TA-18 Security Category I and II materials and activities to the Nevada Test Site; this transfer is in process.
TA-21 (DP-Site)	TA-21 is on the northern border of LANL, next to the Los Alamos townsite. The TA has two primary research areas: DP West and DP East. DP West is the former radioactive materials (including plutonium) processing facility that has been partially decontaminated, decommissioned, and demolished (DD&D). DP East consists of two tritium facilities. Current plans include closing TA-21 and consolidating tritium operations at the Weapons Engineering Tritium Facility in TA-16. The Tritium Systems Test Assembly has been deactivated and will undergo DD&D, and the Tritium Science and Fabrication Facility operations ended in 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 TA-16, was an explosives storage area. The TA contains five empty storage magazines that are in the process of being decontaminated and decommissioned.
TA-33 (HP-Site)	TA-33 is remotely located at the southeastern boundary of LANL, where experiments that do not require daily oversight, but do require isolation, are located. 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. This was formerly the site of the Atlas Project. The Atlas Removal Project has been completed at this site, and the building is now available as storage space. Additionally, there are some Biosafety Level 1 and 2 laboratories at TA-35.
TA-36 (Kappa-Site)	TA-36 is in a remotely located area in the eastern portion of LANL that is fenced and patrolled. It has four active firing sites that support explosives testing. The sites are used for a wide variety of nonnuclear ordnance tests pertaining to warhead designs, armor and armor-defeating mechanisms, explosives vulnerability to projectile and shaped-charge attack, warhead lethality, and determining the effects of shock waves on explosives and propellants.
TA-37 (Magazine Area C)	This TA is used as an explosives storage area. It is located at the eastern perimeter of TA-16.

Technical Area	***Activities***
TA-39 (Ancho Canyon Site)	TA-39 is located at the bottom of Ancho Canyon. The behavior of nonnuclear weapons is studied here, primarily by photographic techniques. Also studied are the various phenomenological aspects of explosives, interactions of explosives, explosions involving other materials, shock wave physics, equation-of-state measurements, and pulsed-power systems design.
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. Fundamental and applied research includes investigating phenomena associated with the physics of high explosives and research in rapid-shock-induced reactions. This TA is also used for investigating the physics and chemistry of detonators and shock wave propagation.
TA-41 (W-Site)	TA-41, located in Los Alamos Canyon, is no longer used and many buildings have been decontaminated and decommissioned. 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 Los Alamos 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 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 located near the entrance to the TA, with an upgraded helipad, is operated by the U.S. Forest Service.
TA-50 (Waste Management Site)	TA-50 is located near the center of LANL. The site supports LANL's waste management activities for several types of waste, including storing solid and liquid low-level radioactive waste, low-level mixed waste, transuranic waste, and hazardous waste. Major facilities at TA-50 include the Radioactive Liquid Waste Treatment Facility; the Waste Characterization, Reduction, and Repackaging Facility; and the Actinide Research and Technology Instruction Center.
TA-51 (Environmental Research Site)	Located on Pajarito Road in the eastern portion of LANL, TA-51 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 site.
TA-53 (Los Alamos Neutron Science Center)	TA-53 is located in the northern portion of LANL and includes LANSCE, which 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 contribute 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.
TA-55 (Plutonium Facility Complex Site)	TA-55, located just southeast of TA-3, includes the Plutonium Facility Complex and is the chosen location for the Chemistry and Metallurgy Research Building Replacement Project. This facility provides chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides into many compounds and forms. Additional capabilities include the means to ship, receive, handle, and store nuclear materials, as well as to manage the wastes and residues produced by TA-55 operations. Relocated chemistry and metallurgy research, actinide chemistry, and materials characterization capabilities may be provided at the site through the Chemistry and Metallurgy Research Building Replacement Project currently under construction.

Technical Area	***Activities***
TA-57 (Fenton Hill Site)	TA-57 is located about 20 miles west (32 kilometers) of LANL on the southwest edge of the Valles Caldera in the Jemez Mountains. This TA lies within an area of 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 (Two-Mile North Site)	TA-58, located near LANL's northwest border on Two-Mile 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. TA-59 facilities provide LANL support services in the areas of 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. Institutional-level analytical support for environmental samples and bioassay samples is also provided.
TA-60 (Sigma Mesa)	TA-60 lies between Mortandad Canyon and Sandia Canyon southeast of TA-3. The site is primarily used for physical support and infrastructure activities and includes the Nevada Test Site Test Fabrication Facility and a test tower. Because of 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 physical support 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 site.
TA-68 (Water Canyon Site)	TA-68, located in the southern portion of LANL, is a testing area for dynamic experiments and 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 Operation 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 is located along East Jemez Road on the northeastern boundary of LANL. The site contains LANL's small arms firing range, which is used by protective force personnel for required training and practice purposes.
TA-73 (Airport Site)	TA-73 is located along the northern boundary of LANL, adjacent to NM 502. Los Alamos County 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 was a forested area in the northeastern corner of LANL. Large parts of this TA have been either conveyed to Los Alamos County or transferred to the Department of the Interior (in trust for the Pueblo of San Ildefonso) and are no longer part of LANL.

TA = technical area, NNSA = National Nuclear Security Administration, NM = New Mexico.

Several TAs at LANL have experienced facility changes recently. Changes occurring at LANL TAs since publication of the *1999 SWEIS* include:

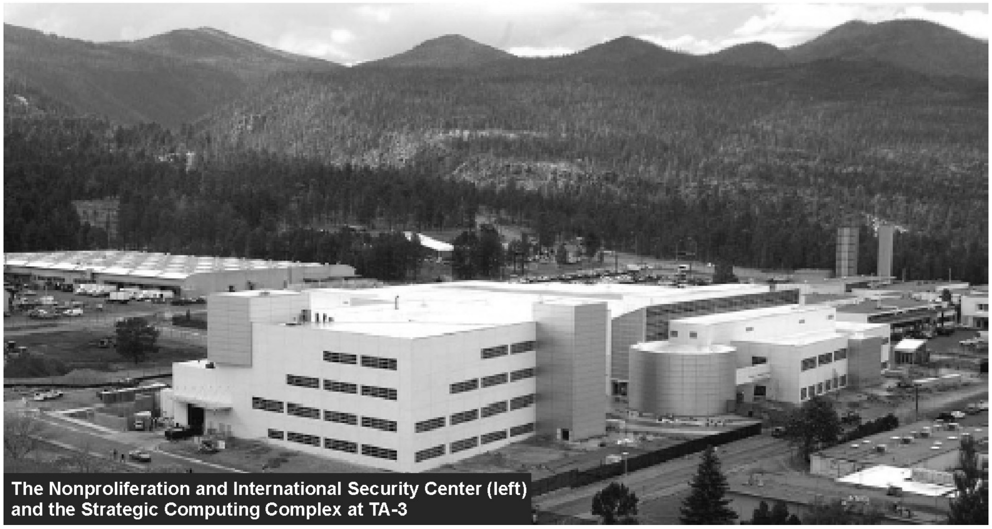
- **TA-2—**The 1940s-era Omega West Reactor Building has been completely decontaminated, decommissioned, and demolished (DD&D). The land has been reclaimed and revegetated.

- **TA-3—**New facilities have been constructed since the *1999 SWEIS*, including the Los Alamos Research Park, which was constructed on land leased from DOE to allow a wide range of companies to work within the same geographic location on projects that will benefit both private industry and LANL; the Metropolis Center, which houses one of the world's fastest supercomputers; and the Nonproliferation and International Security Center, which was built to increase the efficiency and effectiveness of support to the NNSA Office of Nonproliferation and International Security by consolidating personnel at a central LANL location.

  The Los Alamos Research Park was constructed on undeveloped land leased to Los Alamos County for 50 years in 1999. While located within TA-3, this Research Park is operated by the county and is not subject to the administrative control of DOE except as provided through the lease agreement. Currently, one building has been constructed (along with parking structures). Construction of the first building in the Los Alamos Research Park began in 2000 and was completed in March 2001. As described in the *Environmental Assessment for the Lease of Land for the Development of a Research Park at Los Alamos National Laboratory* (DOE 1997b), up to 10 structures may eventually be constructed, consuming an estimated 1.3 megawatts peak electric demand, 39 billion British Thermal Units of natural gas, and 17 million gallons (64,352,001 liters) of water annually.

  The Metropolis Center (formerly called the Strategic Computing Complex) and the Nonproliferation and International Security Center were constructed on previously disturbed land containing parking lots or other structures. As previously discussed, most other facility construction, modifications, and upgrades were conducted within existing facilities. The following sections describe major constructions at TA-3.

  Construction of the Metropolis Center (TA-3-2327) began in 1999 and was completed at the end of 2001. Occupancy by about 300 designers, computer scientists, code developers, and university and industrial scientists was completed in 2002. When expansion of the original facility is completed, it will require an estimated 51 million gallons (193 million liters) of cooling water per year and will have a maximum electricity load requirement of 15 megawatts. The impacts of this project were initially addressed in the *Environmental Assessment for the Proposed Strategic Computing Complex, Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 1998), which considered the construction and operation of this facility with an initial computing capacity of up to 50 teraflops (50 trillion floating point operations per second). NNSA has subsequently determined that a capability of at least 100 teraflops would be required to effectively support the mission requirements of this facility, and estimates that an operational level as high as 1,000 teraflops (1 petaflops) might be required in the future.



The Nonproliferation and International Security Center (left) and the Strategic Computing Complex at TA-3

Construction of the Nonproliferation and International Security Center (TA-3-2322) began in March 2001. Occupancy began in March 2003. The building houses laboratories, a machine shop for fabrication of satellite parts, a high-bay fabrication area, an area for the safe handling of sealed radioactive sources, and offices. Since workers have been relocated from other LANL buildings, there have been no increases in LANL's generation of sewage or solid or chemical wastes, or its overall demand for utilities. The impacts of this project were addressed in the *Environmental Assessment for the Proposed Construction and Operation of the Nonproliferation and International Security Center* (DOE 1999c).

Additional new construction at TA-3 since 1999 includes the Security Systems Support Facility; the Decision Applications Office Building; the new Materials Sciences and Technology Office Building; the LANL Center for Integrated Nanotechnologies; the new LANL Medical Facility; and the Biosafety Level 3 Facility, which is not yet operational. Construction is complete on the National Security Sciences Building, which will replace the old Administration Building. Two of three planned parking structures were constructed to complement the new office space in TA-3 (NNSA 2001). Several buildings were removed from TA-3, including the Sherwood Building, the Scyllac Building, the Assembly Rack Towers, and the old Environment, Safety, and Health Clinic, as well as a number of trailers. Access control stations have been constructed and operations have been initiated, allowing NNSA to control vehicle access into TA-3.

- **TA-16—**Several new facilities have been constructed in this TA, including the Tritium Science and Engineering Office Building, the Weapons Engineering Office Building, and the Weapons Plant Support Building. In addition, several major demolition projects totaling over 100,000 square feet (9,290 square meters) have taken place at TA-16, including the 220, 340, and 370 complexes and the old steam plant.

- **TA-18—**This TA has operated for many years as a major training facility for nuclear specialists in areas such as criticality management and safety, emergency response in support of counterterrorism activities, nonproliferation programs, and criticality experiments in support of stockpile stewardship. This TA is currently undergoing decommissioning consistent with the ROD for the *Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (67 FR 79906). Efforts are underway to remove the majority of special nuclear material from this area and to relocate certain operations to the Nevada Test Site by 2008 (Security Category I and II nuclear materials have been removed from this TA).

- **TA-21—**In the past, this TA has supported tritium research, but this work is being consolidated at TA-16 or offsite at another NNSA facility. Part of TA-21 has been conveyed per Public Law 105-119 requirements.

- **TA-41—**This TA was previously used for a variety of administrative and technical activities, but is no longer used. Many buildings have been decontaminated and decommissioned.

- **TA-55—**The Plutonium Facility Complex is located in this TA. Security Category I and II nuclear materials removed from TA-18 are being stored here pending transfer to the Device Assembly Facility at the Nevada Test Site.

- **TA-61—**This TA is the location of the Los Alamos County Landfill, which currently handles municipal solid waste from both Los Alamos County and LANL. The landfill is scheduled to cease operation in 2008 under the direction of NMED.

2.4 Key Facilities and Non-Key Facilities Changes Since the *1999 SWEIS*

Taken together, the 15 Key Facilities at LANL represent the majority of environmental risks associated with LANL operations. Specifically, information in the *1999 SWEIS* projected that these Key Facilities would 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.

This remains true for operations-related activities at LANL Key Facilities today (LANL 2005f). Facility cleanouts and DD&D, however, as well as environmental restoration activities, account for large quantities of waste requiring management. **Figure 2–3** shows the location of the 15 Key Facilities at LANL.

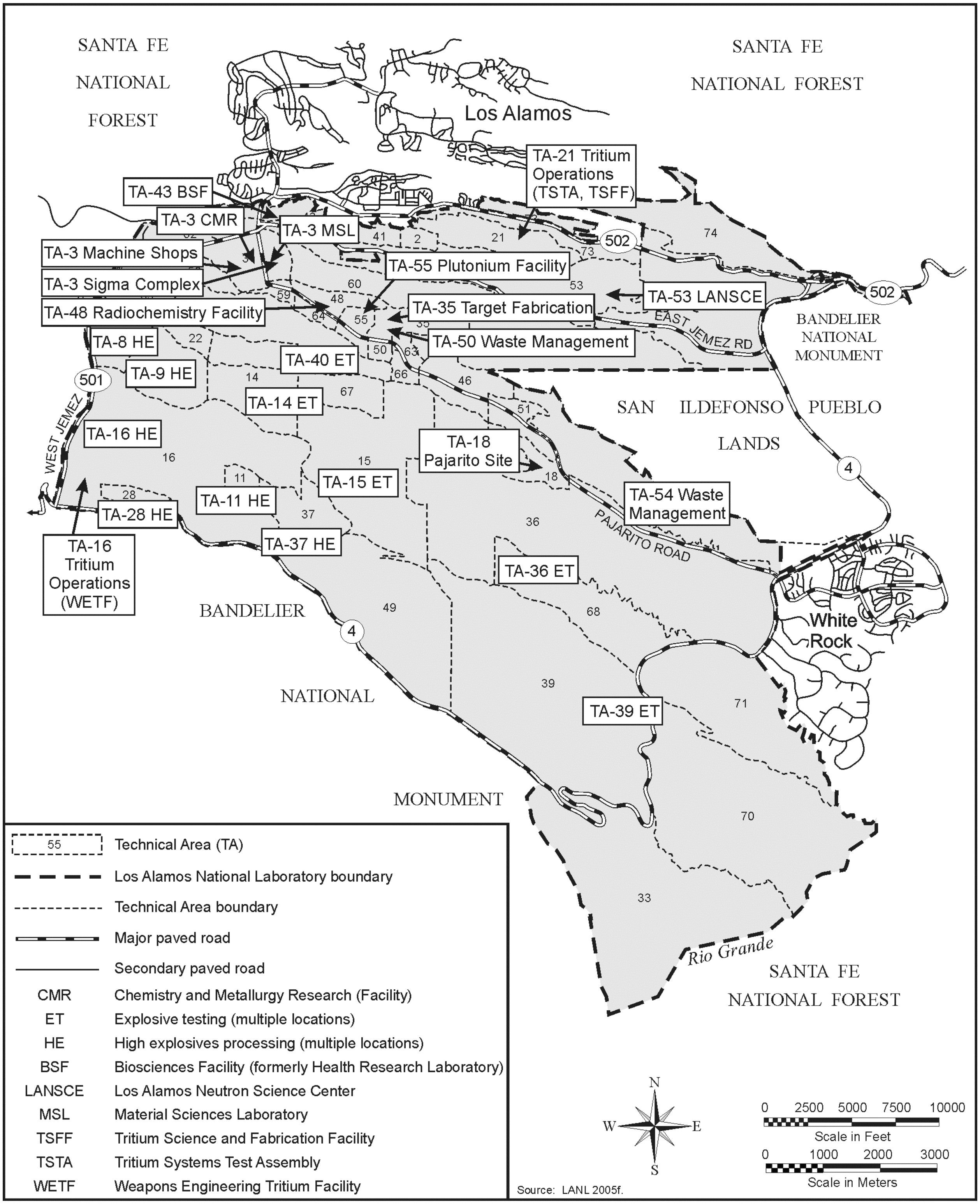


Figure 2–3 Los Alamos National Laboratory Key Facilities

Definition of a Key Facility

The definition of each Key Facility hinges upon operations,[3] capabilities, and location, and is not necessarily confined to a single structure, building, or TA. In fact, the number of structures[4] constituting a Key Facility ranges from one, such as the Metropolis Center, to more than 400 for LANSCE. Key Facilities may also exist in more than a single TA, as is the case with the High Explosives Testing and High Explosives Processing Key Facilities. *SWEIS Yearbooks* discuss each of the 15 Key Facilities from three aspects: substantial facility construction and modifications, types and levels of operations, and operations data by calendar year from publication of the *1999 SWEIS* through 2005. Each of these three aspects is given perspective by comparing them to projections made in the *1999 SWEIS*. This comparison provides an evaluation of whether or not data resulting from LANL operations continue to fall within the environmental envelope established in the *1999 SWEIS* ROD. The remainder of LANL facilities are called "non-Key," not because they are any less important to critical research and development activities, but because they did not fit the criteria of a Key Facility.

This SWEIS also describes changes that have occurred at non-Key Facilities. Although operations at non-Key Facilities do not individually contribute substantially to environmental impacts, non-Key Facilities represent a substantial fraction of LANL facilities. Non-Key Facilities comprise all or the majority of the facilities at 30 of the 49 TAs located on about 14,200 acres (5,750 hectares) of LANL's 25,600 acres (10,360 hectares) of land. Non-Key Facilities house about half the LANL workforce and include such important buildings and operations as the Center for Integrated Nanotechnology, the National Security Sciences Building and, the TA-46 Sanitary Wastewater System Plant.

Nuclear and Radiological Facility Designations

As previously noted in Chapter 1, Key Facilities in the *1999 SWEIS* included 42 of the 48 Hazard Category 2 and Category 3 nuclear structures at LANL.[5] Subsequently, DOE and LANL have reclassified some buildings so that there are now fewer Hazard Category 2 and 3 nuclear structures.

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[3] As used in the 1999 SWEIS and SWEIS Yearbooks, facility operations include three categories of activities: research, production, and services to other LANL organizations. Research is both theoretical and applied. Examples include modeling of the subatomic investigations and collaborative efforts with industry. Production involves delivery of a product to a customer, such as radioisotopes to hospitals and the medical industry. Examples of services provided to other LANL facilities include utilities and infrastructure support, analysis of samples, environmental surveys, and waste management.
[4] Structures may be buildings or any other engineered object such as test stations, manholes, and trailers.
[5] The identification of nuclear facilities is based upon the official list maintained by the Los Alamos Site Office; information in this SWEIS is as of October 2005 (DOE and LANL 2005).

