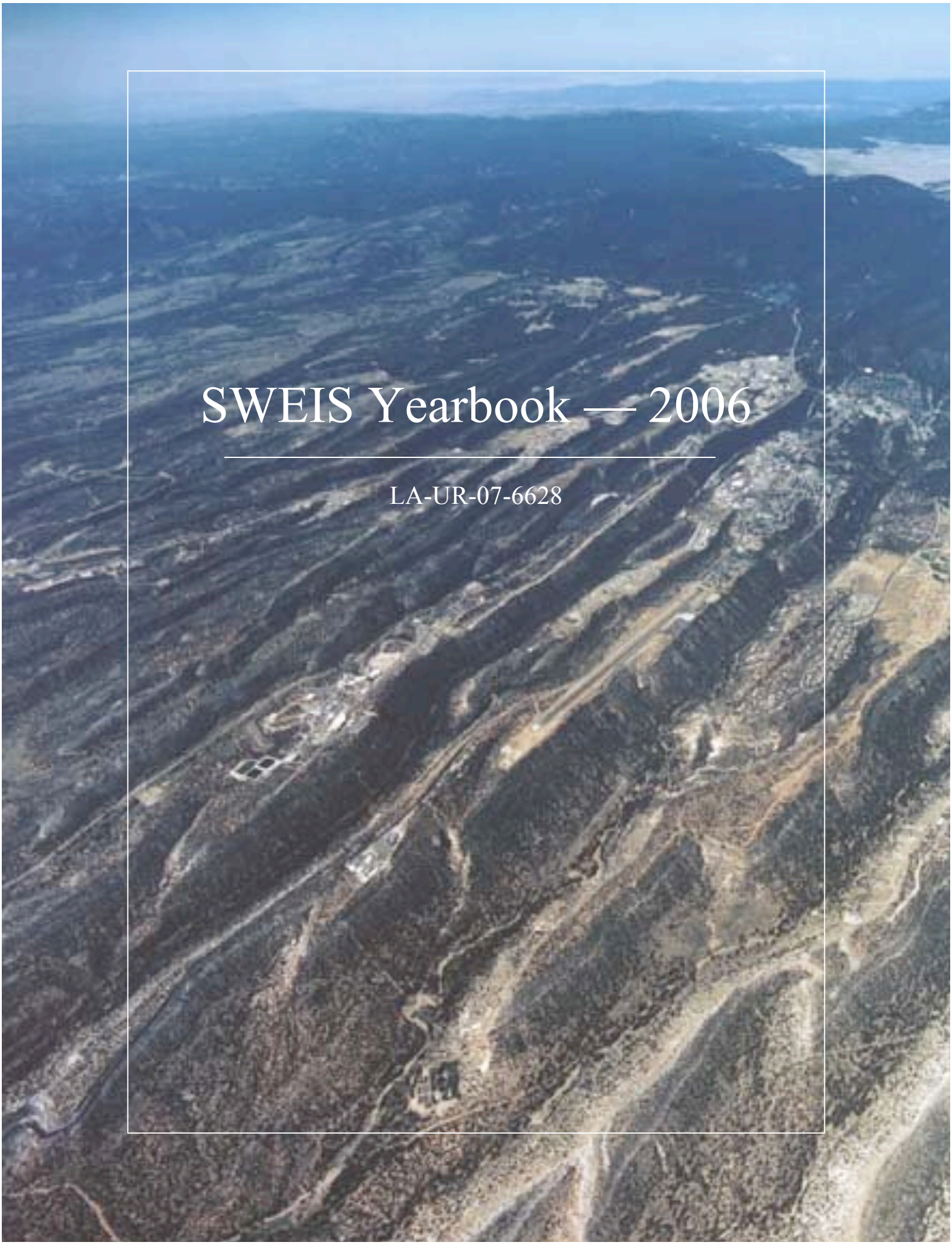

SWEIS Yearbook — 2006

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Title

SWEIS Yearbook—2006

Comparison of 2006 Data Projections of the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory

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Los Alamos
NATIONAL LABORATORY
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Preface

In the Record of Decision for Stockpile Stewardship and Management, the US Department of Energy (DOE)[1] charged LANL with several new tasks, including war reserve pit production. DOE evaluated potential environmental impacts of these assignments in the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (DOE 1999a). This Site-Wide Environmental Impact Statement (SWEIS) provided the basis for DOE decisions to implement these new assignments at LANL through the SWEIS Record of Decision (ROD) issued in September 1999 (DOE 1999b).

Every five years, DOE performs a formal analysis of the adequacy of the SWEIS to characterize the environmental envelope for continuing operations at LANL. The Annual SWEIS Yearbook was designed to assist DOE in this analysis by comparing operational data with projections of the SWEIS for the level of operations selected by the ROD. As originally planned, the Yearbook was to be published one year following the activities; however, publication was moved approximately six months earlier to achieve timely presentation of the information. Yearbook publications to date include the following:

- "SWEIS 1998 Yearbook," LA-UR-99-6391, December 1999 (LANL 1999, http://lib-www.lanl.gov/cgi-bin/getfile?00460172.pdf).
- "SWEIS Yearbook – 1999," LA-UR-00-5520, December 2000 (LANL 2000a, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-00-5520.htm).
- "A Special Edition of the SWEIS Yearbook, Wildfire 2000," LA-UR-00-3471, August 2000 (LANL 2000b, http://lib-www.lanl.gov/cgi-bin/getfile?00393627.pdf).
- "SWEIS Yearbook – 2000," LA-UR-01-2965, July 2001 (LANL 2001, http://lib-www.lanl.gov/la-pubs/00818189.pdf).
- "SWEIS Yearbook – 2001," LA-UR-02-3143, September 2002 (LANL 2002, http://lib-www.lanl.gov/cgi-bin/getfile?00818857.pdf).
- "SWEIS Yearbook – 2002," LA-UR-03-5862, September 2003 (LANL 2003, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-03-5862.htm)

[1] Congress established the National Nuclear Security Administration (NNSA) within the DOE to manage the nuclear weapons program for the United States. Los Alamos National Laboratory (LANL or Laboratory) is one of the facilities now managed by the NNSA. The NNSA officially began operations on March 1, 2000. Its mission is to carry out the national security responsibilities of the DOE, including maintenance of a safe, secure, and reliable stockpile of nuclear weapons and associated materials capabilities and technologies; promotion of international nuclear safety and nonproliferation; and administration and management of the naval nuclear propulsion program.

- "SWEIS Yearbook – 2003," LA-UR-04-6024, September 2004 (LANL 2004, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-04-6024.htm)

- "SWEIS Yearbook – 2004," LA-UR-05-6627, September 2005 (LANL 2005, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-05-6627.htm)

- "SWEIS Yearbook – 2005," LA-UR-06-6020, September 2006 (LANL 2006, http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-06-6020.htm)

- "SWEIS Yearbook – 2006," LA-UR-07-6628, October 2007 (LANL 2007, http://library.lanl.gov/cgi-bin/getfile?LA-UR-07-6628.htm)

The 2006 Yearbook will present the eighth year of data compiled since the ROD for the LANL SWEIS was issued in September 1999. The Yearbook 2006 is an essential component in DOE's five-year evaluation of how accurately the SWEIS represents LANL current and projected operations. DOE regulations require this review, called a supplement analysis, of the SWEIS every five years, to determine if the SWEIS is adequate or needs to be supplemented or a new SWEIS should be written.

The collective set of Yearbooks contains data needed for trend analyses, identifies potential problem areas, and enables decision-makers to determine when and if an updated SWEIS or other National Environmental Policy Act analysis is necessary. This edition of the Yearbook summarizes the data from 2006, and, together with the previous editions of the Yearbook, provides trend analysis of these data to assist DOE in its decision-making process.

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Executive Summary

On June 1, 2006, the management of Los Alamos National Laboratory (LANL) transitioned from the University of California (UC) to Los Alamos National Security, LLC (LANS). LANS, a team formed by the UC, Bechtel, BWX Technologies, and Washington Group International, currently operates LANL for the US Department of Energy (DOE) and the National Nuclear Security Administration (NNSA). In addition to the change in management, major reorganization also occurred during calendar year (CY) 2006, resulting in the formation, renaming, and/or dissolving of various LANL groups, divisons, and directorates.

In 1999, the DOE published a Site-Wide Environmental Impact Statement (SWEIS) for continued operation of LANL. DOE issued a Record of Decision (ROD) for this document in September 1999.

DOE and LANL implemented a program, the Annual Yearbook, making comparisons between SWEIS ROD projections and actual operations data for two reasons: first, to preserve and enhance the usefulness of the SWEIS as a "living" document and, second, to provide DOE with a tool to assist in determining the continued adequacy of the SWEIS in characterizing existing operations. The Yearbooks from CY 1998 through 2006, with the exception of CY 2002, focus on operations during one CY and specifically address the following:

- facility and/or process modifications or additions,
- types and levels of operations during the CY,
- operations data during the CY, and
- site-wide effects of operations for the CY.

The 2002 Yearbook was a special edition to assist DOE/NNSA in evaluating the need for preparing a new SWEIS for LANL. This edition of the Yearbook summarized the data routinely collected from individual CYs as described above. It also contained additional text and tabular summaries as well as a trend analysis. The 2002 Yearbook also indicated LANL's programmatic progress in moving towards the SWEIS projections.

The SWEIS analyzed the potential environmental impacts of scenarios for future operations at LANL. DOE announced in its ROD that it would operate LANL at an expanded level and that the environmental consequences of that level of operations were acceptable. The ROD is not a predictor of specific operations, but establishes boundary conditions for operations. The ROD provides an environmental operating envelope for specific facilities and LANL as a whole. If operations were to routinely exceed the operating envelope, DOE would evaluate the need for a new SWEIS. As long as operations remain below the level analyzed in the ROD, the environmental operating envelope is valid. Thus, the levels of operation projected by the SWEIS ROD should not be viewed as goals to be achieved, but rather as acceptable operational levels.

The 2006 Yearbook addresses capabilities and operations using the concept of "Key Facility" as presented in the SWEIS. The definition of each Key Facility hinges upon operations (research, production, or services) and capabilities and is not necessarily confined to a single structure, building, or technical area (TA). Chapter 2 discusses each of the 15 Key Facilities from three aspects—significant facility construction and modifications that have occurred during 2006, the types and levels of operations that occurred during 2006, and the 2006 operations data. Chapter 2 also discusses the "Non-Key Facilities," which include all buildings and structures not part of a Key Facility, or the balance of LANL.