Table 2–3 presents the Key and non-Key Facilities identified in the *1999 SWEIS*, the structures currently listed as nuclear facilities, and their nuclear hazard categories (DOE and LANL 2005). There are now 15 structures or areas, 11 potential release sites, as well as the site-wide transportation capability, making a total of 27 nuclear facilities on the list. Many of the facilities that were classified as nuclear facilities in 1999 have been downgraded to radiological facilities[6] due to reductions in the amount of radioactive material in these facilities, or because the facilities have been decontaminated and decommissioned. Since the *1999 SWEIS*, the TA-54 Radioactive Materials, Research, Operations, and Demonstration Facility; the TA-48 Radiochemistry and Hot Cell Facility; the TA-21 Tritium Science Test Assembly; and the TA-3 Sigma Complex have been removed from the list. With these reductions in nuclear hazard categorizations, some facilities also have had their security hazard categorizations reduced. In addition, the new Decontamination and Volume Reduction System (TA-54) has been added to the list of nuclear facilities (June 2004) as a Hazard Category 2 nuclear facility. Several potential release sites, including MDAs, have also been added to the list of nuclear hazard facilities.

With the issuance of Nuclear Safety Management regulations (Title 10 *Code of Federal Regulations* [CFR] Part 830) on January 10, 2001, onsite transportation is also addressed relative to its nuclear hazard categorization. When the *1999 SWEIS* was published, onsite transportation was considered part of the affected environment. The onsite transportation of nuclear materials greater than or equal to Hazard Category 3 quantities is addressed in a NNSA-approved safety analysis (LANL 2003h).

Overview of Key Facility Capabilities and Changes

The following are brief descriptions of Key Facilities, their capabilities, and changes that have occurred since the publication of the *1999 SWEIS*. This discussion includes information on the location (TA) of each Key Facility, the building or buildings considered part of the Key Facility, and respective nuclear hazard categorizations. Emphasis is placed on the capabilities for which the facility maintains equipment and expertise and any changes that may have occurred since 1999. Subsequent chapters of this SWEIS will evaluate each alternative (No Action, Reduced, and Expanded) in terms of how it could impact the level of activity within each Key Facility capability, as well as major projects planned at any non-Key Facility.

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[6] *Radiological facilities are defined as areas or activities that contain or use less than Hazard Category 3 inventories as listed in Table A.1 DOE-STD-1027-92, but where the amount of radioactive material present is sufficient to create a "radiological area" as defined by 10 CFR Part 835. Sealed radioactive sources, material in U.S. Department of Transportation Type B containers, and structures whose only source of radiation is machine produced x-rays may be excluded. The identification of radiological facilities is based upon the official list maintained by the Los Alamos Site Office as of November 2002 (LANL 2002h).*

Table 2–3 Los Alamos National Laboratory Key and Nuclear Facilities – *1999 SWEIS* and 2005 Listings

Key Facility and Location	*1999 SWEIS* Facility or Structure	*1999 SWEIS* Nuclear Hazard Category	*2005 Listing* Facility or Structure	*2005 Listing* Nuclear Hazard Category
Chemistry and Metallurgy Research Building (TA-3)	Chemistry and Metallurgy Research Building	2	Chemistry and Metallurgy Research Building	2
Machine Shops (TA-3)				
Materials Science Laboratory (TA-3)				
Sigma Complex (TA-3)	Sigma Building	3		
	Thorium Storage	3		
High Explosives Processing (TA-8 and TA-16)	Radiography Facility	2	Radiography Facility	Radiological
	Isotope Building	2		
	Experimental Science	2	Experimental Science	Radiological
	Intermediate Device Assembly	2	Intermediate Device Assembly	Radiological
High Explosive Testing (various TAs)				
Tritium Facilities (TA-16 and TA-21)	Weapons Engineering Tritium Facility	2	Weapons Engineering Tritium Facility	2
	Tritium System Test Assembly	2	Tritium Systems Test Assembly	Radiological
	Tritium Science and Fabrication Facility	2	Tritium Science and Fabrication Facility	Radiological
Pajarito Site (TA-18)	Critical Assembly and Storage Area 1	2	Los Alamos Critical Experiment Facility (whole facility)	2
	Hillside Vault	2		
	Critical Assembly and Storage Area 2	2		
	Critical Assembly and Storage Area 3	2		
Target Fabrication Facility (TA-35)				
Bioscience Facilities (various TAs)			Health Research Laboratory	Radiological
Radiochemistry Facility (TA-48)	Radiochemistry and Hot Cell Facility	3	Radiochemistry and Hot Cell Facility	Radiological
Radioactive Liquid Waste Treatment Facility (TA-50)	Main Treatment Plant	2	Main Treatment Plant, Pretreatment Plant	2
	Low-Level Waste Tank Farm		Low-level liquid influent tanks, treatment effluent tanks, low-level sludge tanks	2
	Acid and Caustic Tank Farm		Acid and caustic waste holding tanks	2
	Holding Tank		Holding Tank	2

Key Facility and Location	1999 SWEIS		2005 Listing	
	Facility or Structure	Nuclear Hazard Category	Facility or Structure	Nuclear Hazard Category
LANSCE (TA-53)	Experimental Science	3		
			1 L Target	3
			Lujan Center ER-1/2 Actinide	3
			Area A-East	3
Solid Radioactive and Chemical Waste Facilities (TA-50 and TA-54)	Radioactive Materials, Research, Operations, and Demonstration	2 [a]	Actinide Research Technology Instruction Center	
	Waste Characterization, Reduction, and Repackaging Facility Building	2	Waste Characterization, Reduction, and Repackaging Facility	3
	Nondestructive Analysis Mobile Activities		Nondestructive analysis mobile activities outside TA-50-69	2
	Drum Storage		Drum Staging, Storage, and Equilibration Pad outside TA-50-69	2
	Low-Level Radioactive Waste Storage and Disposal Area G	2	Waste Storage and Disposal Facility (Area G) [b]	2
	Transuranic Waste Inspectable Storage Project	2 [a]		
	Transuranic Storage Dome (Building)	2	Waste Assay Facility	2
	Transuranic Drum Preparation	2		
	Radioassay and Nondestructive Testing Facility	2	Radioassay and Nondestructive Testing Facility	2
	Transuranic Storage Domes (3)	2	Transuranic Waste Management Domes (12)	(c)
	Sheds (4)	2	Sheds (4)	(c)
	Temporary Retrieval Dome	2		
	Tension Support Domes (5)	2		
	Decontamination and Volume Reduction Glovebox		Decontamination and Volume Reduction System	2
	Storage Pad/Transuranic Storage	2	Pad 10 (previously pads 2 and 4)	2
	Storage Pad	2		

Key Facility and Location	1999 SWEIS		2005 Listing	
	Facility or Structure	*Nuclear Hazard Category*	*Facility or Structure*	*Nuclear Hazard Category*
Plutonium Facilities Complex (TA-55)	Plutonium Facility	2	Plutonium Facility	2
	Nuclear Material Storage	2		
			Staging Facility	2
			Safe Secure Transport Facility	2
Non-Key Facilities (TA-3, TA-33, and TA-35)	Physics Building	3	Physics Building	Radiological
	Source storage	2		
	Calibration Building	3		
	Former Tritium Research	3	Former Tritium Research	Radiological
	Nuclear Safeguards Research Facility	3	Nuclear Safeguards Research Facility	Radiological
Site-wide			Site-wide transportation of nuclear materials	2
Potential Release Sites (TA-10, TA-21, TA-35, TA-49, TA-50, TA-53, and TA-54)			Former liquid disposal complex	3
			Material Disposal Area A	2
			Material Disposal Area B	3
			Material Disposal Area T	2
			Material Disposal Area W Sodium Storage Tanks	3
			Wastewater Treatment Plant	3
			Wastewater Treatment Plant (Pratt Canyon)	3
			Material Disposal Area AB	2
			Material Disposal Area C	2
			Underground tank with spent resin	2
			Material Disposal Area H	3

TA = Technical Area, LANSCE = Los Alamos Neutron Science Center.

[a] Data indicate that this building was a nuclear Hazard Category 2 in 1998 and in 2000 so it is included here.

[b] This includes low-level radioactive waste (including mixed waste) storage and disposal in domes, pits, shafts, and trenches; transuranic waste storage in domes and shafts; transuranic legacy waste in pits and shafts; disposal of asbestos in pits and shafts; and operations building for transuranic waste storage.

[c] These structures are included as part of the Waste Storage and Disposal Facility (Area G).

Sources: LANL 2003a, 2004a, 2006g, DOE and LANL 2005.

Capabilities and Other Activities

In the Key Facility framework, a capability refers to the combination of buildings, equipment, infrastructure, and expertise necessary to undertake types or groups of activities and to implement mission assignments. The *1999 SWEIS* defined specific capabilities for each of the 15 Key Facilities based on projections of work (including production, research, and development) anticipated at each Key Facility. In some cases, capabilities at more than one Key Facility may have similar or identical names, but slightly different descriptions and operations. This is because several Key Facilities often work together to support a single mission or program, and work taking place in one area may complement efforts in another location. Unless otherwise noted, the capabilities described in this new SWEIS are the same as those previously defined in the *1999 SWEIS*. With a few exceptions, the capabilities identified in the *1999 SWEIS* ROD for LANL have remained constant since 1999. The exceptions are:

- Movement of the Nonproliferation Training and Nuclear Measurement School, which was briefly located at TA-18 and returned to TA-3 (the Chemistry and Metallurgy Research Building) in 2004, where it will stay until the Chemistry and Metallurgy Research Building is no longer available or until a new Security Category I and II facility is built at TA-48 as part of the Radiological Sciences Institute, of which Phase I is the Institute for Nuclear Nonproliferation Science and Technology (see Appendix G, Section G.3 for details);
- Relocation of the Decontamination Operations Capability from the Radioactive Liquid Waste Treatment Facility to the Solid Radioactive and Chemical Waste Facilities in 2001;
- Loss of Cryogenic Separation Capability at the Tritium Key Facilities in 2001 (LANL 2004f); and
- Transfer of thin film loading of neutron tube targets from the Tritium Key Facilities to Sandia National Laboratories in 2006.

Facility Performance and Other Changes Since the 1999 SWEIS

To evaluate the environmental impacts, the *1999 SWEIS* estimated the level of operations for each capability. If all of these capabilities were conducted at the estimated levels, they would be expected to result in a certain amount of emissions, liquid discharges, and waste. These projected parameters (emissions, liquid, and waste) set the limits for the operations levels. The *1999 SWEIS*, however, was not intended to set stringent limits on the level of activity for a particular capability. In most facilities, the operations levels for all capabilities would not be reached at one time because of the ebb-and-flow nature of the work at LANL. Thus, it is possible to exceed the projected operations level for one capability and still be within the operations limits for the facility.

The facility performance and changes sections of the following Key Facility descriptions summarize the operational performance levels within the defined facility capabilities for the period since the *1999 SWEIS* was published (through the end of 2005). Emphasis is placed on whether any capabilities have been gained or lost and whether the levels of activity have remained within the established environmental impact envelope. Operations data for air emissions, liquid releases (number of NPDES outfalls and effluent quality where applicable), and waste volumes (including transuranic waste, low-level radioactive waste, mixed low-level radioactive waste, and hazardous and chemical wastes) illustrate how the activity levels of each Key Facility have changed over the past 7 years. Quantified information about these changes is provided in **Table 2–5** at the end of this chapter.

2.4.1 Chemistry and Metallurgy Research Building (Technical Area 3)

The Chemistry and Metallurgy Research Building, (Building 3-29), located within TA-3, consists of seven wings that were constructed in 1952; a new wing (Wing 9) was added in 1960 for activities that must be performed in hot cells. The three-story building is a multiple-user facility in which specific wings are associated with different activities. It is the only LANL facility with full capabilities for performing special nuclear material analytical chemistry and materials science. This Key Facility is a Hazard Category 2 nuclear facility.

Chemistry and Metallurgy Research Building at TA-3

The principal capabilities and other activities at the Chemistry and Metallurgy Research Building include:

- Analytical chemistry capabilities involving the study, evaluation, and analysis of radioactive materials;
- Various operations considered essential for the stewardship of uranium products, including uranium processing and handling and storage of highly radioactive materials;
- Destructive and nondestructive analysis employing analytical chemistry, metallographic analysis, measurement of neutron or gamma radiation from an item, and other measurement techniques;
- Nonproliferation training utilizing measurement technologies and special nuclear material housed at the Chemistry and Metallurgy Research Building and other LANL facilities to train international inspection teams for the International Atomic Energy Agency;
- Actinide research and development that may include separation of medical isotopes from targets, processing of neutron sources, and research into the characteristics of materials, including the behavior or characteristics of materials in extreme environments; and
- Fabrication and processing of a variety of materials, including hazardous and nuclear materials, in support of highly enriched uranium processing and research and development on targets, weapons components, and other experimental tasks.

Chemistry and Metallurgy Research Building Performance and Changes Since the *1999 SWEIS*

As discussed in the *1999 SWEIS*, extensive upgrades originally planned for the Chemistry and Metallurgy Research Building would be much more expensive and time-consuming than originally anticipated and only marginally effective in providing the operational risk reduction and program capabilities required to support DOE mission assignments at LANL. As a result, DOE reduced the number of Chemistry and Metallurgy Research Building upgrade projects to those needed to ensure safe and reliable operations. Operations and capabilities are currently restricted due to safety and security constraints; the Chemistry and Metallurgy Research Building is not operational to the extent needed to meet the NNSA requirements established in the *1999 SWEIS* for the then-foreseeable future. In November 2003, NNSA issued an *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2003d), which evaluated the potential environmental impacts resulting from activities associated with consolidating and relocating the mission-critical Chemistry and Metallurgy Research Building capabilities at LANL and replacement of the Chemistry and Metallurgy Research Building. In its ROD issued in February 2004, NNSA decided to replace the Chemistry and Metallurgy Research Building with a new Chemistry and Metallurgy Research Replacement Facility at TA-55 and to completely vacate and demolish the Chemistry and Metallurgy Research Building (69 FR 6967). The ROD stated that the new facility would be established as a Hazard Category 2 nuclear facility. NNSA is currently re-evaluating the need for this facility as part of its evolution of Complex Transformation, as discussed in Chapter 1, Section 1.5, of this SWEIS.

The principal capabilities and activities described for this Key Facility either operated within the bounds of the *1999 SWEIS* over the past 7 years or were inactive. The capability to evaluate secondary assemblies used in nuclear weapons through destructive and nondestructive analyses has not been used since 1999. Mechanical and chemical processing of sealed sources is no longer allowed in the Chemistry and Metallurgy Research Building per the Facility Authorization Basis, so there were no actinide processing operation activities. The research and development project related to spent nuclear fuel and long-term storage was completed in 1997 when the final shipment from Omega West was sent to the Savannah River Site. In addition, there were no activities related to the spent nuclear fuel capability and long-term storage research. Regarding the fabrication and metallography capability, the project to produce molybdenum-99 was terminated in 1999, the Ulysses Project was never initiated, and the equipment was removed in preparation for the Bolas Grande Project.

Modifications to Wing 9 were started in 1999 to support the Bolas Grande Project. This project would provide disposition of large vessels previously used to contain experimental explosive shots involving plutonium. The National Environmental Policy Act (NEPA) coverage for this project was provided by a *Supplemental Analysis Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Bolas Grande Project* (DOE/EIS-0238-SA-03) (DOE 2003c). As of the end of 2007, implementation of this project was pending approval.

Less than half the projected number of samples was analyzed annually in support of actinide research and processing activities. The Chemistry and Metallurgy Research Building's capability for metallurgical microstructural and chemical analysis and compatibility testing of actinides was used to analyze and test an average of 100 samples per year, equal to the projected *1999 SWEIS* rate. Demonstration of the actinide decontamination technology was completed in 2001.

Radiological air emissions remain below *1999 SWEIS* projections, except for technetium-99 and germanium-68, which were each present in 1 year, and strontium-90, which was present in 2 years in dosimetrically insignificant amounts and were not identified in the *1999 SWEIS*. The Chemistry and Metallurgy Research Building operated with one NPDES-permitted outfall, as projected in the *1999 SWEIS*. Except for 2001, the outfall discharge rates have regularly exceeded *1999 SWEIS* projections (500,000 gallons per year) by as much as 4 million gallons per year. In 2004, a dechlorination system was added to prevent NPDES permit noncompliances for chlorine at this outfall. Chemical waste, low-level radioactive waste, and mixed low-level radioactive waste were below their projected amounts. In 2002, mixed transuranic waste quantities were slightly higher (21 cubic yards or 16 cubic meters per year) than the *1999 SWEIS* projections (17 cubic yards or 13 cubic meters per year). In 2001, transuranic waste quantities generated were 66 percent higher than projected due to remodeling activities at the Chemistry and Metallurgy Research Building (17 cubic yards or 13 cubic meters per year). Quantities generated in all other years were below projections.

2.4.2 Sigma Complex (Technical Area 3)

The Sigma Complex Key Facility, also located in TA-3, consists of four principal buildings: the main Sigma Building (3-66), the Beryllium Technology Facility (3-141), the Press Building (3-35), and the Thorium Storage Building (3-159). The Sigma Complex supports a large, multidisciplinary technology base in materials fabrication science. This facility is used mainly for materials synthesis and processing, characterization, fabrication, joining, and coating of metallic and ceramic items. The Sigma Complex Key Facility had two Hazard Category 3 nuclear facilities identified in the *1999 SWEIS*, 3-66 and 3-159. However, in April 2000, Building 3-159 was downgraded from a Hazard Category 3 nuclear facility to a radiological facility and removed from the nuclear facilities list. In March 2001, Building 3-66 also was downgraded from a Hazard Category 3 nuclear facility and removed from the nuclear facilities list. In September 2001, the Sigma Building, the Press Building, and the Thorium Building were placed on the radiological facility list. The Beryllium Technology Facility is a nonnuclear moderate hazard facility.

Sigma Building at TA-3

The primary capabilities and activities conducted within the Sigma Complex are:

- Research and development on materials fabrication, coating, joining, and processing, including materials synthesis and processing work related to research and development on fabricating items from materials that are difficult to work with;
- Characterization of materials, which includes understanding the properties of metals, metal alloys, ceramic-coated metals, and other similar combinations, as well as the effects on these materials and their properties caused by aging, chemical attack, mechanical stresses, and other agents; and
- Fabrication of metallic and ceramic items, including fabricating and working with metallic and ceramic materials and various combinations.

Sigma Facility Performance and Changes Since the *1999 SWEIS*

The *1999 SWEIS* projected substantial facility changes for the Sigma Building itself. Three of five planned upgrades are complete; one is essentially complete; and one remains incomplete. They include:

- Replacement of graphite collection systems (completed in 1998);
- Modification of the industrial drain system (completed in 1999);
- Replacement of electrical components (essentially completed in 2000; however, add-on assignments will continue);
- Roof replacement (most of the roof was replaced in 1998 and 1999; however, additional work needs to be performed); and
- Seismic upgrades (not started).