During 2006, construction of new facilities continued at one of the 15 Key Facilities. One major construction project, the Center for Integrated Nanotechnologies was completed and occupied during 2006. At the Non-Key Facilities, two major construction projects, the Security Perimeter Project and the National Security Sciences Building , were completed in 2006.

The ROD projected a total of 38 facility construction and modification projects for LANL. Twenty projects have now been completed: six in 1998, eight in 1999, two in 2000, and four in 2002. The number of projects started or continued each year were 13 in 1998, 10 in 1999, seven in 2000, and six in both 2001 and 2002. One of these projects was completed in 2003 and one in 2004.

A major modification project, elimination and/or rerouting of National Pollutant Discharge Elimination System (NPDES) outfalls, was completed in 1999, bringing the total number of permitted outfalls down from the 55 identified by the SWEIS ROD to 20. During 2000, Outfall 03A-199, which will serve the TA-3-1837 cooling towers, was included in the new NPDES permit issued by the US Environmental Protection Agency on December 29, 2000. This brings the total number of permitted outfalls up to 21. During 2006, only 17 of the 21 outfalls flowed.

As in the Yearbooks since 1999, this issue reports chemical usage and calculated emissions (expressed as kilograms per year) for the Key Facilities, based on an improved chemical reporting system. The 2006 chemical usage amounts were extracted from LANL's new chemical inventory system, called ChemLog, rather than the Automated Chemical Inventory System used in the past. The quantities used for this report represent chemicals procured or brought on site by CY from 1999 through 2006. Information is presented in Appendix A for actual chemical use and estimated emissions for each Key Facility. Additional information for chemical use and emissions reporting can be found in the annual Emissions Inventory Report as required by New Mexico Administrative Code, Title 20, Chapter 2, Part 73. The most recent report is "Emissions Inventory Report Summary for Calendar Year 2006."

With a few exceptions, the capabilities identified in the SWEIS ROD for LANL have remained constant since 1998. The exceptions are the following:

- movement of the Nonproliferation Training/Nuclear Measurement School between Pajarito Site and the Chemistry and Metallurgy Research (CMR) Building during 2000 and 2002,
- relocation of the Decontamination Operations Capability from the Radioactive Liquid Waste Treatment Facility to the Solid Radioactive and Chemical Waste Facilities in 2001,
- transfer of part of the Characterization of Materials Capability from Sigma to the Target Fabrication Facility (TFF) in 2001 then back to Sigma in 2006, and
- loss of Cryogenic Separation Capability at the Tritium Key Facilities in 2001.

Also, following the events of September 11, 2001, LANL was requested to provide support for homeland security.

During CY 2006, 80 capabilities were active. The 16 inactive capabilities were the Cryogenic Separation at the Tritium Facilities; both the Destructive and Nondestructive Assay and the Fabrication and Metallography capabilities at CMR; Characterization of Materials at the TFF; the Accelerator Transmutation of Wastes at the Los Alamos Neutron Science Center (LANSCE); Waste Retrieval, Size Reduction, and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities; and eight of the nine TA-18 capabilities (Dosimeter Assessment and Calibration, Detector Development, Materials Testing, Fast-Neutron Spectrum, Dynamic Measurements, Skyshine Measurements, Vaporization, and Irradiation).

While there was activity under nearly all capabilities, the levels of these activities were mostly below levels projected by the ROD. For example, the LANSCE linear accelerator generated an H^- beam to the Lujan Center for 3,892 hours in 2006, at an average current of 190 microamps, compared to 6,400 hours at 200 microamps projected by the ROD. Similarly, no criticality experiments were conducted at Pajarito Site, compared to the 1,050 projected experiments.

Only two of LANL's facilities operated during 2006 at levels approximating those projected by the ROD—the Materials Science Laboratory (MSL) and the Non-Key Facilities. The Key Facility MSL is more akin to the Non-Key Facilities and represents 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 14 Key Facilities all conducted operations at or below projected activity levels.

Radioactive airborne emissions from point sources (i.e., stacks) during 2006 totaled approximately 1,450 curies, approximately 7 percent of the 10-year average of 21,700 curies projected by the ROD. Radioactive emissions decreased by 83 percent from 2005 due to the repair of the emission control system at LANSCE.

Calculated NPDES discharges totaled 221.70 million gallons for CY 2006 compared to a projected volume of 278 million gallons per year. This is approximately 23.24 million gallons more than the CY 2005 total of 198.26 million gallons, due largely to resumption

of normal Laboratory operations after the LANL stand down that occurred in July 2004. The 2006 total volume of discharge is well below the maximum flow of 278.0 million gallons that was projected in the SWEIS ROD. In addition, the apparent decrease in flows compared to the SWEIS ROD is primarily due to the methodology by which flow was measured and reported in the past. Historically, instantaneous flow was measured during field visits as required in the NPDES permit. These measurements were then extrapolated over a 24-hour day/seven-day week. With implementation of the new NPDES permit on February 1, 2001, data are collected and reported using actual flows recorded by flow meters at most outfalls. At those outfalls that do not have meters, the flow is calculated as before, based on instantaneous flow.

Waste quantities from 2006 LANL operations were below SWEIS ROD projections for all waste types, reflecting the levels of operations at both the Key and Non-Key Facilities. Quantities of wastes generated in 2006 ranged from approximately 5 percent of the mixed low level waste projection to about 79 percent of the low level waste projection.

Since 1998, the highest peak electricity consumption was 444 gigawatt-hours during 2006 and the maximum peak demand was 85 megawatts during 2001 compared to projections of 782 gigawatt-hours with a peak demand of 113 megawatts. The peak water usage was 461 million gallons during 1998 (compared to 759 million gallons projected), and the peak natural gas consumption was 1.49 million decatherms during 2001 (compared to 1.84 million decatherms projected). Between 1998 and 2006, the highest collective total effective dose equivalent for the LANL workforce was 163 person-rem during 2006, which is considerably lower than the workforce dose of 704 person-rem projected by the ROD.

The size of the workforce has been above ROD projections since 1997. The 12,764 employees at the end of CY 2006 represent 1,413 more employees than projected and reflect a decrease of 740 employees from CY 2005.

Measured parameters for ecological resources and groundwater were similar to ROD projections, and measured parameters for cultural resources and land resources were below ROD projections. For land use, the ROD projected the disturbance of 41 acres of new land at TA-54 because of the need for additional disposal cells for low level waste. As of 2006, this expansion had not become necessary.

Cultural resources remained protected, and no excavation of sites at TA-54 has occurred. (The ROD projected that 15 prehistoric sites would be affected by the expansion of Area G into Zones 4 and 6 at TA-54.)

As projected by the ROD, 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 in the 1995–2006 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977. Five additional characterization wells were complete by the end of 2006.

In addition, ecological resources are being sustained as a result of protection afforded by DOE/NNSA administration 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 has included a wildfire fuels reduction program, burned area rehabilitation and monitoring efforts, and enhanced vegetation and wildlife monitoring.

In conclusion, LANL operations data mostly fell within projections. Operations data that exceeded projections, such as number of employees, produced a positive impact on the economy of northern New Mexico. Overall, the 2006 operations data indicate that LANL was operating within the SWEIS envelope and still ramping up operations towards the preferred Expanded Operations Alternative in the ROD.

One purpose of the 2006 Yearbook is to compare LANL operations and resultant 2006 data to the SWEIS ROD to determine if LANL was still operating within the environmental envelope established by the SWEIS and the ROD. Data for 2006 indicate that positive impacts (such as socioeconomics) were greater than SWEIS ROD projections, while negative impacts, such as radioactive air emissions and land disturbance, were well within the SWEIS operating envelope.

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Acknowledgments

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Hector Hinojosa provided editorial support and served as the designer and electronic publication specialist. We would also like to thank Brad McKown for creating maps and figures. A special thanks to John Isaacson, SWEIS Program Manager, and Jennifer Nisengard, SWEIS Office, for their support and assistance.

Many individuals assisted in the collection of information and review of drafts. Data and information came from many parts of the Laboratory, including facility and operating personnel and those who monitor and track environmental parameters. The Yearbook could not have been completed and verified without their help. Though all individuals cannot be mentioned here, the table below identifies major contributors from each of the Key Facilities and other operations.

Area of Contribution	Contributor
Air Emissions	Margie Stockton
Air Emissions	Doug Stavert
Air Emissions	Walter Whetham
Bioscience (Formerly Health Research Laboratory)	S. Kathleen Kelly
Chemistry and Metallurgy Research Building	Robert Romero
Cultural Resources	Kari Garcia
Cultural Resources	Bruce Masse
Ecological Resources	Leslie Hansen
Ecological Resources	Sam Loftin
Environmental Remediation and Surveillance Program	Shannon Smith
Groundwater	Bob King
Groundwater	Jean Dewart
High Explosives Processing	Bart Olinger
High Explosives Testing	Randy Johnson
Land Resources	Kirt Anderson
Liquid Effluents	Marc Bailey
Liquid Effluents	Steve Veenis
Liquid Effluents	Terrill Lemke
Liquid Effluents	Robin Reynolds
Liquid Effluents	Jake Meadows
Los Alamos Neutron Science Center	Ben Poff
Los Alamos Neutron Science Center	Howard Nekimken
Machine Shops	Patricia Vardaro-Charles
Machine Shops	Greg Fenner

Area of Contribution	Contributor
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Materials Science Laboratory	Betsy Grindstaff
Materials Science Laboratory	Dee Hoisington
National Pollutant Discharge Elimination System Data	Marc Bailey
Non-Key Facilities–Atlas	Jerry Grindstaff
Non-Key Facilities–National Security Sciences Building	Keith Orr
Non-Key Facilities–Los Alamos Site Office Building	Joe Brophy
Non-Key Facilities–Security Perimeter Project	Mark Harris
Pajarito Site	Tom Beckman
Plutonium Complex	Harvey Decker
Pollution Prevention Program	Pat Gallagher
Radioactive Liquid Waste Treatment Facility	Leonard Sandoval
Radioactive Liquid Waste Treatment Facility	Chris Del Signore
Radiochemistry Facility	Patricia Vardaro-Charles
Radiochemistry Facility	Jacque McClory
Radiochemistry Facility	Peter Rice
Sigma	Patricia Vardaro-Charles
Sigma	Paul Dunn
Sigma	Greg Fenner
Socioeconomics	John Pantano
Solid Radioactive and Chemical Waste Facilities	Leonard Sandoval
Solid Radioactive and Chemical Waste Facilities	Bob Lechel
Solid Radioactive and Chemical Waste Facilities	Heather Voss
Solid Radioactive and Chemical Waste Facilities	Tim Sloan
Solid Radioactive and Chemical Wastes	Tim Sloan
Target Fabrication Facility	Patricia Vardaro-Charles
Target Fabrication Facility	Jerry Grindstaff
Trend Analysis	Kirt Anderson
Trend Analysis	Monica Witt
Tritium Facilities	Suzanne Kitten
Tritium Facilities	Richard Hemphill
Utilities	Jerome Gonzales
Utilities	Gilbert Mackey
Utilities	Jim Haugen
Worker Safety/Doses	Dina Matz
Worker Safety/Doses	Bob Bates

Acronyms

ACA	Accelerated Corrective Action
AFCI	Advanced Fuel Cycle Initiative
ALARA	as low as reasonably achievable
AOC	area of concern
ARTIC	Actinide Research and Technology Instruction Complex
BIO	Basis for Interim Operation
BMP	best management practice
BSL	Biosafety Level
CASA	Critical Assembly and Storage Area
CGP	Construction General Permit
CINT	Center for Integrated Nanotechnology
CME	Corrective Measures Evaluation
CMR	Chemical and Metallurgy Research (Building)
CY	calendar year
CRT	Cultural Resources Team
D&D	decontamination and demolition
DARHT	Dual-Axis Radiographic Hydrodynamic Test (facility)
DOE	US Department of Energy
DVRS	Decontamination and Volume Reduction System
EISU	Electrical Infrastructure Safety Upgrades
EMS	Environmental Management System
EPA	US Environmental Protection Agency
ER	Environmental Restoration (Project)
ERS	Environmental Remediation and Surveillance (Program)
ETA	Eastern Technical Area
FFCA	Federal Facility Compliance Agreement
FTE	full-time equivalent (employee)
FY	fiscal year
HAP	hazardous air pollutant
HEPA	high-efficiency particulate air (filter)
HRL	Health Research Laboratory
HSWA	Hazardous and Solid Waste Amendment
HX	Hydrodynamic Experiments (Division)
IAEA	International Atomic Energy Agency
IWP	Investigation Work Plan
KSL	KBR/Shaw/LATA
kV	kilovolts
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
LANSCE	Los Alamos Neutron Science Center
LASO	Los Alamos Site Office
LEDA	Low-Energy Demonstration Accelerator
linac	linear accelerator
LLW	low-level radioactive waste
LPSS	Long-Pulse Spallation Source
m	meter
MDA	material disposal area
MeV	million electron volts
MGY	million gallons per year
MLLW	mixed low-level radioactive waste
MOX	mixed oxide (fuel)
MSGP	Multi-Sector General Permit
MSL	Materials Science Laboratory
NEPA	National Environmental Policy Act
NFA	No Further Action
NMED	New Mexico Environment Department
NMSHPD	New Mexico State Historic Preservation Division

NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NSSB	National Security Sciences Building
NTTL	Neutron Tube Target Loading
OSR	Offsite Source Recovery (Program)
PHERMEX	Pulsed High-Energy Radiographic Machine Emitting X-rays (facility)
PNM	Public Service Company of New Mexico
PP	Pollution Prevention
PRS	potential release site
PTLA	Protection Technology Los Alamos
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RFI	RCRA Facility Investigation
RLUOB	Radiological Laboratory Utilities Office Building
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
SA	Supplement Analysis
SERF	Sanitary Effluent Recycle Facility
SHPO	State Historic Preservation Officer
SNM	special nuclear material
STA	Southern Technical Area
SWEIS	Site-Wide Environmental Impact Statement
SWMU	solid waste management unit
SWPPP	stormwater pollution prevention plan
SWWS	Sanitary Wastewater System
TA	Technical Area
TEDE	total effective dose equivalent
TFF	Target Fabrication Facility
TRU	transuranic
TSFF	Tritium Science and Fabrication Facility
TSR	Technical Safety Requirement
TSTA	Tritium Systems Test Assembly (facility)
TWISP	Transuranic Waste Inspectable Storage Project
TYCSP	Ten-Year Comprehensive Site Plan
UC	University of California
UF/RO	ultrafiltration/reverse osmosis
UPS	uninterruptible power supply
VAP	Vehicle Access Portal
VOC	volatile organic compound
WCRR	Waste Characterization, Reduction, and Repackaging (facility)
WET	Weapons Engineering Technology (Division)
WETF	Weapons Engineering Tritium Facility
WFO-FOD	Weapons Facilities Operations-Facility Operations Director
WIPP	Waste Isolation Pilot Plant
WMin	Waste Minimization
WNR	Weapons Neutron Research (facility)
WTA	Western Technical Area

1.0 Introduction

1.1 The SWEIS

In 1999, the US Department of Energy (DOE)[1] published the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (DOE 1999a). DOE issued its Record of Decision (ROD) on this Site-Wide Environmental Impact Statement (SWEIS) in September 1999 (DOE 1999b). The ROD identified the decisions DOE made on levels of operation for LANL for the foreseeable future.

1.2 Annual Yearbook

To enhance the usefulness of this SWEIS, a National Environmental Policy Act (NEPA) document, DOE and LANL implemented a program making annual comparisons between SWEIS ROD projections and actual operations via an Annual Yearbook. The Yearbook's purpose is not to present environmental impacts or environmental consequences, but rather to provide data that could be used to develop an impact analysis. The Yearbook focuses on the following:

- Facility and process modifications or additions (Chapter 2). These include projected activities, for which NEPA coverage was provided by the SWEIS, and some post-SWEIS activities for which environmental coverage was not provided. In the latter case, the Yearbook identifies the additional NEPA analyses (i.e., categorical exclusions, environmental assessments, or environmental impact statements) that were performed.

- The types and levels of operations during the calendar year (CY) (Chapter 2). Types of operations are described using capabilities defined in the SWEIS. Levels of operations are expressed in units of production, numbers of researchers, numbers of experiments, hours of operation, and other descriptive units.

- Operations data for the Key and Non-Key Facilities, comparable to data projected by the SWEIS ROD (Chapter 2). Data for each facility include waste generated, air emissions, liquid effluents, and number of workers.

- Site-wide effects of operations for the CY (Chapter 3). These include measures such as number of workers, radiation doses, workplace incidents, utility requirements, air emissions, liquid effluents, and solid wastes. These effects also include changes in the regional aquifer, ecological resources, and other resources for which the DOE has long-term stewardship responsibilities as an administrator of Federal lands.

[1] Congress established the National Nuclear Security Administration (NNSA) within the DOE to manage the nuclear weapons program for the United States. Los Alamos National Laboratory (LANL or Laboratory) is one of the facilities now managed by the NNSA. The NNSA officially began operations on March 1, 2000. Its mission is to carry out the national security responsibilities of the DOE, including maintenance of a safe, secure, and reliable stockpile of nuclear weapons and associated materials capabilities and technologies; promotion of international nuclear safety and nonproliferation; and administration and management of the naval nuclear propulsion program.

- Trend analysis (Chapter 4). This includes analysis on land use, quantities of waste generated, utility consumption, and other long-term effects from LANL operations.

- Summary and conclusion (Chapter 5). This chapter summarizes CY 2006 for LANL in terms of overall facility constructions and modifications, facility operations, and operations data and environmental parameters. These data form the basis of the conclusion for whether or not LANL is operating within the envelope of the SWEIS ROD.

- Chemical usage and emissions data (Appendix A). These data summarize the chemical usage and air emissions by Key Facility.

- Nuclear facilities list (Appendix B). This appendix provides a summary of the facilities identified as nuclear at the time the SWEIS was developed through CY 2006.

- Radiological facilities list (Appendix C). These data identify the facilities considered as radiological in CY 2006 and indicate their categorization at the time the SWEIS was developed.

- Pollution Prevention Awards (Appendix D). This appendix provides a summary of the DOE 2006 Pollution Prevention Awards for LANL.

Data for comparison come from a variety of sources, including facility records, operations reports, facility personnel, and the annual Environmental Surveillance Report. The focus on operations rather than on programs, missions, or funding sources is consistent with the approach of the SWEIS.

The Annual Yearbooks provide DOE with information needed to evaluate adequacy of the SWEIS and enable DOE to make decisions on when and if a new SWEIS is needed. The Yearbooks also provide facilities and managers at LANL with a guide in determining whether activities are within the SWEIS operating envelope. The report does not reiterate the detailed information found in other LANL documents, but rather points the interested reader to those documents for the additional detail. The Yearbooks serve as a guide to environmental information collected and reported by the various groups at LANL.

The SWEIS analyzed the potential environmental impacts of scenarios for future operations at LANL. DOE announced in its ROD that it would operate LANL at an expanded level and that the environmental consequences of that level of operations were acceptable. The ROD is not a predictor of specific operations, but establishes boundary conditions for operations. The ROD provides an environmental operating envelope for specific facilities and for LANL as a whole. If operations at LANL were to routinely exceed the operating envelope, DOE would evaluate the need for a new SWEIS. As long as LANL operations remain below the level analyzed in the ROD, the environmental

operating envelope is valid. Thus, the levels of operation projected by the SWEIS ROD should not be viewed as goals to be achieved, but rather as acceptable operational limits.

DOE regulations require a formal evaluation, called a supplement analysis (SA), of the SWEIS every five years following the issuance of the ROD, to determine if the SWEIS is adequate or needs to be supplemented or a new SWEIS should be written. Therefore, every fifth year after the issuance of the ROD, the Yearbook will not only report the previous years' data on operations, but will also include summaries and trends of the data presented in the previous four editions.

1.3 This Yearbook

The ROD selected levels of operations, and the SWEIS provided projections for these operations. This Yearbook compares data from CY 2006 to the appropriate SWEIS ROD projections. Hence, this report uses the phrases "SWEIS ROD projections," "SWEIS ROD," or "ROD" to convey this concept, as appropriate.

The collection of data on facility operations is a unique effort. The type of information developed for the SWEIS is not routinely collected at LANL. Nevertheless, this information is the heart of the SWEIS and the Yearbook. Although this requires a special effort, the description of current operations and indications of future changes in operations are believed to be sufficiently important to warrant an incremental effort.