In addition to the five planned upgrades, three additional upgrades were completed in 2003:

- Replacement of liquid nitrogen Dewar container,
- Painting the exterior of the Sigma Building, and
- Reinstallation of the utilities to activate the Press Building.

Construction of the Beryllium Technology Facility, formerly known as the Rolling Mill Building, was completed in 1999. This state-of-the-art beryllium processing facility has 16,000 square feet (1,490 square meters) of floor space, of which 13,000 square feet (1,210 square meters) are used for beryllium operations. The remaining 3,000 square feet (280 square meters) are for general metallurgical activities. The mission of the new facility is to maintain and enhance the beryllium technology base that exists at LANL and to establish the capability for fabrication of beryllium powder components. Research also will be conducted at the Beryllium Technology Facility, including research concerning the energy- and weapons-related use of beryllium metal and beryllium oxide. The beryllium equipment for this new facility was moved in stages from the

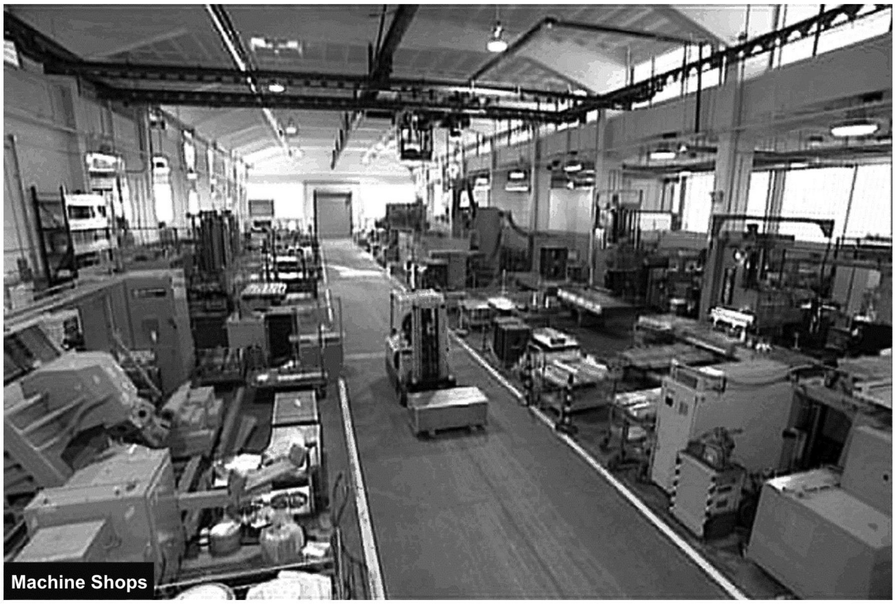
Machine Shops Key Facility into the Beryllium Technology Facility in 2000. The authorization to begin operations in the Beryllium Technology Facility was granted by NNSA in January 2001.

The research and development activity and the fabrication of metallic and ceramic items activity have operated below the levels projected in the *1999 SWEIS*. Parts of the characterization of materials activity operated above the levels projected in the *1999 SWEIS*. Other activities, including analysis of tritium reservoirs and development of a library of aged non-special nuclear material, operated below the levels projected in the *1999 SWEIS*.

Radiological air emissions were below projected levels identified in the *1999 SWEIS*. Thorium-230 and uranium-235 were not identified in the *1999 SWEIS* as contributors to the Sigma Building's overall air emission makeup, but have been present in dosimetrically insignificant amounts (less than a microcurie). In early 2000, stack monitoring was discontinued because potential emissions from the monitored stacks were sufficiently low that such monitoring was no longer warranted for compliance. Since 1994, the facility has operated with two NPDES-permitted outfalls, but only one outfall was used. Annual outfall discharge rates were within *1999 SWEIS* projections for 1999 through 2005, except for 2003, when the facility's effluent exceeded NPDES permit levels by 4 percent. A dechlorination system was installed in October 2003 to prevent further noncompliance events (LANL 2004d). Chemical wastes exceeded projections in 2002 by 49,400 pounds (22,400 kilograms) due to structure rehabilitation and disposal of equipment and other material debris resulting from bringing the Press Building back on line. In 2004, chemical waste projections were again exceeded because the graphite machine shop at Sigma generated a lot of graphite waste that could not be disposed of in the Los Alamos County Landfill. Over a 4-year period, the LANL Pollution Prevention office has searched unsuccessfully for a company to take the graphite powder for recycle. During this time, 115 55-gallon drums (about 24,400 kilograms) of nonhazardous graphite waste accumulated. As a last resort, all the drums were disposed of in June 2004. Currently, drums are being disposed of as they are filled, about five at a time. Also included in the chemical waste volume disposed of in 2004 were two 20-foot transportainers containing 32,000 pounds (about 14,500 kilograms) of beryllium waste from the Beryllium Technology Facility.

2.4.3 Machine Shops (Technical Area 3)

The main Machine Shops Complex, located in TA-3, consists of two buildings, the Nonhazardous Materials Machine Shop (3-39) and the Radiological Hazardous Materials Machine Shop (3-102). Both buildings are located within the same exclusion area in the southwestern quadrant of TA-3. A 125-foot-long (38-meter-long) corridor connects the two buildings. In September 2001, Building 3-102 was placed on the radiological facility list. Historically, LANL has maintained a prototype capability in support of research and development for nearly all of the nuclear weapons components (parts) designed at LANL.



The primary capabilities and activities conducted at the Machine Shops Complex include:

- Fabrication of specialty components including unique, unusual, or one-of-a-kind parts, fixtures, tools, or other equipment for use (1) in various applications for destructive testing, (2) as replacement parts for the Stockpile Stewardship Program, and (3) in gloveboxes;
- Fabrication using unique or exotic materials such as depleted uranium and lithium and its compounds; and
- Dimensional inspection of finished fabricated components including measurements to ensure correct size and shape.

Machine Shops Performance and Changes Since the *1999 SWEIS*

Although not projected in the *1999 SWEIS*, building maintenance and upgrades were performed on Buildings 3-39 and 3-102. The heat-treating capability of Building 3-66 was duplicated in Building 3-102. Beryllium equipment was moved to the Beryllium Technology Facility from Building 3-39. Depleted uranium was added to the materials compatibility study, and controlled storage areas were added to Building 3-39 in support of the weapons program. In 2004, additional electrical upgrades of Building 3-39 were completed. Also in 2004, one facility modification provided space to house a vault for classified work at the Secret Restricted Data level in support of the Security and Safeguards Division's Joint Conflict and Tactical Simulation System. The Joint Conflict and Tactical Simulation System Laboratory consists of a vault for internal communications, an office area, and a stand-alone classified computing system, all of which were installed in room 27 of Building 3-39. The project involved adding walls inside the existing structure.

In 2005, modular units were constructed on the north side of Building 3-39 to conduct upgrades of test equipment, tooling, computer numerical controlled programming, and controls for TA-55 activities; these units are prototypes for the Plutonium Facilities Complex. All manufacturing science and technology activities conducted in Building 3-39 are nonhazardous. Other minor activities conducted in this space include robotics testing, tensile testing, and welding activities.

The principal activities listed above operated below the levels projected in the *1999 SWEIS*, including fabrication of specialty components and fabrication with unique materials. Dimensional inspection was provided for the fabrication activities.

Since 1999, radiological air emissions from the Machine Shops have been below those projected in the *1999 SWEIS*. The following nuclides were not identified in the *1999 SWEIS*, but have been present in dosimetrically insignificant amounts (microcuries): americium-241, plutonium-239, thorium-228, thorium-230, thorium-232, uranium-234, and uranium-235. The facility has no NPDES-permitted outfalls. In the past 6 years, transuranic, low-level radioactive, and chemical wastes either were not produced or their production was less than predicted in the *1999 SWEIS*. Until 2001, small quantities (less than 1 cubic yard or 1 cubic meter per year) of mixed low-level radioactive waste were produced, although none was projected in the *1999 SWEIS*.

2.4.4 Materials Science Laboratory (Technical Area 3)

The Materials Science Laboratory, located on the southeastern edge of TA-3, is composed of several buildings containing 27 laboratories, 60 offices, 21 materials research areas, and various support areas. The main building (3-1698) is a two-story structure with approximately 55,000 square feet (5,110 square meters) of floor space. The building is designed to accommodate scientists and researchers, including participants from academia and industry whose focus is on materials science research. This building first opened in 1993. In September 2001, the Materials Science Laboratory was placed on the radiological facility list, where it remains today.

Materials Science Laboratory at TA-3

The principal capabilities and activities conducted at the Materials Science Laboratory include:

- Materials processing to support formulation of a wide range of useful materials through the development of materials fabrication and chemical processing technologies;
- Mechanical testing in laboratories where materials are subjected to a broad range of mechanical loadings study their fundamental properties and characterize their performance;
- Development of advanced materials for high-strength and high-temperature applications; and
- Characterization of materials utilizing x-ray, optical metallography, spectroscopy, and surface science chemistry to understand the properties and processing of these materials and to apply that understanding to materials development.

Materials Science Laboratory Performance and Changes Since the *1999 SWEIS*

The *1999 SWEIS* projected completion of the top floor of the Materials Science Laboratory. This project remains unscheduled and unfunded. Construction of the Material Science and Technology Office Building in the southeast quadrant of TA-3 was initiated in 2003 and completed in 2004. This new building provides materials science and technology staff with permanent offices in place of a cluster of temporary trailers and transportable structures.

The principal capabilities listed above have been maintained at the levels projected in the *1999 SWEIS* or, in some cases, the processes have been improved. Radiological air emissions from this Key Facility have been sufficiently small, so measurements of radionuclides have not been necessary to meet facility or regulatory requirements. The facility has no NPDES-permitted outfalls. All generated wastes have been maintained below levels identified in the *1999 SWEIS*, except during 2000, when chemical wastes exceeded projections by approximately 620 pounds (280 kilograms) due to the generation of industrial solid waste by routine maintenance activities.

2.4.5 High Explosives Processing (Technical Areas 8, 9, 11, 16, 22, and 37)

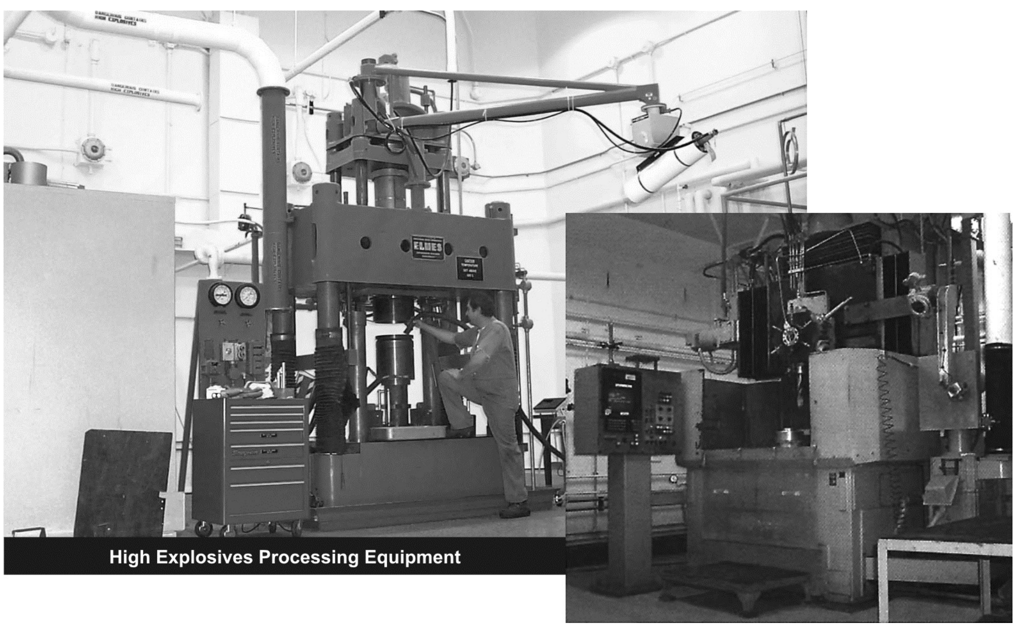
The High Explosives Research and Development and Processing Facilities are located in six TAs: TA-8, TA-9, TA-11, TA-16, TA-22, and TA-37. Most of these facilities were originally designed and built for production-scale operations during the early and mid-1950s and produced high explosives components for nuclear weapons in the U.S. stockpile reserve for several years. LANL has historically upgraded and modernized processing equipment in these facilities to provide prototype high explosives components to meet the needs of the Nevada Test Site Program, hydrodynamic tests at LANL, detonator design and production, and other high explosives activities.

Over the last few years, an average of 1,000 to 1,500 high explosives parts per year has been typically fabricated at LANL. Building types within this Key Facility consist of production and assembly facilities, analytical laboratories, explosives storage magazines, and a facility for treatment of explosive-contaminated wastewaters. At the time of the *1999 SWEIS*, this Key

Facility had one Hazard Category 2 nuclear building (the Radiography Facility) at TA-8. This building was downgraded to a radiological facility in 2005.

The primary capabilities and activities conducted at these facilities include:

- High explosives synthesis and production activities including explosive-manufacturing capabilities such as synthesizing new explosives and manufacturing pilot-plant quantities of raw explosives and plastic-bonded explosives;
- High explosives and plastics development and characterization for any explosives used in nuclear weapons technology;
- High explosives and plastics fabrication where high explosives powders are typically compacted into solid pieces and machined to final specified shapes;
- Assembly of test devices ranging from full-scale nuclear explosive-like assemblies (where fissile material has been replaced by inert material) to material characterization tests;
- Safety and mechanical testing of explosives samples, including tensile, compression, and creep properties; and
- Research, development, and fabrication of high-power detonators including detonator design; printed circuit manufacture; metal deposition and joining, plastic materials technology; explosives loading, initiation, and diagnostics; lasers; and safety of explosives systems design development and manufacturing activities.



High Explosives Processing Equipment

High Explosives Processing Facility Performance and Changes Since the *1999 SWEIS*

Although not projected in the *1999 SWEIS*, a real-time radiography capability was added to this Key Facility and became operational in 2001. Buildings 16-220, 16-222, 16-223, 16-224, 16-225, and 16-226 were vacated and demolished. Planning and modification work at TA-9 to consolidate high explosives formulation operations previously conducted at Building-16-340 continued. Explosives stored at TA-28 were moved to TA-37 for storage, and TA-28 is no longer used by the High Explosives Processing Key Facility. The Building-16-1409 incinerator associated with the burn operations of high explosives-contaminated combustible trash underwent Resource Conservation and Recovery Act (RCRA) clean-closure and was dismantled and scrapped. RCRA closure has also been obtained for TA-16-401 and TA-16-406, which are units at the TA-16 Burn Ground. Closure of MDA P, which began in 1997, was completed in 2002. An estimated total of about 20,800 cubic yards (15,900 cubic meters) of hazardous waste and 21,300 cubic yards (16,300 cubic meters) of other waste were excavated and shipped to a disposal facility. A total of 6,600 cubic yards (5,000 cubic meters) of material were shipped and used as clean fill at MDA J. The aboveground wastewater storage tank system was placed into service at TA-9 in 1998. The new High Explosives Wastewater Treatment Facility at TA-16 is a centralized treatment plant that became operational in 1997 and discharges approximately 35,000 gallons (132,000 liters) per year of treated effluent at an NPDES-permitted outfall. RCRA closure activities continued for the TA-16-387 flash pad and the TA-16-394 burn tray, resulting in removal of a total of about 860 cubic yards (660 cubic meters) of hazardous wastes. A burn unit was upgraded to improve capacity and efficiency and minimize environmental impacts. In 2000, the Cerro Grande Fire swept across TA-16, burning V-Site (an inoperable historic Manhattan Project era site), but all other buildings were placed into a safe closed condition, and fire personnel bulldozed a fire line around the Weapons Engineering Tritium Facility. No other High Explosives Processing facilities were destroyed, although some structures were damaged at TA-9, TA-11, and TA-37. All high explosives burning operations were consolidated at TA-16-388 and TA-16-399. Burning operations generally are limited to TA-16-388, although TA-16-399 is still available for burning of bulk high explosives.

In 2004, construction began on a new office building at the Hydrotest Design Facility, Building 22-120. Staff occupied the building in March 2005. In 2005, construction was completed on the new High-Power Detonator Production Facility, Building 22-115, and magazine 22-118. Use of the structures began in December 2005.

The principal activities at this Key Facility as described above were performed at levels equal to or less than those projected in the *1999 SWEIS*. No stacks have required monitoring for radiological air emissions. All non-point sources are measured using ambient monitoring. These facilities currently use 3 NPDES-permitted outfalls, compared to the 11 outfalls projected in the *1999 SWEIS*. Annual NPDES discharge rates since 1999 have remained below the levels projected in the *1999 SWEIS*. The quality of the NPDES effluent exceeded permit levels one time in March 2001 (LANL 2002d). Chemical wastes consistently exceeded *1999 SWEIS* projections for various reasons. Activities that caused these exceedances, some of which were covered by separate NEPA review, included: placement in storage of scrap metal for recycle due to the DOE radiological area release moratorium; cleanup of MDA R Legacy Material Action Project activities; and demolition and waste disposition of Buildings TA-16-220, -222, -223, -224, -225, and -226. Transuranic and mixed low-level radioactive waste generation has remained below the levels identified in the *1999 SWEIS*. Low-level radioactive waste quantities exceeded *1999 SWEIS* projections in 2003 by 12 cubic meters.

2.4.6 High Explosives Testing (Technical Areas 14, 15, 36, 39, and 40)

The High Explosives Testing Key Facility, located in five TAs (TA-14, TA-15, TA-36, TA-39, and TA-40), comprises more than one-half (22 of 40 square miles [14,080 of 25,600 acres (5,698 of 10,360 hectares)]) of the land area occupied by LANL and has 16 associated firing sites. The firing sites are in remote locations and canyons and specialize in experimental studies of the dynamic properties of materials under high-pressure and -temperature conditions. The facilities that make up the explosives testing operations are used primarily for research, development, test operations, and detonator development and testing related to the DOE Stockpile Stewardship Program. Major High Explosives Testing buildings are located at TA-15 and include the Dual Axis Radiographic Hydrodynamic Test Facility (TA-15-312) and the TA-15-306 firing site. Building types consist of preparation and assembly facilities, bunkers, analytical laboratories, high explosives storage magazines, and offices.