The SWEIS Yearbook 2002 represented the fifth year of data collection and comparison since the issuance of the SWEIS. It included summaries of data from 1998 through 2002, trends in the data across these years, and additional information as deemed necessary to enable DOE/NNSA to use that document together with the SWEIS Yearbooks 2003 and 2004, as the primary source of information to determine the adequacy of the existing SWEIS. The Yearbook 2006 presents the ninth year of data compiled since the SWEIS ROD was issued in September 1999. The annual Yearbooks together are an essential component in DOE's five-year evaluation of how accurately the SWEIS represents LANL current and projected operations.

According to Federal regulations, the DOE/NNSA initiated preparation of a *Supplement Analysis for the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory* in mid-2004. The purpose of the SA was to determine if the existing SWEIS remains adequate. In addition to preparing the 2003 Yearbook, the Risk Reduction Office (formerly known as part of the Ecology group) prepared a SA information document (LANL 2004) to provide the data to be analyzed in the SA. This information document presented the following data: (1) facility and process modifications and additions; (2) current and projected capabilities and levels of operation from 1998 through 2009 as compared to the SWEIS ROD (DOE 1999b); (3) operations data for the Key and Non-Key Facilities, including waste volumes and air emissions from 1998 through 2003 as compared to the SWEIS ROD; (4) current, proposed, or modified projects with potential environmental consequences; (5) evaluation of the present LANL affected environment due to certain natural and historical events, new regulatory or

institutional requirements and guidelines, and expanded knowledge; (6) revised accident analysis based on current conditions and site boundary changes; and (7) a wildfire accident analysis.

During the development of the SA, DOE/NNSA identified the need to prepare a Supplemental SWEIS. Since the issuance of the Final SWEIS in 1999, DOE/NNSA have completed several environmental impact statements, environmental assessments, and a Special Environmental Analysis addressing LANL operations and actions taken immediately after the 2000 Cerro Grande Fire, which burned a part of LANL. These analyses document substantial developing changes to both LANL's environmental setting and programs since 1999.

In October 2004, DOE/NNSA (NNSA 2004) decided to update and supplement the original LANL SWEIS by preparing a Supplemental SWEIS to consider

- impacts of proposed new activities;
- impacts resulting from changes in the environmental setting; and
- cumulative impacts associated with on-going activities on site.

In August 2005, a memo was issued to LANL from DOE/NNSA to prepare a new SWEIS (NNSA 2005). This new SWEIS was determined to be the appropriate level of analysis for compliance with the NEPA with regard to the required five-year adequacy review of the 1999 LANL SWEIS. The new SWEIS will tier from the 1999 SWEIS and will consider both reduced operations and expanded operations alternatives, in addition to the no action alternative. The period of analysis for future operations will be five years into the future (from the date of the new ROD). Environmental impacts of specific projects for LANL facility replacements and refurbishments, as well as projects having to do with operational changes, will be analyzed in this new SWEIS.

In 2006, work continued on the development of the new SWEIS. Accomplishments include the production of, and DOE/NNSA concurrence on, the release of the Draft SWEIS. The Draft SWEIS was released to the public in June 2006. The release of the public Draft SWEIS initiated the public comment period. Two public meetings were held in August 2006, and Congressional, State, and local government briefings on the SWEIS were held as well as Pueblo briefings. The public comment period lasted 75 days and closed in September 2006. The remainder of the 2006 SWEIS effort was focused on development of the Comment Response Document and the incorporation of received comments from the Public, Federal, State, Tribal, and local governments into the SWEIS document where appropriate.

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2.0 Facilities and Operations

LANL has about 2,000 structures with approximately eight million square feet under roof, spread over an area of approximately 40 square miles of land owned by the US Government and administered by DOE and the 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 the site is considered laboratory or production space; the remaining square footage is considered administrative, storage, service, and other space. 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. Collectively, between 2001 and 2006, 437,461 gross square feet have been removed from all technical areas (TAs) through a variety of funding initiatives.

In order to present a logical, comprehensive evaluation of the potential environmental impacts at LANL, the 1999 SWEIS developed the Key Facility concept, 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). Taken together, the 15 Key Facilities represent the great majority of environmental risks associated with LANL operations. The 15 Key Facilities identified were both critical to meeting mission assignments and

- housed operations that have potential to cause significant environmental impacts, or
- were of most interest or concern to the public (based on comments in the SWEIS public hearings), or
- would be subject to change because of DOE programmatic decisions.

The remainder of LANL was called "Non-Key," not to imply that these facilities were any less important to accomplishment of critical research and development, but because they did not fit the above criteria (DOE 1999a).

In addition, the Key Facilities (as presented in the SWEIS) comprised 42 of the 48 Category 2 and Category 3 Nuclear Structures at LANL[1]. Subsequently, DOE and LANL have published 10 lists identifying nuclear facilities at LANL [one in 1998 (DOE 1998a), another in 2000 (DOE 2000a), two in 2001 (LANL 2001a and 2001b), one in 2002 (LANL 2002a), two in 2004 (LANL 2004a and 2004b)], two in 2005 (LANL 2005a and 2005b), and one in January of 2007 (LANL 2007a)] that significantly changed the classification of some buildings. Appendix B provides a summary of the current nuclear

[1] DOE Order 5480.23 (DOE 1992a) categorizes nuclear hazards as Category 1, Category 2, or Category 3. Because LANL has no Category 1 nuclear facilities (usually applied to nuclear reactors), definitions are presented for only Categories 2 and 3:

- Category 2 Nuclear Hazard – has the potential for significant on-site consequences. DOE-STD-1027-92 (DOE 1992b) provides the resulting threshold quantities for radioactive materials that define Category 2 facilities.
- Category 3 Nuclear Hazard – has the potential for only significant localized consequences. Category 3 is designed to capture those facilities such as laboratory operations, low-level radioactive waste (LLW) handling operations, and research operations that possess less than Category 2 quantities of material. DOE-STD-1027-92 (DOE 1992b) provides the Category 3 thresholds for radionuclides. The identification of nuclear facilities is based upon the official list maintained by DOE Los Alamos Site Office (LASO) as of December 2002 (LANL 2002a).

facilities; a table has been added to each section of this chapter to explain the differences and identify the 27 nuclear facilities currently listed by DOE/NNSA. Of these 27 facilities, all but six reside within a Key Facility. Appendix C provides a comparison of the facilities identified as radiological when the SWEIS was prepared and those identified as radiological in 2005 (LANL 2002b). The 2005 lists are shorter due to better guidance on the radiological designation[2].

With the issuance of 10 CFR 830 on January 10, 2001, on-site transportation also needs to be addressed relative to nuclear hazard categorization (FR 2001). This is a change from the SWEIS. At the time the SWEIS was published, on-site transportation was considered part of the affected environment in Section 4.10.3.1. The on-site transportation of nuclear materials greater than or equal to Hazard Category 3 quantities is addressed in a DOE-approved safety analysis (LANL 2002c, DOE 2002a, Steele 2002). The implementation of the analysis and associated controls is under development.

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 comprising a Key Facility ranges from one, the Target Fabrication Facility (TFF), to more than 400 for LANSCE. Key Facilities can also exist in more than a single TA, as is the case with the High Explosives Testing and High Explosives Processing Key Facilities, which exist in all or parts of five and seven TAs, respectively.

This chapter discusses each of the 15 Key Facilities from three aspects—significant facility construction and modifications, types and levels of operations, and operations data that have occurred during 2006. Each of these three aspects is given perspective by comparing them to projections made by the SWEIS ROD. This comparison provides an evaluation of whether or not data resulting from LANL operations continue to fall within the environmental envelope established by the SWEIS ROD. It should be noted that construction activities projected by the SWEIS ROD were for the 10-year period 1996–2006. All construction activities may not be complete and projected operations may not have yet reached maximum levels.

This chapter also discusses Non-Key Facilities, which include buildings and structures not part of a Key Facility, or the balance of LANL. The Non-Key Facilities represent a significant fraction of LANL and comprise all or the majority of 30 of LANL's 49 TAs including TA-00, which comprises leased space within the Los Alamos town site and TA-57 at Fenton Hill, and approximately 14,224 of LANL's 26,480 acres. The Non-Key Facilities currently employ about 42 percent of the LANL workforce. The Non-Key Facilities include such important buildings and operations as the Nicholas C. Metropolis Center for Modeling and Simulation (formerly known as the Strategic Computing

[2] Since the publication of the SWEIS, only two radiological facility lists have been published. The first (LANL 2001c) was published in 2001 and the second (LANL 2002b) in 2002.

[3] As used in the SWEIS and this Yearbook, facility operations include three categories of activities—research, production, and services to other LANL organizations. Research is both theoretical and applied. Examples include modeling (e.g., atmospheric weather patterns) to subatomic investigations (e.g., using the Los Alamos Neutron Science Center [LANSCE] linear accelerator [linac]) to collaborative efforts with industry (e.g., fuel cells for automobiles). 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.

Complex), the Nonproliferation and International Security Center, the new National Security Sciences Building (NSSB) that is now the main administration building, and the TA-46 sanitary sewage treatment facility, called the Sanitary Effluent Recycling Facility (SERF). Table 2.0-1 identifies and compares the acreage of the 15 Key Facilities and the Non-Key Facilities. Figure 2-1 shows the location of LANL within northern New Mexico, while Figure 2-2 illustrates the TAs. Figure 2-3 shows the locations of the Key Facilities.

Table 2.0-1. Key and Non-Key Facilities

Facility	Technical Areas	~Size (acres)
Plutonium Complex	TA-55	93
Tritium Facilities	TA-16 & TA-21	312
Chemistry and Metallurgy Research (CMR) Building	TA-03	14
Pajarito Site	TA-18	131
Sigma Complex	TA-03	11
Materials Science Laboratory (MSL)	TA-03	2
TFF	TA-35	3
Machine Shops	TA-03	8
High Explosives Processing	TAs 08, 09, 11, 16, 22, 37	1,115
High Explosives Testing	TAs 15, 36, 39, 40	8,691
LANSCE	TA-53	751
Bioscience Facilities (Formerly Health Research Laboratory [HRL])	TAs 43, 03, 16, 35, 46	4
Radiochemistry Facility	TA-48	116
Radioactive Liquid Waste Treatment Facility (RLWTF)	TA-50	62
Solid Radioactive and Chemical Waste Facilities	TA-50 & TA-54	943
Subtotal, Key Facilities		12,256
Non-Key Facilities	30 of 49 TAs	14,224[a]
LANL		26,480

a 14,224 acres is a correction from the 2002 Yearbook that reported 14,244 acres for the Non-Key Facilities.