Typical Nonnuclear High Explosive Test

The major capabilities and categories of high explosives testing activities include:

- Hydrodynamic tests consisting of a dynamic integrated systems test of a mock-up nuclear package, during which the high explosives are detonated and the resulting motions and reactions of materials and components are observed and measured;
- Dynamic experiments to provide information regarding the basic physics of materials or to characterize the physical changes or motion of materials under the influence of high explosives detonations;
- Explosives research and testing activities conducted primarily to study the properties of the explosives themselves compared to explosive effects on other materials;
- Munitions experiment testing conducted to study the influence of external stimuli on explosives;
- High explosives pulsed-power experiment testing conducted to develop and study new concepts based on the use of explosively-driven electromagnetic power systems;

- Calibration, development, and maintenance testing conducted primarily to prepare for more elaborate tests, including tests to develop, evaluate, and calibrate diagnostic instrumentation or other systems; and
- Other explosives testing activities such as development of advanced high explosives and work to improve weapons evaluation techniques.

High Explosives Testing Facility Performance and Changes Since the *1999 SWEIS*

As projected in the *1999 SWEIS*, the Dual Axis Radiographic Hydrodynamic Test Facility was constructed. The first axis became operational in 2001 and the second axis was tested in late 2004. In 2005, failing accelerator cells at the Dual Axis Radiographic Hydrodynamic Test Facility Axis II were refurbished to bring them up to design specifications. Construction was also initiated on a concrete ramp and an access door into the Dual Axis Radiographic Hydrodynamic Test Facility Axis II; this access door will facilitate accelerator cell and equipment maintenance within the axis. As required by the *Dual Axis Radiographic Hydrodynamic Test Facility Final Environmental Impact Statement* (DOE 1995a), the Pulsed High Energy Radiation Machine Emitting X-Rays Facility (TA-15-184) was deactivated in March 2004. Although not projected, the Applied Research Optics Electronics Laboratory and adjacent parking lot were constructed. The outfall at TA-36 was eliminated from the NPDES permit.[7] Closeout of outfall 03A-028 located at the Pulsed High Energy Radiographic Machine Emitting X-rays Facility (Building 15-184) was initiated in 2005. Temporary closeout of aboveground storage tanks located at Buildings 15-306, 15-310, and 36-86 was initiated in 2005. These tanks (15-324, 15-325, 15-473, 15-474, 36-141, 36-142) previously contained dielectric mineral oil in support of radiographic experiments. Several structures within the High Explosives Testing Key Facilities were decommissioned and removed during 2005. These structures include TA-15-8, TA-15-46, TA-15-138, TA-15-141, TA-40-4, TA-40-19, and TA-40-43. Construction was also completed on the High Explosives Preparation Facility, the Camera Room at TA-36-12, the carpenter shop at TA-15, the X-Ray Calibration Facility at TA-15, and a warehouse at TA-15.

The 2000 Cerro Grande Fire destroyed or damaged equipment, materials, and storage structures within this Key Facility. Damaged buildings were subsequently decontaminated and demolished. As approximately 14 facilities were destroyed and approximately 28 additional facilities were damaged, the Cerro Grande Fire has had a long-term effect on the High Explosives Testing operations. Management has limited high explosives testing at TA-40 to tests that are contained because of adjacent steep canyon walls and excess forest fuels. All burned structures have been replaced.

As stated above, the principal activities have operated below the levels projected in the *1999 SWEIS*. During 2005, foam was used to reduce particulate emissions during dynamic experiments. Aqueous foam was used on explosive tests that included beryllium. Use of the foam continues for certain tests, but plans are to move these tests into containments.

[7] *This outfall was originally accounted for with the non-Key Facilities.*

No stacks require monitoring for radiological air emissions at this Key Facility; all non-point sources are measured using ambient monitoring. Chemical usage has been below that projected in the *1999 SWEIS*. This Key Facility has two functional NPDES-permitted outfalls, compared to 14 discussed in the *1999 SWEIS*. Total NPDES discharge volumes for these two outfalls were within *1999 SWEIS* projections for 2002 through 2005 and exceeded projected levels for 3 years (1999 through 2001). It should be noted that, prior to 2002, discharge rates were estimated and may have resulted in an overestimate of volume. A water meter was installed in 2002 to provide more accurate flow data. The quality of effluent from the Dual Axis Radiographic Hydrodynamic Test Facility exceeded NPDES permit levels one time during the period of interest in September 2001; changes were implemented and the effluent met requirements by the next sampling period (LANL 2002d). Chemical wastes produced were below *1999 SWEIS* projections, except in 2000, when chemical wastes exceeded projections due to cleanup performed following the Cerro Grande Fire. Construction and demolition debris accounted for an estimated 20,600 pounds (9,360 kilograms) of nonhazardous chemical waste that was disposed of in sanitary landfills. The remaining chemical waste was shipped offsite to approved hazardous waste facilities for treatment and disposal. Production of transuranic, low-level radioactive, and mixed low-level radioactive wastes was below the levels identified in the *1999 SWEIS* for years 1999 through 2005, with the exception of 2004, when mixed low-level radioactive wastes exceeded projections by approximately 18 cubic meters (640 cubic feet). The excess mixed low-level radioactive waste consisted mostly of lead bricks and plates used for shielding; the lead was contaminated with beryllium and depleted uranium. This was the result of an effort across the High Explosive Testing TAs to remove unwanted lead from the site.

2.4.7 Tritium Facilities (Technical Area 16 and Technical Area 21)

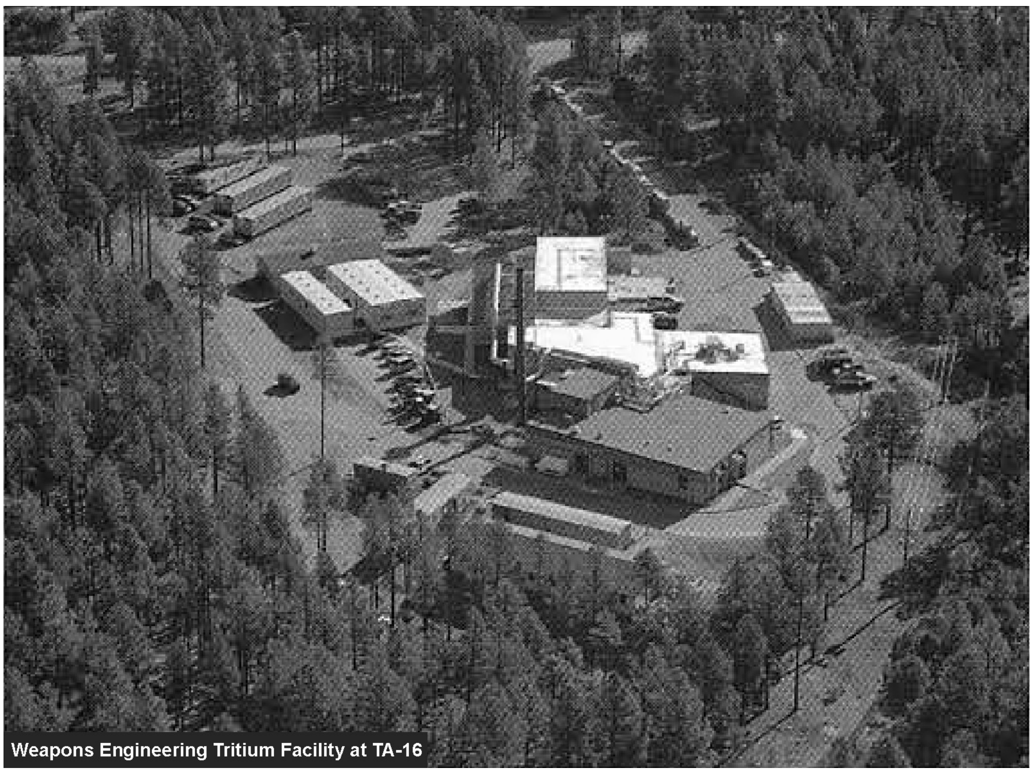
This Key Facility consists of tritium operations performed within TA-16 and TA-21. Tritium operations were conducted in three buildings over the past 7 years: the Weapons Engineering Tritium Facility (Building 16-205), the Tritium Science and Fabrication Facility (Building 21-209), and the Tritium Systems Test Assembly (Building 21-155N). These facilities support several tritium-related programs at LANL and play an important role in DOE energy research and nuclear weapons programs. The primary potential environmental impacts from tritium operations at LANL reside with these facilities.

The Weapons Engineering Tritium Facility at TA-16 is a Hazard Category 2 nuclear facility. It is a single-level structure with approximately 7,890 square feet (730 square meters) of floor area.

The Tritium Science and Fabrication Facility is a tritium research and development facility located in Building 21-209 at TA-21. This facility is located east of the Tritium Systems Test Assembly Facility at the DP East research area. During 2004, the tritium inventory at the Tritium Science and Fabrication Facility was reduced to less than 0.07 pounds (30 grams). This facility was then reclassified from a Hazard Category 2 to a Hazard Category 3 facility in August 2004. Programmatic activities at the Tritium Science and Fabrication Facility were reduced and moved to the Weapons Engineering Tritium Facility in 2005. The transition of the Tritium Science and Fabrication Facility to a radiological facility was completed in 2005. Neutron tube target loading activities at the Tritium Science and Fabrication Facility ended in March 2006 and the facility was placed in a surveillance and maintenance mode. NNSA prepared the *Environmental Assessment for the Proposed Consolidation of Neutron Generator Tritium Target Loading*

Production (DOE 2005b); this project relocated the neutron tube target loading operations from the Tritium Science and Fabrication Facility to Sandia National Laboratories in Albuquerque, New Mexico.

The Tritium Systems Test Assembly Facility includes the main experimental tritium area (3,700 square feet [344 square meters]) and two small laboratories. The facility is located at the DP East research area. During 2003, the tritium inventory at the Tritium Systems Test Assembly was reduced; as a result, the facility was reclassified to a radiological facility. In August 2003, the Tritium Systems Test Assembly was formally designated for surveillance and maintenance and limited equipment removal, as part of its decontamination, decommissioning, and ultimate demolition process.


Weapons Engineering Tritium Facility at TA-16

The principal capabilities and activities conducted at the Weapons Engineering Tritium Facility, the Tritium Systems Test Assembly, and the Tritium Science and Fabrication Facility included:

- High-pressure gas fills and processing operations for research and development and nuclear weapon systems;
- Function testing for highly specialized gas boost systems used in nuclear weapons and experimental equipment;
- Separation and purification of tritium from gaseous mixtures using diffusion and membrane purification techniques;
- Tritium-handling capabilities to accommodate a wide variety of metallurgical and material research activities;

- Gas analysis using spectrometry and other techniques such as beta scintillation counting to measure the composition and quantities of gas samples;
- Calorimetry used for measuring the amount of tritium in a container; and
- Storage of tritium gas and tritium oxide.

Tritium Facilities Performance and Changes Since the *1999 SWEIS*

Modifications at the Tritium Key Facility since 1999 have included remodeling and upgrading facility structures, as well as constructing a new office building. During 2005, there were major construction activities and building modifications at the Weapons Engineering Tritium Facility at TA-16, including addition of a new diesel generator and an upgraded uninterruptible power supply unit. Inclusion of Building 16-450 in the Weapons Engineering Tritium Facility nuclear boundary was postponed because of the LANL operations standdown and it has yet to be included. In addition, NNSA halted implementation of neutron tube target loading activities at the Weapons Engineering Tritium Facility and transferred these activities and associated programmatic hardware to Sandia National Laboratories in Albuquerque in 2005.

Between 1999 and 2005,[8] no new capabilities were added to the Tritium Key Facility, and one capability, cryogenic separation, was lost due to discontinuation of its operation in the Tritium Systems Test Assembly Facility where it was located. Among the continuing capabilities, operation levels have consistently been below the levels projected in the *1999 SWEIS* and have remained within the established environmental envelope. For example, in 2005, 22 high-pressure gas fill operations were conducted, compared to 65 fills projected by the *1999 SWEIS* ROD, and approximately 11 gas boost system tests and gas processing operations were performed, compared to 35 projected (LANL 2005f).

The following summaries of operations data over the period 1999 through 2005 illustrate how activity levels are affecting the surrounding environment. All three buildings are served by ventilation systems that exhaust to stacks. Between 1999 and 2005, tritium air emissions were below the *1999 SWEIS* projections, with two exceptions: a one-time release of elemental tritium in January 2001 at the Weapons Engineering Tritium Facility and an exceedance of tritium in water vapor released from the Tritium Systems Test Assembly during 2002, 2003, 2004, and 2005 (due to deactivation activities). This Key Facility has two NPDES-permitted outfalls, as projected in the *1999 SWEIS*.[9] Annual NPDES discharge rates exceeded *1999 SWEIS* projections 5 out of 7 years. The quality of the TA-21 effluent exceeded NPDES permit levels twice in 1999 (LANL 2000e). Chemical waste volumes exceeded *1999 SWEIS* projections in 2001 and 2002 due to refrigerant replacement at Building 16-450. Low-level radioactive waste, mixed low-level radioactive waste, and transuranic waste volumes were all below the projected amounts.

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[8] The discussion of operations since 1999 includes operations at the TA-21 facilities, the Tritium Systems Test Assembly and Tritium Science and Fabrication Facility, as well as the TA-16 Weapons Engineering Tritium Facility operations.
[9] Although these outfalls were ascribed to the Tritium Key Facility in the 1999 SWEIS, the majority of the effluent comes from the TA-21 Steam Plant. For the sake of consistency, these outfalls continue to be accounted for with the Tritium Key Facility in this SWEIS.

2.4.8 Pajarito Site (Technical Area 18)

The Pajarito Site is located entirely at TA-18. As described in the *1999 SWEIS*, this Key Facility includes the Los Alamos Critical Experiments Facility and other experimental facilities, and consists of a main building, three outlying remote-controlled critical assembly buildings known as the Critical Assembly and Storage Area, and several smaller support buildings including a vault facility called the Hillside Vault. These facilities are 3 miles (4.8 kilometers) from the nearest residential area, White Rock, and 0.25 miles (400 meters) from the closest TA. The Pajarito Site is located in a canyon at the confluence of Pajarito Canyon and Threemile Canyon. The surrounding canyon walls rise approximately 200 feet (61 meters) on three sides of the site. DOE lists this entire Key Facility as a Hazard Category 2 nuclear facility and identifies seven buildings with nuclear hazard categorizations.

The Pajarito Site (TA-18)

This Key Facility studies both the static and dynamic behavior of multiplying assemblies of nuclear materials. In addition, the Pajarito Site provides the capability to perform hands-on training and experiments with special nuclear material in various configurations below critical mass.

The principal capabilities of and activities conducted at the Pajarito Site since 1999 include:

- Use of critical assemblies to evaluate the performance of personnel radiation dosimeters;
- Development of nuclear materials detection and monitoring instruments;
- Characterization and evaluation of materials, primarily by measuring the nuclear properties of these materials;
- Subcritical measurements performed on arrays of fissile materials that are below critical mass for material in a given form;
- Experiments using bare and reflected metal critical assemblies that operate on a fast-neutron spectrum;

- Dynamic measurements conducted with two fast-pulsed assemblies that produce controlled, reproducible pulses of neutron and gamma radiation from tens of microseconds to several tens of milliseconds in duration;
- Use of critical assemblies to study "skyshine" (radiation transported point-to-point without a direct line of sight) and to produce radiation fields to mimic those found around nuclear weapons production and dismantlement facilities, in storage areas, and in experimental areas;
- Use of fast-pulsed assemblies that have the capability to vaporize fissile materials used to test materials, measure the properties of fissile materials, and test reactor fuel materials in simulated accident conditions;
- Use of critical assemblies that have varying spectral characteristics in both steady-state and pulsed modes to irradiate fissile materials and other materials with energetic responses for the purposes of testing and verifying computer code calculations; and
- Storage of Security Category III quantities of special nuclear material in the form of sealed sources recovered by the Off-Site Source Recovery Project.

Pajarito Site Performance and Changes Since the *1999 SWEIS*

Since the publication of the *1999 SWEIS*, two office trailers (TA-18-300 and -301) were installed at the Pajarito Site, security enhancements were made, and a cable tray was relocated within this site. The *1999 SWEIS* ROD projected replacement of the portable linear accelerator; this has not been performed. Construction projects in 2005 consisted of security and safety enhancements. In 2002, NNSA prepared the *Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (DOE 2002i). In the associated ROD (67 FR 79906), NNSA decided to relocate Security Category I and II capabilities and materials to the Device Assembly Facility at the Nevada Test Site, in effect initiating the closure of TA-18. Security Category I and II special nuclear materials were moved from this area to the Plutonium Facility Complex at TA-55 pending transfer to the Nevada Test Site. (Currently only Security Category IV material remains at TA-18). Implementation of the ROD was initiated in 2004 (for further information see Appendix H, Section H.1). The *1999 SWEIS* identified nine capabilities for this Key Facility, all of which are still operating. The Nuclear Measurements School, which had moved to the Chemistry and Metallurgy Research Building from the Pajarito Site before the *1999 SWEIS*, moved back to the Pajarito Site in 2000. The International Atomic Energy Agency Classroom returned to the Chemistry and Metallurgy Research Building in 2004, but the rest of the school remains at TA-18.

The Cerro Grande Fire damaged no facilities at TA-18; however, the fire destroyed much of the vegetation in and around the Pajarito Site. As TA-18 is located in a canyon bottom, postfire flooding became a major concern. A flood contingency plan and flood control structures were designed to protect personnel, infrastructure, and nuclear materials. Some portable structures, such as metal sheds used to store radioactive sources, were moved to higher ground.

The principal capabilities of this facility, as listed above, have operated below the levels projected in the *1999 SWEIS*, in part due to a safety stand-down in late 1998 to 1999 and operational downtime from August 2000 to February 2003. There have been no measurable radiological air emissions from the Pajarito Site since 1999. The facility has no NPDES-permitted outfalls. All wastes produced were below levels identified in the *1999 SWEIS*, except during 2000, when approximately 280 cubic feet (8 cubic meters) of mixed low-level radioactive waste were generated as a result of maintenance activities.

2.4.9 Target Fabrication Facility (Technical Area 35)

The Target Fabrication Facility, located at TA-35, comprises three buildings (35-213, 35-455, and 35-458). The main building is a two-story structure encompassing approximately 61,000 square feet (5,670 square meters) of floor space housing activities related to weapons production and laser fusion research. The Target Fabrication Facility is located immediately to the east of TA-55 and directly north of TA-50. This Key Facility is categorized as a low hazard nonnuclear facility. Exhaust air from process equipment is filtered prior to exhaust to the atmosphere. Sanitary waste is piped to the sanitary waste disposal plant located in TA-46. Radioactive liquid waste and liquid chemical waste are transported to the TA-50 Radioactive Liquid Waste Treatment Facility using a direct pipeline.

Inspection of target component (TA-35)

The principal capabilities and activities conducted at the Target Fabrication Facility include:

- Precision machining and target fabrication operations to produce sophisticated devices consisting of highly accurate part shapes and often optical-quality surface finishes;
- Polymer synthesis to formulate new polymers, study their structure and properties, and fabricate them into various devices and components;

- Chemical vapor deposition and chemical vapor infiltration to produce metallic and ceramic bulk coatings, various forms of carbon (including pyrolytic graphite, amorphous carbon, and diamond), nanocrystalline films, powder coatings, thin films, and a variety of shapes up to 3.5 inches (9 centimeters) in diameter and 0.5 inches (1.25 centimeters) in thickness; and

- Characterization of materials.