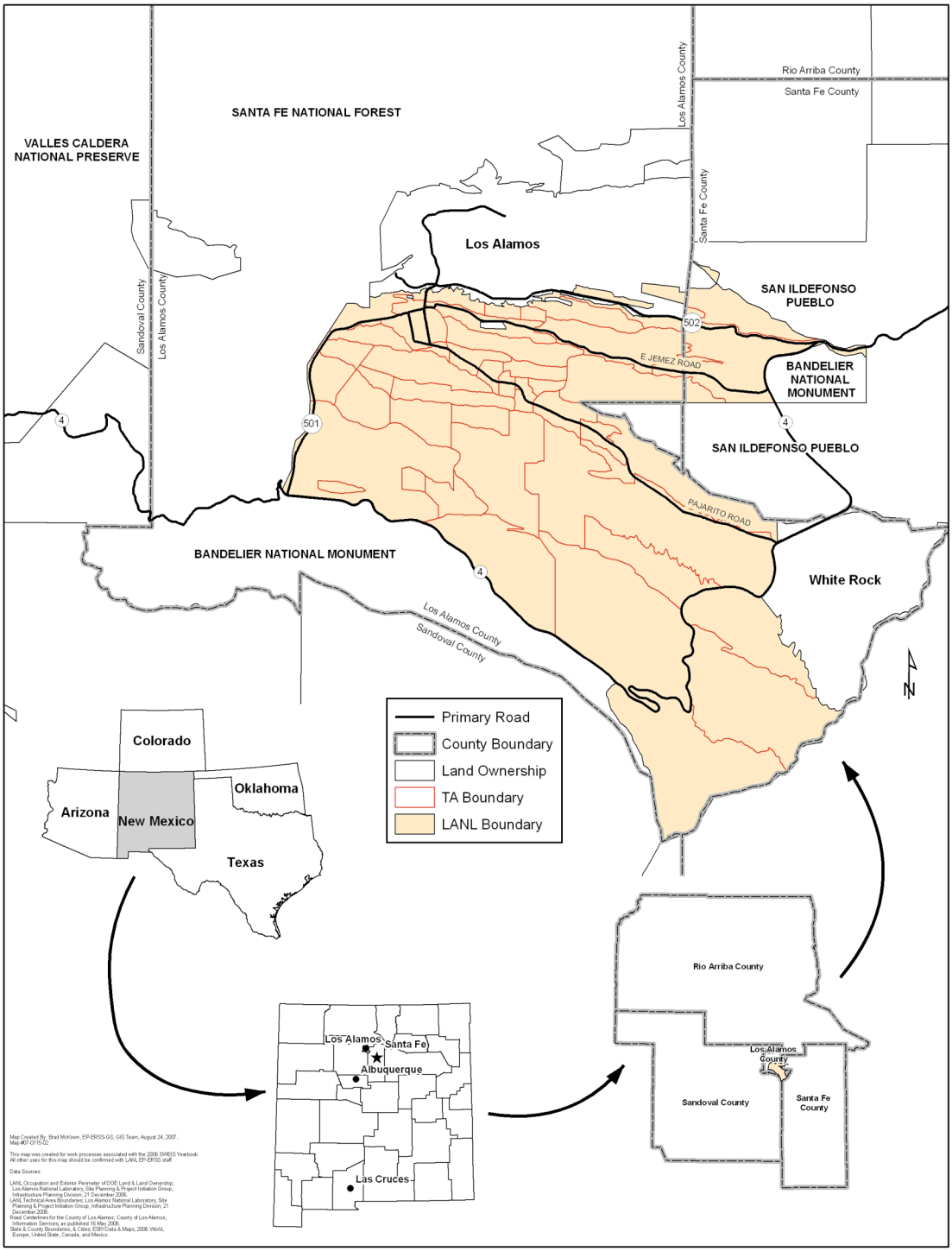


Figure 2-1. Location of LANL

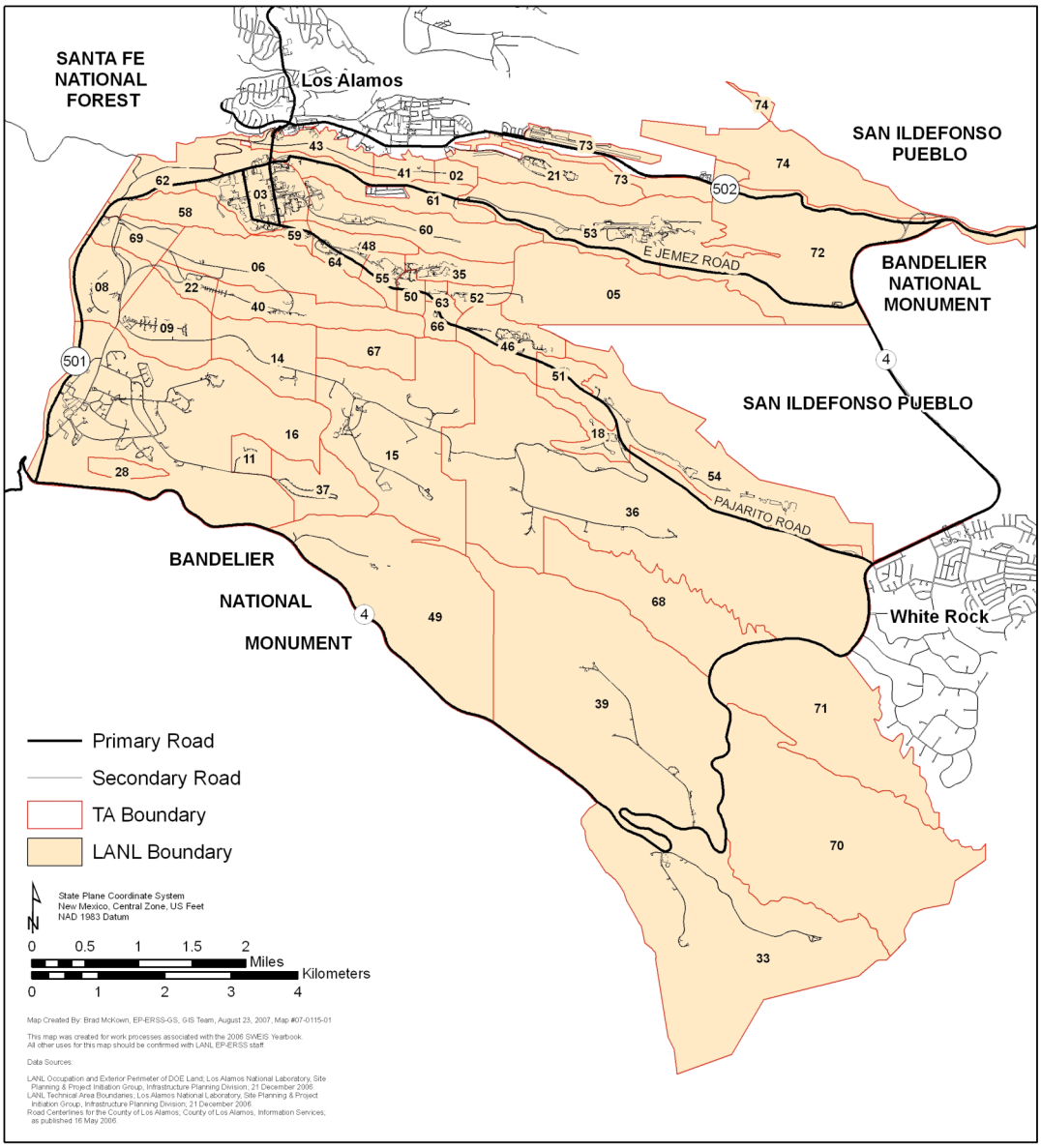
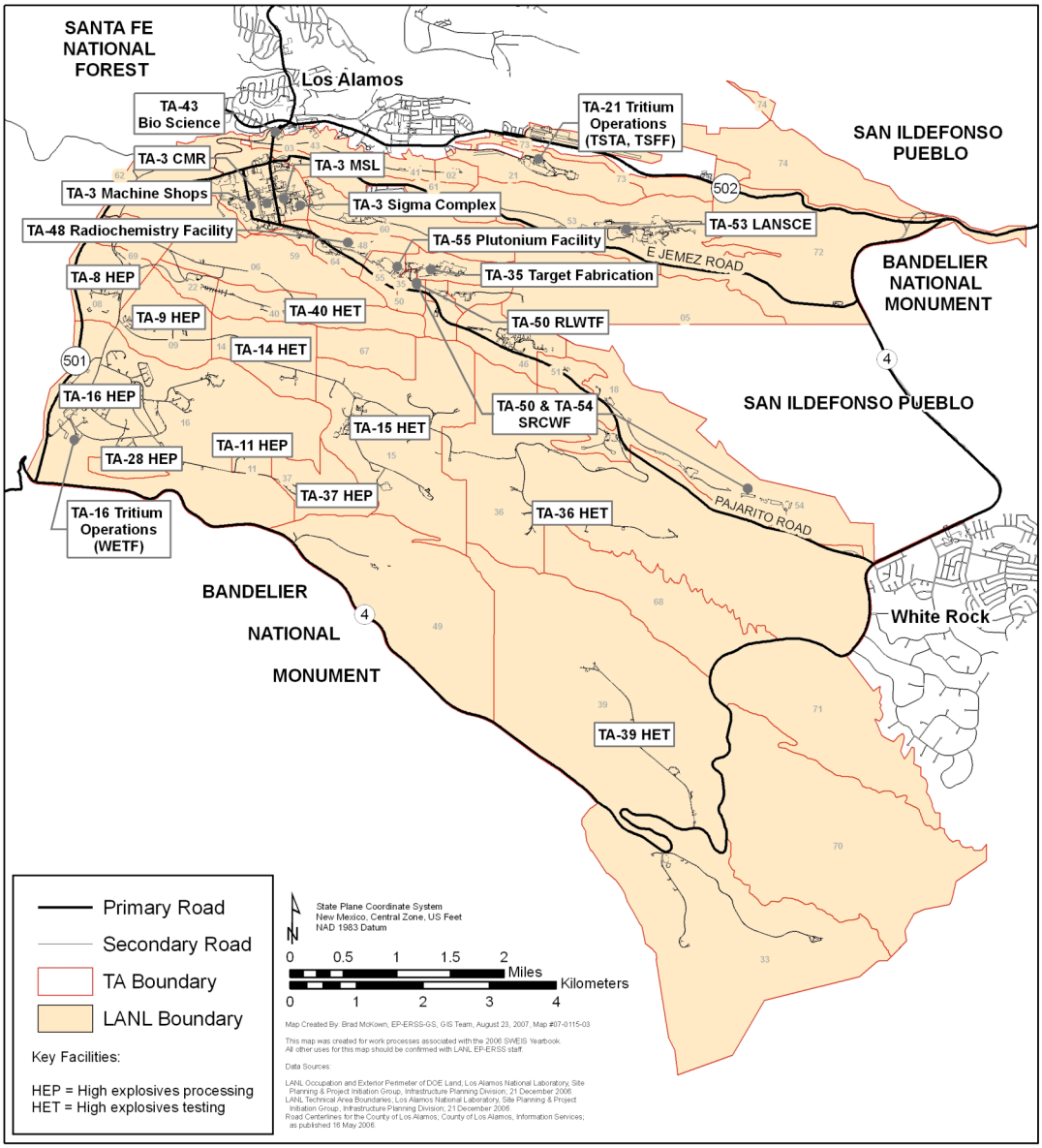


Figure 2-2. Location of TAs



*HEP is High Explosives Processing; HET is High Explosives Testing; WETF is Weapons Engineering Tritium Facility; TSTA is Tritium Systems Test Assembly; TSFF is Tritium Science and Fabrication Facility; SRCWF is Solid Radioactive and Chemical Waste Facility.

Figure 2-3. Location of Key Facilities

2.1 Plutonium Complex (TA-55)

As presented in the SWEIS, the Plutonium Complex Key Facility consists of six primary buildings and a number of lesser buildings and structures. This Key Facility contained one operational Category 2 nuclear hazard facility (TA-55-4), two Low Hazard chemical facilities (TA-55-3 and TA-55-5), and one Low Hazard energy source facility (TA-55-7). TA-55-7 is and has been empty for approximately three years other than office space and small-scale non-rad experiments. It is currently unoccupied. Additionally, Nuclear Materials Technology Division acquired and took ownership of the TA-50-37 building, designated as the Actinide Research Training and Instruction Center (ARTIC) in CY 2003. A new structure for TA-55, the TA-55-314 Fire Safe Storage Building, was completed in October of 2004. In 2005, a third Category 2 nuclear facility, the TA-55-355 Safe, Secure Trailer Facility, was constructed. This facility became operational in November 2005.

The DOE/NNSA listing of LANL nuclear facilities for both 1998 and 2006 (DOE 1998a, LANL 2007a) retained Building TA-55-4 as a Category 2 nuclear hazard facility. The LANL Nuclear Facilities List revised in October 2005 added Buildings TA-55-185 and TA-55-355 to the list of Nuclear Hazard Category 2 facilities (LANL 2007a) (Table 2.1-1). TA-55-185 was slated to be used for mixed oxide (MOX) rods storage in FS65 shipping containers, however, the building was found to be unacceptable (seismic and other requirements) and was never used as such. TA-55-185 is expected to be removed from the Nuclear Facilities List in CY 2007.

Table 2.1-1. Plutonium Complex Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998[a]	NHC LANL 2007[b]
TA-55-0004	Plutonium Processing	2	2	2
TA-55-0041	Nuclear Material Storage	2		
TA-55-185	Drum Storage Building			2
TA-55-355	Safe, Secure Trailer Facility			2

a DOE List of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL List of Los Alamos National Laboratory Nuclear Facilities (LANL 2007a).

Note: *This table and the Nuclear Hazard Classification tables in the other sections of this Yearbook reflect the data in the published DOE listings of LANL nuclear facilities and LANL radiological facilities that applied during the CY under review, in this case 2006. Changes in the listings that have occurred during the year will not be reflected in this table if they are not yet published in these documents. However, changes in nuclear hazard classification will be noted in the text of this section.*

The SWEIS also identified one potential Category 2 nuclear hazard facility (TA-55-41, the Nuclear Material Storage Facility), which was projected for potential modification to bring it into operational status. This was not done, and the DOE/NNSA removed this facility from its list of nuclear facilities in its April 2000 listing (DOE 2000a). There are currently no plans to use this building for storage of nuclear materials.

2.1.1 Construction and Modifications at the Plutonium Complex

The SWEIS projected four facility modifications:

- renovation of the Nuclear Material Storage Facility. Building PF-41was analyzed in the new SWEIS as a potential long-term radiography facility or to be demolished. In September 2006, a memorandum was sent from DOE/NNSA Service Center to DOE Head Quarters recommending that the Final SWEIS identify Option 1 as the proposed option. This option stated DOE/NNSA would demolish TA-55-41 and construct a new building at TA-55 to house and operate radiography capabilities previously performed at TA-08. It was also recommended that the demolition of building TA-55-41 be categorically excluded as the structure is non-contaminated and waste could be sent offsite (NNSA 2006). Decontamination and demolition (D&D) activities of PF-41 are expected to begin in late 2007 (LANL 2006a).
- construction of a new administrative office building. Construction of the Facility Infrastructure Technical Support Building (PF-66) was completed in 1999; construction of the TA-55-313 building (PF-313) immediately to the east of the TA-55-66 building was completed in 2003;
- upgrades within Building 55-4 to support continued manufacturing at the existing capacity of 14 pits per year (includes the 1996 installation of a new TA-55 Facility Control System); and further upgrades for long-term viability of the facility and to boost production to a nominal capacity of 20 pits per year.

During CY 2001, there were several projects that were started for maintenance or replacement purposes. If these projects have not yet been completed, their 2006 status is listed below:

CMR Replacement Project[4] DOE Pre-conceptual Design (LANL 2001d), ongoing in CY 2006;

FRIT Transfer System (LANL 2001e; DOE 1996a), on hold in CY 2006 due to funding deficiency;

TA-18 Relocation Project CATIII/IV at TA-55 (LANL 2001f and 2001g, DOE 2002b). At the end of CY 2005, this was still under consideration; completed.

TA-18 Relocation Project CAT-I Piece (LANL 2001h, DOE 2002b). In 2005, LANL was directed to establish temporary certified secure storage repositories at TA-55 for intermediate storage of Security Category I/II special nuclear material (SNM) from TA-18 (DOE 2005a, LANL 2005c). Construction occurred during spring of 2005; SNM was transferred to TA-55 in September 2005. In October 2006, the majority of all SNM was removed from this site and was taken to Nevada Test Site, TA-55, and Y-12 and a small amount to TA-54 for disposition. All remaining programmatic SNM is destined to be shipped off-site by September 2007 with all surplus SNM shipments to disposition locations by March 2008.

[4] The CMR Replacement Project was covered by an environmental impact statement (DOE 2003b).

During CY 2002, there were several projects that were started for maintenance or replacement purposes. The projects are listed below with their CY 2006 status:

TA-55 Radiography/Interim (LANL 2001i), ongoing in CY 2006;
TA-55 Radiography (LANL 2001j), complements TA-55 Radiography/Interim, ongoing in CY 2006;
New radioactive liquid waste collection system line tie-ins design phase is ongoing in CY 2006 (DOE 2003a); the tie-ins have been completed and some remaining dirt work and paving are expected to be complete in 2007. There is still some minor work inside PF-4.
Installation of new liquid nitrogen lines and tank on west side of facility was completed in August/September of 2005 (DOE 2003c);
TA-55 New Parking Lot (LANL 2002d) was started in CY 2006 and is expected to be complete in 2007.
Facility Infrastructure Technical Support Building Parking Lot (LANL 2002e) was completed in January 2006.
CMR Replacement Geotechnical Investigation (LANL 2002f), the first phase in determining the feasibility of constructing the CMR Replacement. Geotechnical surveys were performed in CY 2003; additional surveys continued in CY 2004 and 2005. Construction on the Radiological Laboratory Utility Office Building (RLUOB) was started in late CY 2006 and is scheduled for completion in CY 2008 (LANL 2005d). Beneficial occupancy is scheduled for September 2009.

In 2004, D&D and upgrades of equipment were initiated in order to upgrade small sample fabrication with a new machining line for plutonium samples. This upgrades work continued through 2006 and is expected to be completed in Fiscal Year (FY) 2007.

The procurement and installation of a new uranium decontamination system was initiated in 2004, however, this project was cancelled in 2006 due to lack of funding.

2.1.2 Operations at the Plutonium Complex

The SWEIS identified seven capabilities[5] for this Key Facility. No new capabilities have been added. One capability, SNM Storage, Shipping, and Receiving, had planned to use the Nuclear Material Storage Facility. Because of changes in plans, the Nuclear Material Storage Facility will not be used for this activity, and SNM storage, shipping, and receiving will continue to be performed at the Plutonium Facility (TA-55-4). For all seven capabilities, activity levels were below those projected by the SWEIS ROD. Table 2.1.2-1 presents details.

[5] As defined in the 1999 SWEIS, 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. Capabilities at LANL have been established over time, principally through mission assignments and activities directed by DOE Program Offices.