Target Fabrication Facility Performance and Changes Since the *1999 SWEIS*

No major additions or modifications have occurred at the Target Fabrication Facility since issuance of the *1999 SWEIS* ROD. The principal activities, as listed above, operated at or below the levels projected in the *1999 SWEIS*, including the precision machining and target fabrication, the polymer synthesis, and the chemical and physical vapor deposition capabilities. Material characterization for tritium reservoirs operated for 2 years.

Programs at the Target Fabrication Facility (TA-35) suffered substantial downtime and loss of productivity during and after the Cerro Grande Fire. No direct fire damage occurred; however, some equipment was damaged because of fluctuating power and loss of liquid nitrogen cooling. Additionally, smoke damage to work areas and air-handling systems was sufficient to prevent use of the Target Assembly Area.

The Target Fabrication Facility has no NPDES-permitted outfalls. Radiological air emissions since 1999 were below the levels projected in the *1999 SWEIS* or were sufficiently small that measurement systems were not deemed necessary to meet regulatory or facility requirements. Waste volumes were within the amounts projected in the *1999 SWEIS*, except chemical wastes, which exceeded projections in 2005 due to disposal of beryllium-contaminated waste from disposal of excess equipment from Rocky Flats, decommissioning of beryllium operations in Room A7, and removal and replacement of a beryllium-contaminated machine from the machine shop.

2.4.10 Bioscience Facilities (Technical Areas 43, 3, 16, 35, 46) (formerly called the Health Research Laboratory [Technical Area 43])

Since publication of the *1999 SWEIS*, the definition of this Key Facility has expanded to include a broader picture of bioscience research taking place across LANL. Some of the capabilities that were attributed to the Health Research Laboratory in the *1999 SWEIS* have become more visible as research and development in particular areas have increased, and some have become less visible as research and development in other areas have declined. These changes, which reflect the dynamic nature of a research laboratory, required an expanded definition of this Key Facility.

The Bioscience Facilities currently include the main Health Research Laboratory (TA-43), as well as additional offices and laboratories located at TA-3, TA-16, TA-35, and TA-46. The impacts of Bioscience Facilities activities at TA-3-1698, the Materials Science Laboratory, are accounted together with the potential impacts of that Key Facility and are not double-counted here. Operations at TA-35, TA-43, and TA-46 have chemical, laser, and limited radiological activities that maintain hazardous materials inventories and generate hazardous chemical wastes and very small amounts of low-level radioactive waste.

There are four biosafety levels consisting of protocols for laboratory practices, techniques, safety equipment, and laboratory facilities. Biosafety Level 1 and Biosafety Level 2 activities and laboratories are currently in operation at LANL and are covered by this SWEIS (these levels are defined in Appendix C, Section C.3). Work conducted in these areas is governed by safety and security requirements for biological agents as outlined in the document entitled, "Biosafety in Microbiological and Biomedical Laboratories," published by the Center for Disease Control, including biohazardous materials listed for each respective biosafety level (HHS 2007).

Operations at this Key Facility have evolved a great deal since 1999. At that time, the principal capabilities and activities were:

Health Research Laboratory (lower left)
Adjacent to the Los Alamos Medical Center

- Research to characterize the extent of diversity in environmental microbes and to understand their functions and occurrences in the environment;
- Research using molecular and biochemical techniques to determine and analyze the sequence of genomes;
- Research using imaging and spectroscopy systems to analyze the structures and functions of subcellular systems and components;
- Research investigating the effects of natural and catastrophic cellular events like response to aging, harmful chemical and physical agents, and cancer;
- Capability to generate biometric organic materials and construct synthetic biomolecules;
- Research isolating and characterizing the properties and three-dimensional shapes of deoxyribonucleic acid (DNA) and protein molecules;
- Performance of whole-body scans as a service to the LANL Personnel Monitoring Program; and
- General biological work performed at Biosafety Levels 1 and 2, which were performed under safety and security requirements for biological materials, including biohazardous material that can be worked at these levels.

Bioscience Facilities Performance and Changes Since the *1999 SWEIS*

As discussed, major additions have been made to the definition of this Key Facility since the *1999 SWEIS*. Today, the principal capabilities and activities conducted at the Bioscience Facilities include:

- Biologically inspired materials research, including studies of how some materials mimic the functions of living systems based upon the relationships found between structure, function, and formation;
- Cell biology projects focused on understanding cellular responses to stress over a range of resolutions from molecular biochemistry to whole-cell studies and proceeding to multicellular and cell-environment interactions;
- Computational biology research focused on developing tools for managing, analyzing, and interpreting biological data and on modeling simple and complex biological systems;
- Environmental microbiology research focused on microbial systems and their environment, including the collection of environmental samples containing microbes, biochemical and genetic analysis of their distribution and functions in ecological systems, and growth and analysis of environmental isolates;
- Genomic studies using molecular and biochemical techniques to analyze the genes of humans, animals, plants, and fungi, as well as genetic material of microbes and viruses including the development of strategies to evaluate the specific sequence of individual genes and gene mapping;
- Bioscience research emphasizing the development and implementation of high-throughput tools and technologies for understanding biology at the systems level;
- Measurement science and diagnostics capabilities including a variety of spectroscopies for analysis of biomolecules and biomolecular complexes, flow cytometry-based analysis of materials, and mass spectrometry for proteomics, metabolomics, and structural biology;
- Molecular synthesis work focused on creating new, isotopically labeled molecules for observation of specific chemical groups and for use as standards in the detection of chemical agents and biological toxins;
- Structural biology using experimental techniques such as x-ray scattering and neutron diffraction, nuclear magnetic resonance, time-resolved vibrational spectroscopies, and state-of-the-art neutron protein crystallography;
- Biothreat reduction and bioforensics analyses, including DNA sequencing, single nucleotide polymorphism, and other molecular approaches to identify pathogen strain signatures for biodefense and national security purposes;
- Pathogenesis research involving genome-scale and computationally enhanced experimental studies to gain a quantitative understanding of various aspects of pathogen life cycles, with a focus on understanding infections in humans, animals, and plants and the epidemiology and life cycle of pathogens in the environment; and

- General biological work performed at Biosafety Levels 1 and 2, including select agent work at Biosafety Level 2 under the Center for Disease Control's "Biosafety in Microbiological and Biomedical Laboratories" guidelines.

The changes in the descriptions of the capabilities ascribed to the Bioscience Facilities have had negligible impacts on wastes and emissions. Most of the principal activities described above remained below *1999 SWEIS* projections and within the established environmental envelope.

Activity levels within the environmental microbiology and genomics capabilities exceeded *1999 SWEIS* projections 1 year out of 7. Research involving DNA exceeded *1999 SWEIS* projections 5 out of 7 years, and research involving protein molecules exceeded projections all 7 years. A number of projects involving work with viruses not specifically anticipated in the *1999 SWEIS* have been approved.

Two changes of note are that bioscience work with radioactive materials is continually decreasing and the animal colony was eliminated in 1999. Although the colony was eliminated, live animals including small animals, amphibians, and insects, are still kept for short periods of time at various locations at LANL, and wild animal handling is performed during environmental surveillance activities in the field and in field trailers.

A Biosafety Level 3 facility was constructed in 2004, but operational occupancy and operation has not occurred (as already stated). NNSA is preparing an EIS to analyze the potential impacts of its operation.

The effects of the Cerro Grande Fire on the Bioscience Facilities and operations included the loss of portable offices containing computers, intellectual property, and data at TA-46. Smoke damage occurred in several buildings at TA-43 and TA-46, requiring cleaning or replacement of an air-handling system and many replacement air filters, as well as replacement of laser optics (TA-46 and TA-3-1698).

Radiological air emissions are not measured for this Key Facility. The Bioscience Facilities currently have no NPDES-permitted outfalls. One outfall was projected in the *1999 SWEIS*, but was removed from service in 1999; no flow was discharged from the outfall during that year. Chemical and radioactive wastes generated were below the volumes projected in the *1999 SWEIS*.

2.4.11 Radiochemistry Facility (Technical Area 48)

The Radiochemistry Key Facility includes all of TA-48 (116 acres [50 hectares]). The facility has three roles: research, production of medical radioisotopes, and support services to other LANL organizations, primarily through radiological and chemical analyses of samples. TA-48 contains five major research buildings: the Radiochemistry Laboratory (48-1), the Assembly Checkout Building (48-17), the Diagnostic Instrumentation and Development Building (48-28), the Clean Chemistry/Mass Spectrometry Building (48-45), and the Weapons Analytical Chemistry Facility (48-107). There is also a Machine and Fabrication Shop (48-8). The Radiochemistry Laboratory (48-1) was downgraded to a radiological facility in 2003.

The principal capabilities and activities conducted at TA-48 include:

Radiochemistry Hot Cell (TA-48)

- Radionuclide transport studies including numerous chemical and geochemical investigations that address concerns about hydrologic flow and transport of radionuclides;
- Environmental remediation capabilities including characterization and remediation of soils contaminated with radionuclides and toxic metals, data analysis, and integrated site-wide assessment;
- Ultra-low-level measurements using isotopic tracers and high-sensitivity measurement technologies to support the nuclear weapons program;
- Development of radiation detectors, conduct of radiochemical separations, and performance of nuclear and radiochemistry for non-weapons-related work;
- Isotope production involving the chemical separation and distribution of isotopes to the medical and industrial communities;
- Actinide and transuranic chemistry using the special safe handling environment provided by the alpha wing of the Radiochemistry Laboratory;
- Reexamination of archive data and measurement of nuclear process parameters of interest;
- Inorganic chemistry work including synthesis, catalysis, and actinide chemistry, as well as the development of environmental technology;
- Synthesis, structural analysis, and x-ray diffraction analysis of actinide complexes in both single-crystal and powder form; and
- Sample counting involving measurement of the quantity of radioactivity present in each sample.

Radiochemistry Facility Performance and Changes Since the *1999 SWEIS*

No facility changes were projected for the Radiochemistry Facility in the *1999 SWEIS*. During 2005, the fire notification system was upgraded under the institutional program. The Building 48-1 roof was replaced in 2007, and heating, ventilation, and air conditioning upgrades are underway. Five structures at TA-48 suffered only minor direct effects from the Cerro Grande Fire; activities in these buildings were not affected. Building 48-45, the Clean Chemistry/Mass Spectrometry Building, however, suffered severe ash, dirt, and soot contamination and its interior was subsequently gutted and replaced.

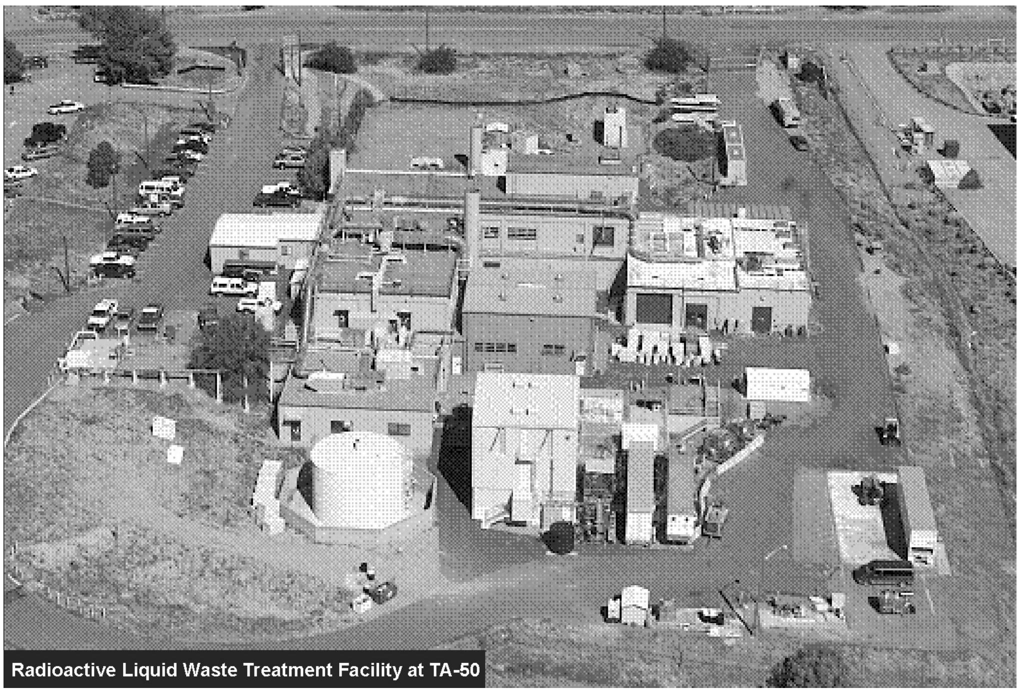
Many of the activities listed above operated at or below the levels projected in the *1999 SWEIS*. In 2005, the environmental remediation capability operations were approximately half the projected level, and the structural analysis capability level of operations was one-third of its projected level. The high-sensitivity measurement technologies level of operations was approximately the same as the level projected in the *1999 SWEIS*. Radiochemical operations levels were slightly lower than projected levels from 1999 to 2002 and substantially decreased in 2003, 2004, and 2005. Both the data analysis and actinide chemistry capabilities operated below the levels of activity projected in the *1999 SWEIS*.

Several other capabilities exceeded the *1999 SWEIS* projections. There was a slight increase in the level of operations for isotope production and sample counting from 1999 through 2005. In addition, radionuclide transport studies increased operations levels to approximately twice the levels projected in the *1999 SWEIS*. Radiochemical operations increased to twice the levels projected in the *1999 SWEIS* until 2002, when there was a substantial decrease in the operations levels.

Radiological air emissions were below *1999 SWEIS* projections for arsenic-72, beryllium-7, bromine-77, plutonium-239, and uranium-235 only. Release of several radionuclides exceeded projections at least 1 year out of 7 (1999 through 2005) including arsenic-73, arsenic-74, gallium-68, germanium-68, rubidium-86, and selenium-75. The nuclides plutonium-238, silicon-32, thorium-230, thorium-232, and uranium-238 were not identified in the *1999 SWEIS*, but were present at least once in the years 1999 through 2005 in microcurie quantities. The Radiochemistry Facility currently has no NPDES-permitted outfalls, although 2 outfalls were projected in the *1999 SWEIS* ROD. No discharges occurred after 1999 from these outfalls prior to their elimination. Chemical wastes from the Radiochemistry Facility exceeded *1999 SWEIS* projections in 2001 through 2004. Excess chemical waste volumes resulted in part from cleanup following the Cerro Grande Fire. Contaminated soil caused by a leaky pipe was subsequently removed from a fire recovery construction project after it was uncovered during excavation of trenches for new utilities. Several chemical clean-outs to dispose of unwanted chemicals were performed at this Key Facility as well. In 2003, transuranic and mixed low-level radioactive waste quantities were small, but exceeded *1999 SWEIS* projections. These wastes were generated by activities supporting the Building-48-1 reclassification from a nuclear facility to a radiological facility.

2.4.12 Radioactive Liquid Waste Treatment Facility (Technical Area 50)

The Radioactive Liquid Waste Treatment Facility is located in TA-50, near the center of LANL. It treats radioactive liquid wastes generated at other LANL facilities and houses analytical laboratories supporting waste treatment operations. This Key Facility consists of four primary structures: the Radioactive Liquid Waste Treatment Facility (50-01), the tank farm and pumping station (50-02), the acid and caustic solution tank farm (50-66), and a 100,000-gallon (380,000-liter) influent holding tank (50-90), as well as a number of ancillary structures. Presently, these four structures are considered one Hazard Category 2 nuclear facility.



Radioactive Liquid Waste Treatment Facility at TA-50

The principal capabilities and activities conducted at the Radioactive Liquid Waste Treatment Facility include:

- Waste characterization and packaging including identification and quantification of constituents of concern in waste streams and packaging and labeling waste according to U.S. Department of Transportation regulations;
- Waste transportation including inspection and cross-checking for acceptance;
- Liquid and solid chemical materials and radioactive waste storage;
- Waste pretreatment;
- Radiological liquid waste treatment using a number of treatment processes, including ultrafiltration and reverse osmosis; and
- Secondary waste treatment.

Radioactive Liquid Waste Treatment Facility Performance and Changes Since the *1999 SWEIS*

The decontamination capability was transferred to the Solid Radioactive and Chemical Waste Key Facility in 2000. Between 1999 and 2005, all liquid waste discharge volumes processed through this Key Facility were less than projected in the *1999 SWEIS* due to ongoing source reduction efforts and internal recycling by waste generators. Most of the process changes at the Radioactive Liquid Waste Treatment Facility have been aimed at further improving the quality of the effluent discharged by the facility. Nitrate reduction equipment was installed at the Radioactive Liquid Waste Treatment Facility in 1998 to improve effluent quality to meet new groundwater standards. In 2001, this equipment was taken out of service; currently, low-volume, high-nitrate liquid wastes are separated "upstream" by the waste generators and shipped to offsite commercial hazardous waste treatment facilities for treatment and disposal. An electrodialysis reversal unit and an evaporator were installed at the Radioactive Liquid Waste Treatment Facility in 1999 and 2000, respectively, to process the waste stream from the reverse osmosis unit. In 2002, a perchlorate removal system (using ion exchange resin columns) was added to the Radioactive Liquid Waste Treatment Facility to further improve the quality of effluent discharged.

The Radioactive Liquid Waste Treatment Facility was one of the very few facilities that operated during the Cerro Grande Fire. Operations were mandatory because radioactive liquid wastes continued to be generated. These flows would be expected from cooling systems and experiments that required cooling during the wildfire. Subsequent to the wildfire, radioactive liquid waste generation continued below typical rates because other LANL facilities required time to resume normal levels of operations.

Other changes that have taken place since issuance of the *1999 SWEIS* ROD largely have been the result of lowered incoming waste volumes, which have enabled changes in certain process steps and rendered others unnecessary. In 2000, the lead decontamination trailer was decommissioned because the quantity of lead needing decontamination had become so small that this operation was no longer cost-effective. In 2001, the transfer line that had carried liquid wastes from the TA-21 tritium facilities to the Radioactive Liquid Waste Treatment Facility was eliminated from service. Because of reduced waste volumes at the TA-21 facility, these materials are now transported by truck. During 2002, the Radioactive Liquid Waste Treatment Facility shop (Building 50-83) was relocated to TA-54 to make room for construction of a new 300,000-gallon (1,140,000-liter) influent storage facility funded by the Cerro Grande Rehabilitation Project. Construction of the new facility began in 2004.