Table 2.1.2-1. Plutonium Complex/Comparison of Operations

Capability	SWEIS ROD[a]	2006 Operations
Plutonium Stabilization	Recover, process, and store the existing plutonium inventory in eight years.	Highest priority items have been stabilized. The implementation plan has been modified between DOE and the Defense Nuclear Facilities Safety Board to be complete by 2010. The project is funded to 2010 but may potentially extend beyond this time by a year or so.
Manufacturing Plutonium Components	Produce nominally 20 war reserve pits/yr. (Requires minor facility modifications.)	Fewer than 20 qualified pits were produced in CY 2006.
Surveillance and Disassembly of Weapons Components	Pit disassembly: Up to 65 pits/yr disassembled. Pit surveillance: Up to 40 pits/yr destructively examined and 20 pits/yr nondestructively examined.	Fewer than 65 pits were disassembled during CY 2006. Fewer than 40 pits were destructively examined as part of the stockpile evaluation program (pit surveillance) in CY 2006.
Actinide Materials and Science Processing, Research, and Development	Develop production disassembly capacity. Process up to 200 pits/yr, including a total of 250 pits (over four years) as part of disposition demonstration activities.	Fewer than 200 pits were disassembled/converted in CY 2006. Fewer than 12 pits were processed through tritium separation in CY 2006.
	Process neutron sources up to 5,000 curies/yr. Process neutron sources other than sealed sources.	Neutron sources were processed in CY 2006 but well below the 5,000 curies/yr level.
	Process up to 400 kilograms/yr of actinides.[b] Provide support for dynamic experiments.	Fewer than 400 kilograms of actinides were processed in CY 2006. No dynamic experiments support occurred in CY 2006.
	Perform decontamination of 28 to 48 uranium components per month.	In CY 2006, fewer than 48 uranium components were decontaminated per month.
	Research in support of DOE actinide cleanup activities. Stabilize minor quantities of specialty items. Research and development on actinide processing and waste activities at DOE sites, including processing up to 140 kilograms of plutonium as chloride salts from the Rocky Flats Environmental Technology Site.	Research supporting DOE actinide cleanup activities continued at low levels. No plutonium residues from Rocky Flats were processed during CY 2006.
	Conduct plutonium research, development, and support. Prepare, measure, and characterize samples for fundamental research and development in areas such as aging, welding and bonding, coatings, and fire resistance.	Sample preparation and characterization continued during CY 2006. Wing 2 at CMR facility is no longer operational. These activities are carried out at TA-55 with no changes for 2006.
	Fabricate and study nuclear fuels used in terrestrial and space reactors. Fabricate and study prototype fuel for lead test assemblies.	The DOE/Office of Nuclear Energy Advanced Fuel Cycle and Mixed Oxide Fuel Initiative (AFCI) is fabricating actinide nitride fuels for irradiation in a reactor environment.
	Develop safeguards instrumentation for plutonium assay.	Continued support of safeguards instrumentation development during CY 2006.
	Analyze samples in support of actinide reprocessing and research and development activities.	Analysis of actinide samples at TA-55 continued in CY 2006 in support of actinide reprocessing and research and development activities.

Table 2.1.2-1. (cont.)

Capability	SWEIS ROD[a]	2006 Operations
Fabrication of Ceramic-Based Reactor Fuels	Build MOX fuel test reactor fuel assemblies and continue research and development on fuels.	AFCI fuels were fabricated in CY 2006 for irradiation testing. MOX fuel was fabricated in CY 2006.
Plutonium-238 Research, Development, and Applications	Process, evaluate, and test up to 25 kilograms/yr plutonium-238. Recycle residues and blend up to 18 kilograms/yr plutonium-238.	Fewer than 10 kilograms of plutonium-238 were processed, evaluated, and/or tested in 2006.
Nuclear Materials Storage, Shipping, and Receiving	Store up to 6,600 kilograms SNM in the Nuclear Material Storage Facility; continue to store working inventory in the vault in Building 55-4; ship and receive SNM as needed to support LANL activities.	Because of changes in plans, the Nuclear Material Storage Facility will not be used for this activity, and SNM storage, shipping, and receiving will continue to be performed at the Plutonium Facility (Building 55-4). Building 55-4 vault levels remained approximately constant at levels identified during preparation of the SWEIS.
	Conduct nondestructive assay on SNM at the Nuclear Material Storage Facility to identify and verify the content of stored containers.	The Nuclear Material Storage Facility is not operational as a storage vault and was not used for nondestructive assay during CY 2006.

a Includes renovation of the Nuclear Material Storage Facility (which is no longer planned for use), construction of new technical support office building, and upgrades to enable the production of nominally 20 war reserve pits per year.

b The actinide activities at the CMR Building and at TA-55 are expected to total 400 kilograms/yr. The future split between these two facilities was not known, so the facility-specific impacts at each facility were conservatively analyzed at this maximum amount. Waste projections that are not specific to the facility (but are related directly to the activities themselves) are only projected for the total of 400 kilograms/yr.

2.1.3 Operations Data for the Plutonium Complex

Details of operational data are presented in Table 2.1.3-1. No wastes generated during 2006 exceeded SWEIS ROD projections.

Table 2.1.3-1. Plutonium Complex/Operations Data

Parameter	Units[a]	SWEIS ROD	2006 Operations
Radioactive Air Emissions:			
Plutonium-239[b]	Ci/yr	2.70E-5	None detected
Plutonium-238	Ci/yr	Not projected[c]	None detected
Americium-241	Ci/yr	Not projected[c]	None detected
Other actinides[d]	Ci/yr	Not projected[c]	3.45E-08
Strontium-90/Yttrium-90	Ci/yr	Not projected[c]	8.88E-09
Tritium in Water Vapor	Ci/yr	7.50E+2	2.80E+00
Tritium as a Gas	Ci/yr	2.50E+2	3.74E+01
NPDES[e] Discharge 03A–181	MGY	14	2.75986
Wastes:			
Chemical	kg/yr	8,400	1,753
LLW[f]	m^3/yr	754[g]	329
MLLW[f]	m^3/yr	13[g]	2.0
TRU[f]	m^3/yr	237[h]	33.9
Mixed TRU	m^3/yr	102[h]	38.9
Number of Workers	FTEs	589[i]	704[i]

a Ci/yr = curies per year; MGY = million gallons per year; FTEs = full-time equivalent workers.

b Projections for the SWEIS were reported as plutonium or plutonium-239, the primary material at TA-55.

c The radionuclide was not projected in the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.
d These radionuclides include isotopes of thorium and uranium.
e NPDES is National Pollutant Discharge Elimination System.
f LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; TRU = transuranic.
g Includes estimates of waste generated by the facility upgrades associated with pit fabrication.
h The SWEIS provided data for TRU and mixed TRU wastes in Chapter 3 and Chapter 5. However, projections made had to be modified to reflect the decision to produce nominally 20 pits per year.
i The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include Protection Technology Los Alamos (PTLA), KBR/SHAW/LATA (KSL), and other subcontractor personnel. The number of employees for 2006 operations is routinely collected information and represents only Los Alamos National Security, LLC (LANS) employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.2 Tritium Facilities (TA-16 and TA-21)

This Key Facility consists of tritium operations at TA-16 and TA-21. Tritium operations in 2006 were conducted in two buildings: The Weapons Engineering Tritium Facility (WETF, Building TA-16-205), and the Tritium Science and Fabrication Facility (TSFF, Building TA-21-209). The Tritium Systems Test Assembly (TSTA) is in a Surveillance and Maintenance mode with only limited equipment removal.

Limited operations involving the removal of tritium from actinide material are conducted at LANL's TA-55 Plutonium Facility; however, these operations are small in scale and this operation was not included as part of the Tritium Facilities in the SWEIS. The tritium emissions from TA-55, however, are included in the Plutonium Complex Key Facility.

One facility, WETF, had a tritium inventory greater than 30 grams during the entire 2005 year and, thus, was listed as a Category 2 nuclear facility (Table 2.2-1). During 2006, the tritium inventory at TSFF was reduced to less than 1.6 grams. This facility was reclassified to a Category 3 nuclear facility in August 2004 and removed from the Nuclear Facilities List in October 2005.

Programmatic activities at the TSFF have concluded in 2006. Neutron Tube Target Loading (NTTL) activities at the TSFF ceased in early 2006 (DOE 1995a). Activities are completed and the TSFF was placed in a Surveillance and Maintenance mode in August 2006. When funding becomes available, the TSFF will be deactivated.

Table 2.2-1. Tritium Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998[a]	NHC LANL 2007[b]
TA-16-0205[c]	WETF	2	2	2
TA-16-0205A[c]	WETF	2		2
TA-16-0450[c]	WETF	2		
TA-21-0155[d]	TSTA	2	2	
TA-21-0209	TSFF[e]	2	2	

a DOE List of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)
b DOE/LANL List of Los Alamos National Laboratory Nuclear Facilities (LANL 2007a)
c In 2003, TA-16-205 and TA-16-205A were nuclear facilities while TA-16-450 was not operational with tritium. The three buildings were physically connected, but radiologically separated. When the WETF Documented Safety Analysis is approved and an operational readiness review is completed, TA-16-205, -205A, and -450 will be considered one facility.
d TSTA was removed from the Nuclear Facilities List in June of 2003 by DOE/NNSA and LANL.

e TSFF was downgraded to a Category 3 nuclear facility in August 2004 and removed from the Nuclear Facilities List in October 2005.

2.2.1 Construction and Modifications at the Tritium Facilities

During 2005, there were major construction activities and building modifications at WETF at TA-16. This included a new diesel generator and upgraded uninterruptible power supply (UPS) unit. The inclusion of Building 450 to the WETF nuclear boundary was postponed because of the LANL operations stand-down, start up is proposed for CY 2007. In addition, DOE/NNSA halted the implementation of NTTL tritium activities at WETF and transferred all NTTL activities and associated programmatic hardware to Sandia in 2005. During 2006, UPS Alternate Power feed from Building 450 to Building 205 UPS Room was installed to provide an alternate power source to the UPS. The major heating, ventilation, and air conditioning upgrade to Building 205 started in CY 2006 and is expected to be completed in early CY 2007.

2.2.2 Operations at the Tritium Facilities

The SWEIS identified nine capabilities for this Key Facility. No new capabilities have been added, and one, Cryogenic Separation at TSTA, has been deleted. Table 2.2.2-1 lists the nine capabilities identified in the SWEIS and presents CY 2006 operational data for each of these capabilities. Operations in 2006 were below projections by the SWEIS ROD because of the LANL operations stand-down and remained within the established environmental envelope. For example, three high-pressure gas fill operations were conducted in 2006 (compared to 65 fills projected by the SWEIS ROD), and approximately 10 gas boost system tests and gas processing operations were performed (compared to 35 projected).

Table 2.2.2-1. Tritium Facilities/Comparison of Operations

Capability	SWEIS ROD[a]	2006 OPERATIONS
High-Pressure Gas Fills and Processing: WETF	Handling and processing of tritium gas in quantities of up to 100 grams with no limit on number of operations per year. Capability used approximately 65 times/yr.	Approximately three high-pressure gas fills/processing operations were performed in 2006.
Gas Boost System Testing and Development: WETF	System testing and gas processing operations involving quantities of up to 100 grams. Capability used approximately 35 times/yr.	Approximately 10 gas boost tests and operations were performed in 2006.
Cryogenic Separation: TSTA	Tritium gas purification and processing in quantities up to 200 grams. Capability used five to six times/yr.	No capability exists at LANL in 2006.
Diffusion and Membrane Purification: TSFF, WETF	Research on tritium movement and penetration through materials. Expect six to eight experiments/month. Capability also used continuously for effluent treatment.	Capability used in 2006.