The following radionuclides were not identified in the *1999 SWEIS* as potential radiological air pollutants, but were present in dosimetrically insignificant amounts (microcuries): americium-241, plutonium-238, plutonium-239, strontium-90, thorium-228, thorium-230, thorium-232, uranium-232, uranium-234, uranium-235, and uranium-238. The Radioactive Liquid Waste Treatment Facility has one NPDES-permitted outfall, as projected in the *1999 SWEIS*. Discharge flow rates have been consistently lower than projected in the *1999 SWEIS* and have steadily decreased. In 1999, the Radioactive Liquid Waste Treatment Facility effluent did not meet water quality discharge standards (the effluent exceeded NPDES permit quality standards nine times) and NMED issued a letter of noncompliance to LANL

(LANL 2002d). Since then, Radioactive Liquid Waste Treatment Facility has installed new or upgraded treatment processes to improve effluent quality. With these improvements, 2005 marked the sixth consecutive year that Radioactive Liquid Waste Treatment Facility effluent had zero violations of the NPDES permit limits and zero exceedances of the DOE Derived Concentration Guide for radioactive liquid wastes. Annual average nitrate discharges were reduced from 360 milligrams per liter in 1993 to less than 10 milligrams per liter in 2000 and have remained at that level through 2005. Another important improvement since the *1999 SWEIS* is that tritium-contaminated wastewater that was previously treated at TA-50 is now being treated at the TA-53 Radioactive Liquid Waste Treatment Plant, which has no environmental discharge of effluents. Transuranic waste generation levels have been below *1999 SWEIS* projections. Every year except 2001, the amount of chemical wastes generated at the Radioactive Liquid Waste Treatment Facility has been below projections. In 2001, however, chemical waste exceeded generation projections due to the replacement of storage tanks and some associated plumbing. Secondary wastes generated during the treatment of radioactive liquid waste and wastes resulting from decontamination operations at LANL, caused several waste streams to exceed projections. Solid low-level radioactive waste volumes exceeded generation projections in 1999, 2001, 2002, 2003, 2004, and 2005. In 2005, exceedance of the low-level radioactive waste volume projected in the *1999 SWEIS* resulted from about 75 cubic yards (58 cubic meters) of construction debris and soil generated from the Cerro Grande Rehabilitation Project to install additional influent storage tanks. Also included in the annual solid low-level radioactive waste volumes are the aqueous evaporator bottoms shipped offsite for treatment (about 96 cubic yards [73 cubic meters] in 2005). Solid mixed low-level radioactive waste generation at the Radioactive Liquid Waste Treatment Facility was not projected in the *1999 SWEIS*, but small quantities have been generated every year but one since 1999. More than 95 percent of these mixed wastes resulted from relocation of the lead contamination activities and attendant cleanup of the area; the balance were wastes from the analytical chemistry laboratory. Transuranic waste and mixed transuranic waste volumes have been below projections.

2.4.13 Los Alamos Neutron Science Center (Technical Area 53)

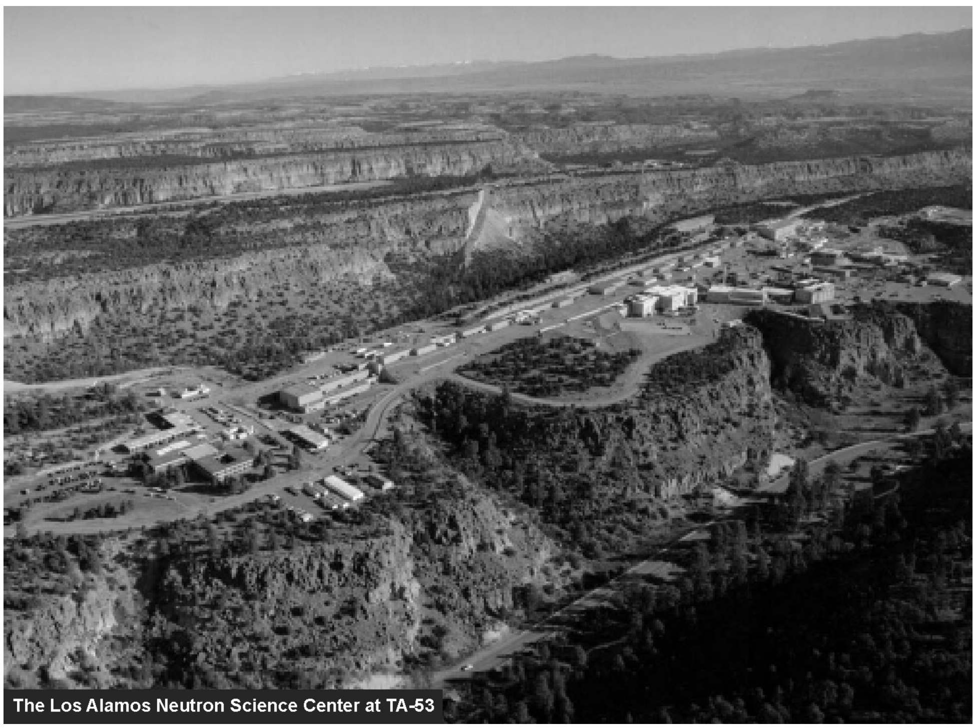
LANSCE lies entirely within TA-53 and comprises more than 400 structures. The majority of LANSCE operations are associated with the 800-million-electron-volt linear accelerator, a proton storage ring, and three major experimental areas: the Manuel Lujan Neutron Scattering Center (the Lujan Center), the Weapons Neutron Research Facility, and Experimental Area C. Experimental Area A, formerly used for materials irradiation experiments and isotope production, is currently inactive. Experimental Area C is the location of proton radiography experiments for the Stockpile Stewardship Program.

This Key Facility has three Hazard Category 3 and no Hazard Category 2 nuclear facilities. In September 2001, the radioactive liquid waste treatment facility and basins in TA-53 (53-945 and 53-954) were added to the LANL radiological facility list (LANL 2002h).

The principal capabilities and activities conducted at LANSCE include:

- Accelerator beam delivery, maintenance, and development of diagnostic instruments;

- Experimental area support including facility and plant operating and engineering services; environment, safety, and health services and oversight; site and building physical security; visitor control; and facility specific training;
- Neutron science and nuclear physics research;
- Accelerator transmutation of wastes experimentation;
- Subatomic physics research including proton radiography experiments;
- Production of medical radioisotopes; and
- High-power microwaves research and advanced accelerator development.


The Los Alamos Neutron Science Center at TA-53

LANSCE Performance and Changes Since the *1999 SWEIS*

The *1999 SWEIS* ROD projected that substantial facility changes and expansion would occur at LANSCE by December 2005. Three projects have been completed, and one has been started:

- The Low-Energy-Demonstration Accelerator became operational. The Low-Energy-Demonstration Accelerator started high-power conditioning of the radio frequency quadruple power supply in November 1998. The first proton beam was produced in March 1999, and maximum power was achieved in September 1999. It was designed for a maximum energy of 12 million electron volts, not the 40 million electron volts projected by the *1999 SWEIS* ROD. The Low-Energy-Demonstration Accelerator was shut down in December 2001 and will remain inactive. The current plan is to remove all support equipment and leave the building and the accelerator itself in place.

- Enhancements were made to the Short-Pulse Spallation Source. The Short-Pulse Spallation Source Project was completed in 2004. This project consisted of two components: Accelerator Enhancement and Spectrometer Enhancement. The Accelerator Enhancement portion completed in June 2003 provided a brighter H^- ion source and upgraded the Proton Storage Ring to handle the higher beam current. The Spectrometer Enhancement Subproject completed in January 2004 provided three new neutron-scattering spectrometers to the Lujan Center and upgraded the capability of one instrument.

- A new 100-megaelectronvolts Isotope Production Facility was constructed. Construction started in 2000 and the facility was completed in 2002. The Isotope Production Facility generated its first beam on December 23, 2003. Full production began in 2005.

- Closure of two sanitary lagoons was initiated. Characterization started in 1999 and continued into 2000. Cleanup at the south lagoon began in 2000 with removal of the sludge and liner. Data analysis and sampling continued through 2001 for both lagoons, and an Interim Action Plan was written for remediation of the north lagoon. Cleanup of the north lagoon was performed in 2002. The lagoons (Solid Waste Management Unit [SWMU] 53-002[a]-99) have been remediated, including complete removal of all contaminated sludge and liners; definition of the nature and extent of residual contamination; and determination that the residual contamination does not pose a potentially unacceptable risk to humans or the environment. Currently, the site is located within an industrial area under LANL (institutional) control and is expected to remain so for the reasonably foreseeable future. For these reasons, neither additional corrective action nor further characterization is warranted at the site. The closure report for the lagoons was reviewed and approved by NMED on July 25, 2006.

Projects that were anticipated to be completed by 2005 in the *1999 SWEIS*, but have not yet been started include the One-megawatt Target/Blanket; the Long-Pulse Spallation Source, including decontamination and renovation of Area A; the Los Alamos International Facility for Transmutation; the Exotic Isotope Production Facility; decontamination and renovation of Area A-East; and the Dynamic Experiment Laboratory. The Stockpile Stewardship Program is currently using Experimental Area C, Building 53-3P, for proton radiography and the Blue Room in Building 53-07 for neutron resonance spectroscopy.

In addition to these projected construction activities, several projects not anticipated in the *1999 SWEIS* have been implemented. A new warehouse was constructed in 1998 to store equipment and other materials formerly stored outside. A new waste treatment facility for radioactive liquids generated at LANSCE and two associated evaporation basins were constructed during 1999. Construction of a new cooling tower was completed in 2000. Construction of this and another cooling tower (structures 53-963 and 53-952) replace cooling towers 53-60, 53-62, and 53-64, which have been taken out of service. The new towers discharge through Outfall 03A-048, as did their predecessors. Construction of two new instruments on Flight Paths 12 and 13 at the Lujan Center started in 2002. The cold neutron Flight Path 12 was commissioned in February 2004, as was most of the NPD-Gamma experiment (NPD is a nuclear reaction in which a neutron impinges on a proton and emits a deuteron plus a gamma ray). The liquid hydrogen target was installed during fall 2005. Basic construction of

Flight Path 13 was completed in 2006. A new experimental facility for production of ultracold neutrons is nearing completion in Experimental Area B.

LANSCE was nearly untouched by the Cerro Grande Fire; a small portion of the roof of one building was damaged. The only impact to operations was evaluating and restoring the status of accelerator systems because site power was lost during the fire. Systems and equipment were returned to power sequentially instead of simultaneously, which required about a month to complete.

The *1999 SWEIS* identified seven capabilities for the LANSCE Key Facility. No new capabilities have been added, and none has been deleted. During 2001, LANSCE operated both accelerators and three of the five experimental areas. Area A has been idle for more than 2 years; Area B has been idle for several years, but as indicated above, a new Ultracold Neutron Facility is under construction (DOE 2002i).

All of the capabilities described above operated at activity levels below those projected in the *1999 SWEIS* or did not operate at all. Support of activities in the experimental areas was conducted as projected in the *1999 SWEIS*, including an increase in power for the LANSCE linear accelerator. Less than 10 percent of the projected number of neutron research experiments was conducted at the Lujan Center. Weapons-related experiments were conducted as well as experiments involving contained high explosives. Research and development was conducted on high-power microwaves and advanced accelerators.

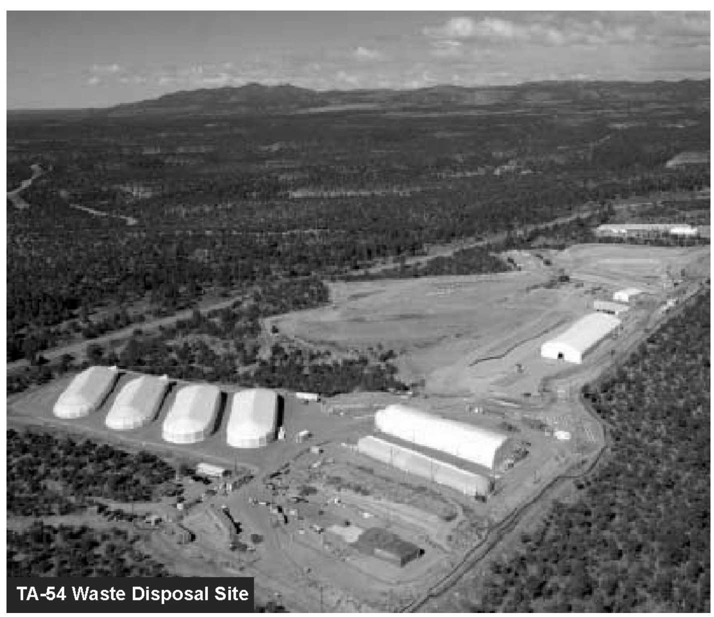
Because of the number of facilities that were not funded and therefore not completed, no accelerator waste transmutation tests were performed; no lead target tests were conducted; and no exotic, neutron-rich, and neutron-deficient isotopes were produced since issuance of the *1999 SWEIS* ROD. Ultra-cold neutron experiments ran only 3 of the 7 years.

The primary indicator of activity for LANSCE is production of the 800-million-electron-volt LANSCE proton beam. Between 1999 and 2005, production figures for the beam were all less than the 6,400 hours at 1,250 microamps projected by the *1999 SWEIS*. In fact, the delivery of an accelerator beam was successful one-third of the time projected in the *1999 SWEIS*. No medical isotopes were produced, except in 2005 when 64 targets for medical isotope production were irradiated, compared to 50 projected by the *1999 SWEIS*.

LANSCE accounts for more than 90 percent of all radioactive air emissions from LANL. These emissions come predominantly (greater than 95 percent) from stack ES–2, which ventilates Building 53-3, the linear accelerator, and adjacent experimental stations. Additional emissions come from stack ES–3, which exhausts the proton storage ring and experimental stations at the Manuel Lujan Center and the Weapons Neutron Research Facility buildings. Both ES–2 and ES–3 are equipped with continuous monitoring equipment. Emissions of activation products from LANSCE were higher in 2005 than in recent years due to the total hours of operation and the failure of one component of the emissions control system. The total point-source emissions were approximately 18,400 curies. As in recent years, the Area A beam stop did not operate during 2005; however, operations in Line D resulted in the majority of emissions reported for 2005. A corrective action implemented in late November 2005 returned emissions rates to their expected levels, and these reduced emissions rates are expected to continue in the future. The following nuclides were not projected as radiological air emissions in the *1999 SWEIS*, but have since been present in measured air emissions or occurred at levels above those projected (see Appendix B for additional information on air emissions): arsenic-72, arsenic-73, beryllium-7, bromine-76, bromine-77, bromine-82, carbon-11, cobalt-60, mercury-193, mercury-193m, mercury-195, mercury-195m, mercury-197, mercury-197m, mercury-203, nitrogen-16, osmium-191, oxygen-14, oxygen-15, selenium-75, sodium-24, sulfur-37, and tritium as water vapor. LANSCE currently has four NPDES-permitted outfalls, compared to five outfalls projected in the *1999 SWEIS*. These outfalls discharge cooling tower blowdown, and discharge rates were consistently below *1999 SWEIS* projections. While operational, the Low-Energy-Demonstration Accelerator (TA-53-952) cooling tower effluent exceeded NPDES permit levels twice in 1999, resulting in a shutdown of operations and an update of procedures (LANL 2000e). LANSCE generates both low-level radioactive liquid wastes and radioactive solid wastes such as beam line components and scrap metals, papers, and plastics. All chemical waste, low-level radioactive waste, mixed low-level radioactive waste, and transuranic waste generation amounts were below the *1999 SWEIS* projections, except for mixed low-level radioactive waste in 2000, which was above the 1999 waste generation projection.

2.4.14 Solid Radioactive and Chemical Waste Facilities (Technical Area 54 and Technical Area 50)

The majority of the structures associated with the Solid Radioactive and Chemical Waste Facilities are located at TA-54. There are over 200 structures within this TA, over 100 of which are dedicated to waste management. This waste management operation captures and tracks data for waste streams regardless of their points of origin and ultimate disposition. A variety of wastes are managed by the Solid Radioactive and Chemical Waste Facilities, including transuranic, low-level radioactive, industrial, toxic, hazardous, and mixtures of these waste types. Transuranic wastes are processed at the Waste Characterization Reduction and Repackaging Facility in TA-50 and transported to TA-54 for storage pending disposal. Most waste handled in TA-54 is of a solid physical state, although there are also small quantities of gaseous or liquid hazardous, toxic, and mixed wastes.



TA-54 Waste Disposal Site

The Hazard Category 2 nuclear facilities at this Key Facility include outdoor operations at the Waste Characterization, Reduction, and Repackaging Facility (50-69); waste storage and disposal facilities in Area G (including low-level waste disposal pits, shafts, and trenches, transuranic waste storage domes, sheds, and storage pads); the Waste Assay Facility (54-2); the Radioassay and Nondestructive Testing Facility (54-38); and the Decontamination and Volume Reduction System (54-412). The

Waste Characterization, Reduction, and Repackaging Facility (50-69) is a Hazard Category 3 nuclear facility.

The principal capabilities and activities conducted at the Solid Radioactive and Chemical Waste Key Facilities include:

- Waste characterization to ensure compliance with waste acceptance criteria for WIPP;
- Solid waste compaction to provide improved package integrity, minimize subsidence at the disposal pit, and conserve disposal space;
- Size reduction to reduce volume and repackage waste;
- Waste transport reception and acceptance, including visual inspection of vehicles and containers, cross-checking of container labels and shipping manifests, and radiation surveys of vehicle and containers;
- Waste storage, including storage of sealed sources for the Off-Site Source Recovery Project;
- Retrieval of transuranic wastes, including repackaging, characterization, and placement in aboveground storage domes;
- Solid low-level radioactive waste disposal in cells and shafts;
- Decontamination of items including personal respirators, air-proportional probes, vehicles, and portable instruments for reuse, as well as precious metals, scrap metals, and lead for resale; and
- Other waste processing such as storage of transuranic sludge (solidified and packaged by the Radioactive Liquid Waste Treatment Facility), stabilization of pyrophoric uranium chips and subsequent storage of the resulting gels, and electrochemical treatment of mixed low-level radioactive waste.

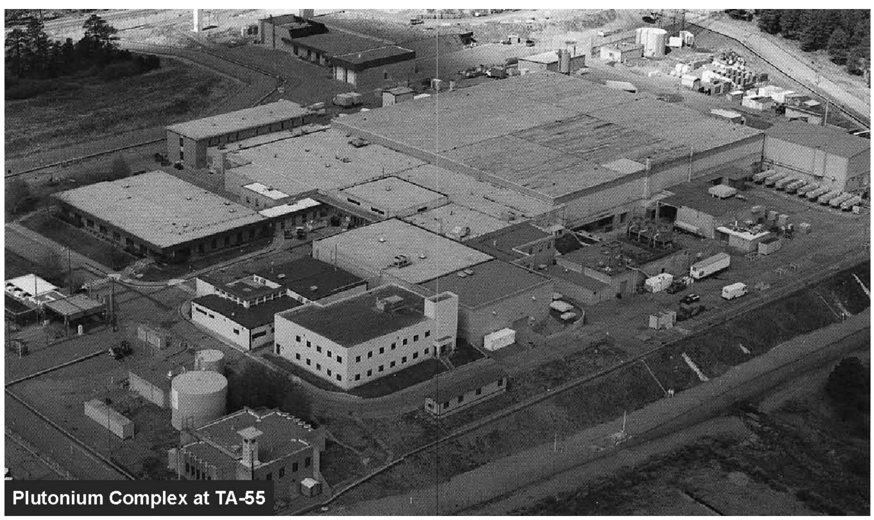
Solid Radioactive and Chemical Waste Facilities Performance and Changes Since the *1999 SWEIS*

Two construction projects were planned for the Solid Radioactive and Chemical Waste Facilities in the *1999 SWEIS*. Additional fabric domes for the storage of transuranic waste were completed in 1998. Execution of the other project, expansion of Area G, has not been completed. Design is underway; construction is scheduled to begin in 2009 with operation expected in 2010. The Radioactive Materials Research Operations and Demonstration Facility was transferred to the Plutonium Key Facility in 2003. A substantial fraction of TA-54's heavy earthmoving equipment was used for the Cerro Grande Fire and was not available for some time. The wildfire also impacted Solid Radioactive and Chemical Waste operations later in the year because fire-related debris was shipped to Area G for storage and disposal.

In 2003, volumes of transuranic waste and mixed transuranic waste processed by the Solid Chemical and Radioactive Waste Facility exceeded *1999 SWEIS* projections. In 2005, volumes of chemical waste, low-level radioactive waste, and mixed transuranic waste exceeded *1999 SWEIS* projections. These waste volumes exceeded projected amounts due to repackaging of legacy transuranic waste for shipment to WIPP. About 95 percent (1,300 drums) of the low-level radioactive wastes were empty drums wrapped in plastic resulting from repackaging of transuranic waste at the Waste Characterization, Reduction, and Repackaging Facility. These drums are typically sent to TA-54, Area G, for compaction and disposal. There are no NPDES-permitted outfalls. No stacks require monitoring for radiological air emissions; all non-point sources are measured using ambient monitoring. Thorium isotopes were identified in 2005 in dosimetrically insignificant quantities.

2.4.15 Plutonium Facility Complex (Technical Area 55)

The Plutonium Facility Complex consists of six primary buildings and a number of support, storage, security, and training structures located throughout the main complex at TA-55. The Plutonium Facility, Building 55-4, is categorized as a Hazard Category 2 nuclear facility, but was built to comply with the seismic standards for Hazard Category 1 buildings. In May 2005, a staging facility, PF-185 (55-185), was upgraded to Hazard Category 2. A third Category 2 nuclear facility, the Safe Secure Transport Facility (55-355), was constructed and became operational in November 2005. In addition, TA-55 includes two low hazard chemical facilities (Buildings 55-3 and 55-5) and one low hazard energy source facility (55-7). The *1999 SWEIS* also identified one potential Hazard Category 2 nuclear facility (the Nuclear Material Storage Facility, Building 55-41), which was slated for potential modification to bring it into operational status. The modifications were not performed, however, and a decision was made in 2006 to demolish the building.


Plutonium Complex at TA-55

The principal capabilities and activities conducted at the Plutonium Facility Complex include:

- Plutonium stabilization, including recovering, processing, and storing the existing inventory;
- Manufacturing plutonium components or other items for research and development or for the nuclear weapons stockpile;

- Surveillance and disassembly of weapons components using both nondestructive and destructive evaluation on pits removed from the stockpile and storage;
- Actinide materials research and development, which involves metallurgical and other characterization of materials and measurements of physical materials properties;
- Development of ceramic-based nuclear reactor fuel fabrication technologies;
- Research on providing a long-term reliable heat source for power systems to support space and terrestrial uses, as well as performing recovery, recycling, and blending of plutonium-238; and
- Storage, shipping, and receiving for the majority of the LANL special nuclear material inventory.

Plutonium Facility Complex Performance and Changes Since the *1999 SWEIS*

Several construction projects and upgrades were planned for the Plutonium Facility Complex and analyzed in the *1999 SWEIS*. A new administrative office building (called the Facility Infrastructure Technical Support Building) and upgrades to certain Plutonium Facility support systems have been completed. Construction of the Fire Safe Storage building (55-314) was completed in October 2004. Another office building, the Manufacturing Technical Support Facility (55-312), was completed in August 2003. As already stated, modifications to the Nuclear Material Storage Facility were halted and a decision was made to demolish the building. Security Category I and II and some Security Category III and IV materials, which are part of the TA-18 Relocation Project, have been relocated to secure facilities at the Plutonium Facility Complex at TA-55 while awaiting transfer to offsite facilities. Procurement and installation of a new uranium decontamination system was initiated in 2004 and was ongoing in 2005. Interim radiography capability also was ongoing in 2005. None of the buildings at TA-55 suffered serious damage from the 2000 Cerro Grande Fire, although the fire encroached on the fenced perimeter intrusion detection and assessment systems area.

The principal activities listed above operated well within the bounds of projections in the *1999 SWEIS*. One change, however, occurred in the plutonium stabilization operation and only the highest priority items have been stabilized. Recovery, processing, and storage of the remaining inventory are now scheduled to be completed by 2013.

All other processes at the Plutonium Facility Complex remained below *1999 SWEIS* projected operating levels. Manufacturing of plutonium components produced no quality-certified pits until 2003; production of fewer than 20 quality-certified pits each year has occurred since 2004. In addition, the surveillance and disassembly of weapons components operated below the projected number of pits. Plutonium-238 research has processed, evaluated, and tested below the 55 pounds (25 kilograms) of material per year projected in the *1999 SWEIS*. Because the Nuclear Material Storage Facility has not been available as a storage vault, NNSA has continued to store working inventory in the TA-55-4 vault. The number of items in the vault has remained relatively constant at levels identified in the *1999 SWEIS*.

Since 1999, the actinide research and development capability processed less than the 881 pounds (400 kilograms) per year projected in the *1999 SWEIS*, and the number of pits that were disassembled or converted also was below the projected amount. Research supporting actinide cleanup activities continued at low levels, and no plutonium residues originating from Rocky Flats were processed. Minimal study of nuclear fuels used in terrestrial and radioisotope power systems has occurred since 1999. In 2002, the Plutonium Facility Complex again began purifying and encapsulating plutonium fuels for this capability.

Radiological air emissions from this Key Facility were below *1999 SWEIS* projections in the years up to and including 2005, except for releases of elemental tritium that exceeded projections in 2002 and 2003 and the presence of actinides (isotopes of thorium and uranium) that were not projected in the *1999 SWEIS* in 2005. The facility has one NPDES-permitted outfall, which is consistent with the *1999 SWEIS* projections, and the NPDES discharge rate has been consistently below projected amounts. The quality of effluent exceeded NPDES permit levels only once in 2003 before being corrected (LANL 2004d). Transuranic, low-level radioactive, and mixed low-level radioactive wastes were all below the *1999 SWEIS* projections. Chemical wastes, however, exceeded projections in 2001 (generated by replacement of the hydraulic cylinders at the facility); in 2002 (generated by cleanup of soil contaminated with spilled transformer oil); and in 2003 (generated by cleanup of soil contaminated with diesel fuel).

2.4.16 Non-Key Facilities

The balance and majority of LANL buildings are referred to in the *1999 SWEIS* as non-Key Facilities. Non-Key Facilities house operations that are unlikely to cause significant environmental impacts. These buildings and structures are located in 30 of the 48 TAs over approximately 14,200 acres (5,750 hectares) of LANL's 25,600 acres (10,360 hectares) of land.

Some of the LANL non-Key Facilities are designated as radiological or moderate hazard facilities, but do not meet the criteria for Key Facilities. Some are currently operating, but several are designated as nonoperable surplus and are awaiting DD&D following removal of special nuclear material and other hazardous materials. At the present time, other than MDAs, 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 that have occurred since the issuance of the *1999 SWEIS*, including hazard category designation changes where appropriate:

- Various Chlorination Stations (Buildings 0-1109, 0-1110, 0-1113, 0-1114, 16-560, 54-1008, 72-3, 73-9) were designated moderate chemical hazard facilities in the *1999 SWEIS*. The quantity of chlorine stored at these facilities has been reduced or the stations no longer use gaseous chlorine for water treatment and are therefore no longer categorized as hazardous facilities. Ownership of certain of the chlorination stations was conveyed to Los Alamos County as part of the 1998 conveyance of the Los Alamos water distribution system and rights to surface water and water rights for subsurface water.

- 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 (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), were designated in the *1999 SWEIS* as a Hazard Category 3 nuclear facility. Prior to 2002, the Health Physics Instrument Calibration facilities were relocated to Buildings 36-1 and 36-214, both of which are on the radiological facilities list. Building 3-40 also remains on the radiological facilities list.

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

- The Calibration Building (3-130) was designated in the *1999 SWEIS* as a Hazard Category 3 nuclear facility due to the radioactive source inventories stored in the building. The building is being converted into office space with some light-laboratory areas. All radioactive sources and special nuclear material have been removed, and the building is no longer on the radiological facilities list.

- The Liquid and Compressed Gas Facility (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 (33-86), a former high-pressure tritium-handling facility, was decommissioned in 2002 prior to its subsequent demolition.

- The Nuclear Safeguards Research Facilities (35-2 and 35-27) were classified as Hazard Category 3 nuclear facilities in the *1999 SWEIS* and were subsequently downgraded to radiological facilities in 2000 (DOE and LANL 2005).

- Central High Pressure Calibration Facility construction (36-214) was completed in October 2001. The facility has been 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 along with a major portion of Building 41-4. Building 41-1, an underground storage vault known as the Ice House, is categorized as a radiological facility, although no special nuclear material is now stored there.

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

The *1999 SWEIS* identified just one major construction project (the Atlas Facility) for inclusion as a new future non-Key Facility. Construction of Atlas within existing buildings and a readiness review were completed in 2001. The Atlas conducted a series of 16 program experiments through October 2002 for the science-based Stockpile Stewardship Program before it was then disassembled and moved to the Nevada Test Site in 2003. After being reassembled, certified, and prepared for operation at the Nevada Test Site, Atlas was placed in standby, ready to support stockpile stewardship as a tri-laboratory (Lawrence Livermore National Laboratory, Sandia National Laboratories, and LANL) resource and a state-of-the-art research facility.

In addition to Atlas, DOE undertook several new construction projects since issuance of the *1999 SWEIS* that were not proposed at that time. These include the Nonproliferation and International Security Center, Center for Integrated Nanotechnologies, Emergency Operations Center, office buildings, LANL Medical Facility, and Live Fire Shoot House. Non-Key Facilities received substantial fire damage from the 2000 Cerro Grande Fire, which impacted 86 structures or buildings, damaged 31 and destroyed 10, including several temporary office facilities. A number of construction projects were undertaken in response to post-Cerro Grande Fire needs.

The following information describes additional non-Key Facility construction projects undertaken since 1999 and their current status:

- The Center for Integrated Nanotechnologies is based in Albuquerque, with facilities at LANL and Sandia National Laboratories. The Center provides open access to tools and the expertise needed to explore the scientific integration of nanostructures into the micro- and macro world. Operated by the DOE Office of Science's Nanoscale Science Research Center, the Center for Integrated Nanotechnologies is a national user facility devoted to establishing the scientific principles that govern the design, performance, and integration of nanoscale materials. In May 2004, groundbreaking took place for a new building that provides laboratory and office space for the LANL branch of the Center. Located northeast of the Materials Science Laboratory in TA-3, this two-story, 36,500-square-foot (3,390-square-meter) building will house approximately 50 workers, including LANL staff and collaborators from universities, other laboratories, and private industry. This building was completed in December 2005 and dedicated in August 2006.

- The Cerro Grande Fire showed that the existing Emergency Operations Center had outlived its useful life. Further research showed that upgrading it would be neither economical nor practical, and the decision was made to design and build a new Emergency

Operations Center. Construction began in early 2002, and the new Emergency Operations Center located at TA-69 became fully operational in December 2003.

- Five two-story office buildings were constructed after the Cerro Grande Fire to replace occupied space lost during the fire and afterwards as a result of postfire recovery efforts. These buildings house about 100 personnel each, consolidating functions and employees within physical proximity, and were occupied in 2003 and 2004.
- The Occupational Medicine Program occupies a new building (the LANL Medical Facility) at TA-3 that houses 60 medical personnel and supports approximately 2,500 LANL patients per month. Through the project, existing nonpermanent facilities were replaced because they had exceeded their life expectancy and were rapidly deteriorating to the point that their condition was impacting the delivery of medical programs. The readiness occupational assessment for the new Medical Facility was completed in December 2003 and the facility became functional in 2004.
- The newly constructed Live Fire Shoot House provides an environment for the safe and realistic conduct of advanced tactical security force training for the Protection Technology Los Alamos staff. Exterior and interior walls were designed to contain bullets and fragmentation from multiple impacts, and bullets traps were also constructed. The facility became operational in March 2003.
- Design of the Information Management Office Building was initiated. The building would consolidate various personnel into a centralized, more efficient office building within TA-3; however, issues have arisen over the size of the building and the planned location. Construction of this building is on hold.
- The National Security Sciences Building constructed in TA-3 provides approximately 275,000 square feet (25,550 square meters) of space for theoretical and applied physics, a Computation Science Program, and senior management office functions. This building is eight stories high and will house about 700 personnel and their functions. Current operations of these capabilities would move from the Administration Building (Building 3-43), which is scheduled to be demolished. The new building also includes a one-story, 600-seat lecture hall and a separate multilevel parking structure that provides 400 spaces near the site. The parking structure was constructed and opened in 2005; the main building was completed in 2006.
- Two new parking structures were constructed in the TA-3 area to ease the critical shortage of parking spaces. One is a precast concrete structure that is four stories tall and provides parking for 337 vehicles. Construction on this first structure began in July 2003 and was completed in April 2004. The second structure (see above) is near the National Security Sciences Building.
- Two staffed access control stations were constructed on Pajarito Road in 2003. The stations cover about 200 square feet (19 square meters) in floor space and an adjacent support building is equipped with various video systems, electric control devices, and fencing to preclude drive-around. They have been operational since April 2004. A

temporary truck inspection station was also constructed at the intersection of NM 4 and East Jemez Road.

These non-Key Facilities occupy more than half of LANL and now provide space for about 70 percent of the workforce. In previous years, activities in these facilities have typically contributed less than 20 percent of most operational effects. In 2004, however, new construction and operational effects in the non-Key Facilities increased. For example, approximately 2 million pounds (930,000 kilograms) of chemical waste generated at the non-Key Facilities constituted about 84 percent of total LANL chemical waste volume in 2004 and exceeded the *1999 SWEIS* ROD projection by about 50 percent. Also in 2004, the non-Key Facilities generated about 87 percent of the total LANL low-level radioactive waste volume; about 30 percent of the mixed low-level radioactive waste volume; and about 54 percent of the transuranic waste volume. The combined flows of the Sanitary Wastewater Systems Plant and the TA-3 Steam Plant account for about 88 percent of the total discharge from non-Key Facilities and about 67 percent of all water discharged by LANL.

Measurement of radiological air emissions from stacks at two non-Key Facilities (Buildings 33-86 and 41-4) ceased in 2003. There were no plutonium or uranium emissions from non-Key Facilities between 1999 and 2004. Tritium emissions slightly exceeded *1999 SWEIS* projections in years 1999 to 2001 because of cleanup activities. These radioactive air emissions of approximately 1,000 curies per year represent off-gassing from inactive facilities and their cleanup activities and less than 5 percent of the total 21,700 curies of emissions from all of LANL that were projected by the *1999 SWEIS* ROD.

Non-Key Facilities currently operate five NPDES-permitted outfalls, compared to 22 outfalls identified in the *1999 SWEIS* for non-Key Facilities. Eighteen outfalls were removed from service since 1999 as a result of efforts to reroute and consolidate flows to eliminate outfalls. In 2001, one of those rerouted outfalls was reinstated in the NPDES permit to direct cooling tower effluent back to Sandia Canyon. The total amount of the effluent discharged by non-Key Facilities exceeded *1999 SWEIS* projections during 3 of the 5 years. Only three of these five NPDES-permitted outfalls have discharged effluent since 1999, because the Sanitary Wastewater Systems Plant effluent is pumped to TA-3 and combined with the Power Plant effluent, and the rerouted outfall just resumed discharging into Sandia Canyon in 2005. Since issuance of the *1999 SWEIS* ROD, non-Key Facilities have continued to discharge about 75 percent of the total NPDES effluent from LANL. Effluent discharged from non-Key Facilities had a 99.9 percent compliance rate during this period; only three events occurred where NPDES permit requirements were exceeded: effluent from the TA-3 Co-Generation Complex (TA-3 Power Plant) cooling towers exceeded permit limits once in 2001 and again in 2002, and effluent from the Metropolis Center cooling towers exceeded permit limits once in May of 2003.

Waste volumes generated by non-Key Facilities have exceeded *1999 SWEIS* projections in several categories. Projected chemical waste volumes were exceeded in 2001 due to the Cerro Grande Fire cleanup, and low-level radioactive waste generation projections were exceeded for the years 2000 through 2004 due to decontamination and decommissioning activities, heightened operational activities, and new construction.

2.5 Overview of Actual Impacts Compared to Site-Wide Environmental Impact Statement Projections

From 1999 through 2005, radioactive airborne emissions from point sources (stacks) have varied from a low of 1,900 curies during 1999 to a high of approximately 19,000 curies during 2005 (just under 90 percent of the 10-year average annual curies of 21,700 projected in the *1999 SWEIS*). The final maximally exposed individual dose over this same multiple-year period varied from a low of 0.32 millirem in 1999 to a high of 6.46 millirem during 2005 (compared to a 5.44 millirem projected dose for this period of time). This dose rate is below the EPA emissions limit of a 10 millirem per year dose rate for DOE facilities.

Calculated NPDES effluent discharges ranged from a low of 124 million gallons (469 million liters) per year in 2001 to a high of 317 million gallons (1.2 billion liters) per year in 1999, compared to a projected discharge volume of 278 million gallons (1.05 billion liters) per year. The apparent decrease in flows, however, is primarily due to the methodology by which the flows were measured and reported in the past. Historically, instantaneous flows were measured during field visits as required in the NPDES permit. These measurements were then extrapolated over a 24-hour day, 7 days per week. With implementation of the new NPDES permit on February 1, 2001, data began to be collected and reported using actual flows recorded by flow meters installed at most outfalls. At those outfalls that do not have meters, the flows are calculated as before (based on instantaneous flow).

Quantities of solid radioactive and chemical wastes generated have ranged from approximately 3.2 percent of the mixed low-level radioactive waste projections in the *1999 SWEIS* during both 1999 and 2002 to 852 percent and 849 percent of the chemical waste projections during 2000 and 2001, respectively. The extremely large quantities of chemical waste (61 million pounds [27.7 million kilograms] during 2000 and 60.8 million pounds [27.6 million kilograms] during 2001) are a result of environmental restoration activities. For example, the remediation of MDA P resulted in 47.4 million pounds (21.5 million kilograms), or 88 percent of the 53.8 million pounds (24.4 million kilograms) of chemical waste generated during 2001. Most chemical wastes are shipped offsite for disposal at commercial facilities (LANL 2003h, 2004f). In 2003, the quantity of mixed transuranic waste generated was 137 percent of the mixed transuranic waste projection. The larger-than-projected quantity of mixed transuranic waste was the result of the Decontamination and Volume Reduction System repackaging of legacy transuranic waste for shipment to WIPP (LANL 2005f). **Table 2–4** summarizes LANL emissions, doses, discharges, and radioactive waste generation and compares them to the *1999 SWEIS* projections.

The LANL workforce has been maintained above *1999 SWEIS* projections since 1999. The 13,504 employees recorded at the end of 2005 represent 1,953 more employees than projected. Since 1999, the peak electricity consumption by LANL operations was 421,413 megawatt-hours during 2005, and the peak demand was 70.9 megawatts during 2001 and 2003, compared to *1999 SWEIS* projections of 782,000 megawatt-hours with a peak demand of 113 megawatts. The peak water usage was 453 million gallons (1.71 billion liters) during 1999 (compared to 759 million gallons [2.87 billion liters] projected), and the peak natural gas consumption was 1.49 million decatherms (42.2 million cubic meters) during 2001 (compared to 1.84 million decatherms [52.1 million cubic meters] projected in the *1999 SWEIS*). Between 1999 and 2005, the highest collective total effective dose equivalent for the LANL workforce was 241 person-rem during 2003, which is considerably lower than the workforce dose of 704 person-rem projected by the *1999 SWEIS* (LANL 2004f).

Table 2–4 Los Alamos National Laboratory Emissions, Doses, Discharges, and Radioactive Waste Generation Since 1999 [a]

	SWEIS ROD	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Radioactive Airborne Emissions from Point Sources								
- Total annual release in curies	21,700	1,900	3,100	15,400	6,150	2,060	5,230	19,100
Percent of 21,700 curies	–	*9*	*15*	*70*	*30*	*9*	*25*	*88*
- MEI dose in millirem per year	5.44	0.32	0.65	1.84	1.69	0.65	1.68	6.46
Percent of 5.44 millirem	–	*6*	*12*	*34*	*31*	*12*	*30*	*119*
NPDES discharges in million gallons per year	278	317	265	124	178	210	162	198
Percent of 278 million gallons per year	–	*114*	*95*	*45*	*64*	*76*	*58*	*71*
Low-level radioactive waste in cubic yards per year	16,000	2,190	5,530	3,400	9,560	7,640	19,400	7,080
Percent of 16,000 cubic yards per year	–	*13.7*	*34.6*	*21.3*	*59.8*	*47.8*	*121*	*44.3*
Mixed low-level radioactive waste in cubic yards per year	830	30	780	80	30	50	50	90
Percent of 830 cubic yards per year	–	*3.6*	*94.0*	*9.6*	*3.6*	*6.0*	*6.0*	*10.8*
Transuranic waste in cubic yards per year	440	190	160	150	160	530	50	100
Percent of 440 cubic yards per year	–	*43.2*	*36.4*	*34.1*	*36.4*	*120*	*11.4*	*22.7*
Mixed transuranic waste in cubic yards per year	150	110	120	60	110	210	30	130
Percent of 150 cubic yards per year	–	*73.3*	*80.0*	*40.0*	*73.3*	*140*	*13.3*	*86.7*
Chemical waste in 1,000 pounds per year	7,160	34,000	61,000	60,800	3,820	1,520	2,460	4,340
Percent of 71,000 pounds per year	–	*475*	*852*	*849*	*53*	*21*	*34*	*61*

[a] Values are rounded.
ROD = Record of Decision, MEI = maximally exposed individual, NPDES = National Pollutant Discharge Elimination System.
Note: To convert cubic yards to cubic meters, multiply by 0.76456; gallons to liters, multiply by 3.378533; pounds to kilograms, multiply by 0.4536.
Sources: LANL 2003h, 2004f, 2005f, 2006g.

Measured parameters for ecological resources and groundwater were similar to *1999 SWEIS* projections, and measured parameters for cultural resources and land resources were below projections. For land use, the *1999 SWEIS* projected the disturbance of 41 acres (17 hectares) of new land at TA-54 because of the need for additional disposal cells for low-level radioactive waste. This expansion is currently underway. In addition, construction of the Los Alamos Research Park was completed on 44 acres (18 hectares) of land along West Jemez Road.

Cultural resources remained protected, and no excavation of sites at TA-54 has occurred. (The *1999 SWEIS* projected that 15 prehistoric sites would be affected by the expansion of Area G into Zones 4 and 6 at TA-54.) Excavations did occur, however, at the Airport-1 East and White Rock-1 tracts from June 2002 through March 2003. These two land tracts were conveyed to the County of Los Alamos for future development (see Table 4-2). Eleven cultural sites also were excavated in Rendija Canyon in 2004 (LANL 2005f).

As projected in the *1999 SWEIS*, water levels in wells penetrating into the regional aquifer continue to decline in response to pumping, typically by several feet each year. In areas where pumping has been reduced, water levels show some recovery. No unexplained changes in patterns have occurred from 1999 through 2005 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977. Five additional characterization wells were completed in 2004 and, pursuant to the 2005 Consent Order, 21 additional characterization wells were installed in 2005. In addition, ecological resources are being sustained as a result of protection afforded by DOE ownership of LANL. These resources include biological resources such as protected sensitive species, ecological processes, and biodiversity. The recovery and response to the Cerro Grande Fire of May 2000 included a Wildfire Fuels Reduction Program, burned area rehabilitation and monitoring efforts, and enhanced vegetation and wildlife monitoring (LANL 2004f, 2005f).

For the most part, operations at LANL remained within the projections made in the *1999 SWEIS*. Operations that exceeded projections, such as the number of employees or the amount of chemical waste generated from cleanup activities, produced a neutral or beneficial impact on northern New Mexico. A larger number of employees increased the tax base and resulted 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 treatment and disposal of the waste was accomplished in accordance with applicable regulations. Overall, data on operations during the period from 1999 through 2005 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 2–5 summarizes the actual impacts and performance changes by resource or impact area from 1999 through 2005 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 2005 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 2–5 Summary Comparison of *1999 SWEIS*[10] Projected Impacts and Actual Changes and Performance (1999 to 2005)

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
Land Resources	LANL covered 43 square miles (111 square kilometers), with about 5 percent of the site 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 to disturb 41 acres (16.6 hectares) of approximately 72 acres designated for waste disposal. 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 4,078 acres (1,650 hectares) have been designated for conveyance to Los Alamos County and the New Mexico Department of Transportation, and transfer to the Department of the Interior (to be held in trust for the Pueblo of San Ildefonso), of which 2,259 acres (914 hectares) have been turned over (as of the end of 2006), including all lands to be transferred to the Department of the Interior (in trust for the Pueblo of San Ildefonso). 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 New Mexico Department of Transportation, 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 and the nearby communities is lost to the casual observer.	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 Pueblo of San Ildefonso sacred area, the Nambe-Española area, and areas in western and southern Santa Fe County.	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 actions.

[10] *Based on the Expanded Operations Alternative as defined in the 1999 SWEIS and ROD (64 FR 50797).*

Resource or Impact Area	***1999 SWEIS Projected Impacts***	***Actual Impacts and Performance Changes (1999 to 2005)***	***Assessment***
	Projected temporary and minor impacts included changes resulting from construction and environmental restoration activities.	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 7,700 acres (3,110 hectares) resulting in a more open, park-like forest, increasing the visibility of some facilities. Bark beetles have killed thousands of evergreen trees, opening the forest and making LANL facilities more visible.	The Cerro Grande Fire and bark beetle infestation 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 Chemistry and Metallurgy Research 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 Chemistry and Metallurgy Research Building operations to TA-55, an area of no observed seismic faulting (DOE 2003c).	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 that 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* projections were not exceeded.
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 (538 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 6 of 7 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 four Key Facilities exceeded their individual 1999 projections. • Tritium Facilities: discharges exceeded annual projections each year, ranging from 0.4 to 33 million gallons per year (1.5 to 125 million liters per year), compared to *1999 SWEIS* projection of 0.3 million gallons (1.1 million liters) per year.	The number of NPDES outfalls was within the *1999 SWEIS* projections. The number of permitted NPDES outfalls and the total flow were consistent with or below *1999 SWEIS* projections. The distribution of flow from individual Key and non-Key Facilities, however, 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)

Resource or Impact Area	***1999 SWEIS Projected Impacts***	***Actual Impacts and Performance Changes (1999 to 2005)***	***Assessment***
		• Chemistry and Metallurgy Research Building discharges exceeded projections 6 of 7 years, ranging from 0.02 to 4.5 million gallons (0.08 to 17 million liters) per year, compared to *1999 SWEIS* projection of 0.5 million gallons (1.9 million liters) per year. • High Explosives Testing Facility discharges exceeded projections 3 years, ranging from 9 to 16.1 million gallons (34 to 61 million liters) per year in 1999 through 2001, compared to *1999 SWEIS* projection of 3.6 million gallons (14 million liters) per year. • Sigma Complex discharges exceeded projections in 2003, with 7.6 million gallons (29 million liters) compared to the *1999 SWEIS* projection of 7.3 million gallons (28 million liters) per year. Non-Key Facilities: Total flow exceeded *1999 SWEIS* projections 3 out of 7 years, in part due to extrapolation from instantaneous flow measurements.	outfalls and measuring stations, providing more accurate information.
- NPDES Outfall Quality	The 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*, RLWTF would be modified and the High Explosives Waste Treatment Facility would be constructed to improve effluent quality.	NPDES effluent quality met permitted levels for 99.75 percent of samples since 2000; number of events where permit levels were exceeded ranged from 0 to 14 (of about 1,100 samples) per year. Exceedances resulted in preparation and implementation of corrective action plans. RLWTF has improved the quality of effluent, reducing annual levels of nitrates and radionuclides. Since 1999, 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 High Explosives Wastewater Treatment Facility outfall have been below *1999 SWEIS* projections since 1999.	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*.
- Water Quality Impacts from Stormwater and Construction Sources	Water quality was projected to be similar or better than recent experience. The following LANL operations were identified in the *1999 SWEIS* as impacting surface water quality: • Stormwater 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	LANL still requires Stormwater Pollution Prevention Plans and best management practices to protect surface waters from pollutants from industrial stormwater sources and construction projects. The number of industrial activities requiring individual Stormwater Pollution Prevention Plans has ranged from 15 to 22. Stormwater 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 Stormwater 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.

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*Assessment*
	Environment Department (Section 404 and 401 permits).		
- 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, polychlorinated biphenyls, and high explosives residue.	Several actions and best management practices were implemented to manage, control, and minimize stormwater 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 5. The annual flow discharged to the individual watersheds exceeded *1999 SWEIS* projections 5 times from 1999 to 2000 and 1 time since 2000. While radionuclides at or above background levels have been detected in sediments on- and offsite, the 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, stormwater runoff increased (2 to 4 times for average flow, and 10 to 1,000 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.	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.
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 Los Alamos County (previously 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 (LANL 2003b).	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 that had little effect on groundwater quantities.	LANL discharges have had little effect on groundwater quantities in the last 6 years.	Impacts of LANL discharges on groundwater quantities continue to be bounded by the impacts analyzed in the *1999 SWEIS*.
- Quality	Because mechanisms for recharge to groundwater are highly uncertain, it is possible that discharges under any of the alternatives in the *1999 SWEIS* could result in contaminant transport in groundwater and off the site.	Regional groundwater samples taken in 2005 and 2006 show the presence of hexavalent chromium. Other contaminants detected included perchlorate in all groundwater zones in Mortandad Canyon, in the regional aquifer in Pueblo Canyon, and in alluvial groundwater in Cañon de Valle; and 1,4-dioxane in perched groundwater in Mortandad Canyon.	Hexavalent chromium has not been detected in offsite regional groundwater or in water supply wells. Production well Otowi-1 in Pueblo Canyon was taken permanently off-line because it had one tenth of the risk level of 24.5 micrograms per liter of perchlorate. There is no Federal or State standard for 1,4-dioxane.

Resource or Impact Area	***1999 SWEIS Projected Impacts***	***Actual Impacts and Performance Changes (1999 to 2005)***	***Assessment***
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 = 1.9	Annual emissions of criteria pollutants from LANL operations reported in the *Annual Emissions Inventories Through 2005* 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*.
- Other Nonradiological Pollutants	A screening analysis of toxic and hazardous pollutants indicated that levels of potential consequence to the public would not be exceeded for most air pollutants. Further detailed analysis demonstrated that concentrations of other pollutants 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} was dominated by the contribution from chloroform. Although annual emissions of chemical pollutants were not reported in detail for all facilities, the details presented for TA-3, for example, indicate emissions of 153 toxic pollutants. The *1999 SWEIS* did not address toxic and hazardous emissions from combustion sources.	Reported toxic and hazardous pollutant emissions generally have been less than guideline values. Carcinogenic emissions generally have been 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 21 additional pollutants were emitted and emissions of 39 pollutants exceeded *1999 SWEIS* projections. Seventy-five pollutants were not emitted that were projected.	The amounts of chemicals 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.

Resource or Impact Area	***1999 SWEIS Projected Impacts***		***Actual Impacts and Performance Changes (1999 to 2005)***		***Assessment***
- Nonradiological Construction Activities	Air quality impacts of construction activities were not quantified in the *1999 SWEIS*. The *1999 SWEIS*, however, 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.
- 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*. The exceptions for peak years were due to deactivation activities at TA-21 and a single event at the Weapons Engineering and Tritium Facility for tritium, as well as a failed valve and hours of operation at LANSCE for activation products.
	Actinides	0.000798	0.0000113	0.0000302	
	Fission Products	0.00014	Not reported	Not reported	
	Activation Products	16,000	5,070	18,900	
	Tritium (water vapor)	1,260	815	1,200	
	Tritium (gas)	1,920	1,770	8,740	
	Argon-41	870	22.7	49.8	
	Other Noble Gases	1,640	Not detected	Not detected	
	Uranium	0.152	0.00836	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 listed endangered species, 2 federally listed 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.		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 (14 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 the Areas of Environmental Interests.		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.

Resource or Impact Area	1999 SWEIS Projected Impacts	Actual Impacts and Performance Changes (1999 to 2005)	Assessment
	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). About 25 acres (10 hectares) of the core zone of the 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).	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 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 potential wildfire. Thinning has both positive and negative effects on wildlife. An infestation of bark beetles resulted in a 12 to 100 percent mortality of pine and fir trees across LANL.	Forest thinning creates a forest that appears more park-like and increases the diversity of shrubs, herbs, and grasses in the understory.
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	2.5 person-rem in peak year (2005)	
Risk (per year)	0.0165 latent cancer fatalities	0.0015 latent cancer fatalities in peak year (2005)	
- MEI	LANL site MEI located north-northeast of LANSCE.	No change in location for the LANL site MEI.	Average dose to MEI continues to be bounded by projections in the *1999 SWEIS*. Higher emissions in 2005, resulting in a higher MEI dose, were due to a failed valve at LANSCE. The peak year dose is below the 10 millirem annual public exposure limit.
Dose (per year)	5.44 millirem	6.5 millirem in peak year (2005)	
Risk (per year)	2.72×10^{-6} latent cancer fatalities	3.9×10^{-6} latent cancer fatalities in peak year (2005)	
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} latent cancer fatalities	8.9×10^{-5} latent cancer fatalities 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	241 person-rem in peak year (2003)	
Risk (per year)	0.281 latent cancer fatalities	0.145 latent cancer fatalities in peak year (2003)	
	Factor used to estimate risk of latent cancer fatalities per rem was 0.0004 in 1999.	Dose-to-risk factor for workers increased from 0.0004 to 0.0006 latent cancer fatalities per rem.	

Resource or Impact Area	*1999 SWEIS Projected Impacts*	*Actual Impacts and Performance Changes (1999 to 2005)*	*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 increased to 90 percent in 2005, and the number of known cultural resource sites increased as well. Conveyance and transfer of land resulted in the removal of cultural resources from the responsibility and protection of DOE, including resources eligible for listing on the National Register of Historic Places and American Indian 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 (to be held in trust 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. Additionally, the fire and the tree-thinning measures taken to reduce wildfire hazard resulted in the discovery of 447 new archaeological sites.	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 2005, there were 13,504 LANL-affiliated employees.	Socioeconomic impacts from continued operations at LANL between 1998 and 2005 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 2005)***	***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: 391,096 megawatt-hours per year, with peak usage of 421,413 megawatt-hours in 2005. Average peak load demand: 68.8 megawatts, with a peak of 70.9 megawatts in 2001 and 2003.	Annual electricity usage at LANL remained below the levels projected in the *1999 SWEIS*. Electrical usage has not exceeded the annual 963,600 megawatt-hour system capacity, or the physical transmission capability (thermal rating) of 110 megawatts.
- Fuel	LANL was projected to require 1.84 million decatherms (52.1 million cubic meters) of natural gas per year. Note: A decatherm is equivalent to 1,000 cubic feet.	Average annual usage: 1.32 million decatherms (37.4 million cubic meters) per year. Peak year usage: 1.49 billion cubic feet (42.2 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 8.07 million decatherms (229 million cubic meters) per year.
- Water	LANL was projected to require 759 million gallons (2.87 million liters) of water per year.	Average annual usage: 385 million gallons (1.46 billion liters) per year. Peak year usage: 453 million gallons (1.71 billion liters) (1999).	Annual water usage at LANL remained below the level projected in the *1999 SWEIS*. Demand for water has not exceeded the ceiling quantity of approximately 542 million gallons (2 billion liters) per year.
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. Cleanup activities have been completed 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 environmental restoration activities were undertaken in response to the Cerro Grande Fire that reduced 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 2005)*	*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 waste, mixed transuranic waste, and chemical waste). 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, of which 41 acres (16.6 hectares) would actually be disturbed by waste disposal.	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 remained within the *1999 SWEIS* projection. For transuranic waste, the quantities were within the *1999 SWEIS* projection for 6 of the 7 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 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.
Emergency Preparedness and Security	LANL's Comprehensive Emergency Management and Response Program, which 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 included replacing a number of aging structures 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, NPDES = National Pollutant Discharge Elimination System, CO = carbon monoxide, NO_x = nitrogen oxide, PM = particulate matter, SO_2 = sulfur dioxide, rem = roentgen equivalent man, MEI = maximally exposed individual, RLWTF = Radioactive Liquid Waste Treatment Facility, 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).