Table 2.2.2-1. (cont.)

Capability	SWEIS ROD[a]	2006 OPERATIONS
Metallurgical and Material Research: TSFF, WETF	Capability involves materials research including metal getter research and application studies. Small quantities of tritium support tritium effects and properties research and development. Contributes less than 2% of LANL's tritium emissions to the environment.	Activities resulted in less than 1% tritium emissions from each facility.
Thin Film Loading: TSFF (WETF by 2006)	Chemical bonding of tritium to metal surfaces. Current application is for tritium loading of neutron tube targets; perform loading operations up to 3,000 units/yr.	No activity in 2006.
Gas Analysis: WETF	Analytical support to current capabilities. Operations estimated to contribute less than 5% of LANL's tritium emissions to the environment.	Gas analysis operations were continued at WETF during 2006. No changes in facility emissions occurred from this activity.
Calorimetry: WETF	This capability provides a measurement method for tritium material accountability. Contained tritium is placed in the calorimeter for quantity measurements. This capability is used frequently, but contributes less than 2% of LANL's tritium emissions to the environment.	Calorimetry activities were conducted at WETF. No changes occurred in facility emissions from this activity.
Solid Material and Container Storage: WETF	Storage of tritium occurs in process systems, process samples, inventory for use, and as waste.	In August 2006, the TSFF was placed in Surveillance and Maintenance mode. Inventory is stored and maintained at the WETF only.

a Includes the remodel of Building TA-16-450 to connect it to WETF in support of NTTL (DOE 1995a).

2.2.3 Operations Data for the Tritium Facilities

Data for operations at the Tritium Facilities were below levels projected by the SWEIS ROD. Operational data are summarized in Table 2.2.3-1.

Table 2.2.3-1. Tritium Facilities (TA-16 and TA-21)/Operations Data

Parameter	Units	SWEIS ROD	2006 OPERATIONS
Radioactive Air Emissions:			
TA-16/WETF, Elemental tritium	Ci/yr	3.00E+2	3.82E+01
TA-16/WETF, Tritium in water vapor	Ci/yr	5.00E+2	3.02E+02
TA-21/TSTA, Elemental tritium	Ci/yr	1.00E+2	7.89E-01
TA-21/TSTA, Tritium in water vapor	Ci/yr	1.00E+2	5.60E-01
TA-21/TSFF, Elemental tritium	Ci/yr	6.40E+2	8.87E+00
TA-21/TSFF, Tritium in water vapor	Ci/yr	8.6E+2	4.39E+02
NPDES Discharge:[a]			
Total Discharges	MGY	0.3	22.42836
02A-129 (TA-21)	MGY	0.1	21.945[b]
03A-158 (TA-21)	MGY	0.2	0.48336
Wastes:			
Chemical	kg/yr	1,700	0.0
LLW	m^3/yr	480	46.1
MLLW	m^3/yr	3	0.887
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	28[c]	1[c]

a Outfalls eliminated before 1999: 05S (TA-21), 03A-036 (TA-21), 04A-091 (TA-16). Consolidation and removal of outfalls has resulted in projected NPDES volumes underestimating actual discharges from the exiting outfalls.
b This outfall does not have a flow meter. This number was based on instantaneous flow measured during a field visit as required by the NPDES permit, then extrapolated over 24 hours, seven days per week.
c The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.3 Chemistry and Metallurgy Research Building (TA-03)

The CMR Building was designed and constructed in 1952 to house analytical chemistry, plutonium metallurgy, uranium chemistry, engineering design, and drafting. However, at the time the SWEIS ROD was issued in 1999, the CMR Building was described as a "production, research, and support center for actinide chemistry and metallurgy research and analysis, uranium processing, and fabrication of weapon components." It consists of a main building (TA-03-29) and a LLW Storage and Transfer Facility (TA-03-154) that is no longer operational. The CMR Building consists of three floors: basement, first floor, and attic. It has seven independent wings connected by a common corridor.

As shown in Table 2.3-1, the CMR facility has been designated a Hazard Category 2 nuclear facility since the publication of the SWEIS ROD (DOE 1997a, DOE 1998a, LANL 2007a). CMR is also currently designated a security category 3 nuclear facility.

Table 2.3-1 CMR Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998[a]	NHC LANL 2007[b]
TA-03-0029	CMR	2		2
TA-03-0029	Radiochemistry Hot Cell		2[c]	
TA-03-0029	SNM Vault		2[c]	
TA-03-0029	Nondestructive analysis/nondestructive examination Waste Assay		2[c]	
TA-03-0029	IAEA Classroom[d]			
TA-03-0029	Wing 9 (Enriched Uranium)		2	

a DOE List of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL List of Los Alamos National Laboratory Nuclear Facilities (LANL 2007a).
c The CMR facility was divided into separate components in 1998 and grouped together in 2007.
d The IAEA (International Atomic Energy Agency) Classroom was used to conduct Nonproliferation Training. In CY 2001, this capability was moved to Pajarito Site (TA-18) and renamed the "Nuclear Measurement School." However, the capability was returned to and operated in CMR in CY 2002 and continued to operate at CMR in CY 2006.

2.3.1 Construction and Modifications at the CMR Building

The ROD projected five facility modifications by December 2006:

- Phase I Upgrades to maintain safe operating conditions for 5–10 years;
- Phase II Upgrades (except seismic) to enable operations for an additional 20–30 years;

- modifications for production of targets for the molybdenum-99 medical isotope;
- modifications for the recovery of sealed neutron sources; and
- modifications for safety testing of pits.

The projected modifications for production of targets for the molybdenum-99 medical isotope, recovery of sealed neutron sources, and the safety testing of pits were not done due to loss of program funding.

During the 1996–1998 time period, only the Phase I Upgrades were in progress. By the end of 1998, all 11 of these upgrades had been started, but only five of the 11 Phase I Upgrades were completed. Concurrently, in August 1998, DOE approved the CMR Basis for Interim Operations (BIO), and in the fall of 1998, DOE determined that extensive upgrades to CMR would not be cost effective. In 1999, DOE directed the CMR Upgrades Project to re-baseline and include only those upgrades needed to ensure compliance with the BIO. These upgrades were required for the facility to be reliable through 2010. The re-baseline was approved in October 1999. It included 16 upgrades necessary to ensure worker safety, public safety, environmental compliance, and reliability of services to safety systems. These 16 upgrades are listed below:

- Duct Wash-down System
- Heating, Ventilation, and Air Conditioning delta Pressure System
- Hood Wash-down System
- Hot Cell Delta Pressure System
- Hot Cell Controls
- Stack Monitors Phase A
- Emergency Personnel Accountability System
- Stack Monitors Phase B
- Compressor System
- Sprinkler Head Replacement
- Emergency Lighting System
- Emergency Notification
- Internal Power Distribution
- Operations Center
- Ventilation System Filter Replacement
- Fire Protection System

All 16 upgrades were completed by March 2002; the Project submitted all Turnover/Closeout documentation to DOE/NNSA in July 2002; and DOE/NNSA approved Turnover/Closeout in November 2002.

In November 2003, DOE/NNSA issued an *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project* (DOE 2003b), which evaluated the potential environmental impacts resulting from activities associated with consolidating and relocating the mission-critical CMR Building capabilities at LANL and replacement of the CMR Building. In its ROD issued in February 2004, the NNSA decided to replace the CMR Building with a new CMR Replacement Facility at TA-55

and to completely vacate and demolish the CMR Building (DOE 2004a). The ROD stated that the new facility would be established as a Hazard Category 2 nuclear facility.

During CY 2003, modifications to Wing 9 were started in support of the Bolas Grande Project. This project would provide for the disposition of large vessels previously used to contain experimental explosive shots involving various actinides. NEPA coverage for this project was provided by a *Supplement Analysis to the 1999 Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory for the Proposed Disposition of Certain Large Containment Vessels*, *DOE/EIS-0238-SA-03* (DOE 2003d). In 2006, implementation of this project was still pending approval.

CMR BIO/Technical Safety Requirements Update
An update to the CMR BIO/Technical Safety Requirements (TSRs) was submitted to DOE/NNSA in April 2004. This submittal was rejected in April 2005 by DOE/NNSA who then directed that the Interim TSRs be updated by August 31, 2005. The Interim TSR submittal consolidated controls from all Unresolved Safety Question Determinations and hazard analyses performed since 1999. In addition, the Interim TSRs were updated to be compliant with the DOE Standard 1186 for Specific Administrative Controls and Design Feature In-Service Inspection requirements. In 2006, the Interim TSR was still pending NNSA approval.

2.3.2 Operations at the CMR Building

The Nonproliferation Training and Nuclear Measurement School (the Schoolhouse), which was briefly located at TA-18, returned to the CMR Building in 2002. The Schoolhouse at CMR was reinstated July 17, 2002, and remained a viable program in 2006.

The eight capabilities identified in the SWEIS for the CMR Facility are presented in Table 2.3.2-1.

Table 2.3.2-1. CMR Building (TA-03)/Comparison of Operations

Capability	SWEIS ROD[a]	2006 Operations
Analytical Chemistry	Sample analysis in support of a wide range of actinide research and processing activities. Approximately 7,000 samples/yr.	The project received 800 samples during CY 2006 and conducted approximately 7000 analytical processes.
Uranium Processing	Activities to recover, process, and store LANL highly enriched uranium inventory by 2005. Includes possible recovery of materials resulting from manufacturing operations.	During CY 2006, 70 kg of Transient Reactor Test Facility fuel of highly enriched uranium were processed.
Destructive and Nondestructive Analysis (Design Evaluation Project)	Evaluate 6 to 10 secondaries/yr through destructive/nondestructive analyses and disassembly.	No activity. Project is no longer active; capability has not been used since 1999.

Table 2.3.2-1. (cont.)

Capability	SWEIS ROD[a]	2006 Operations
Nonproliferation Training.	Nonproliferation training involving SNM. No additional quantities of SNM, but may work with more types of SNM than present during preparation of the SWEIS.	This activity was located at CMR in 1999 when the SWEIS was issued. In 2000, it was relocated to TA-18 and renamed the Nuclear Measurement School in an effort to reduce the CMR Building to a Category 3 nuclear facility. In 2002, this activity returned to CMR from TA-18 and was active in CYs 2002–2006. During CY 2006, two nuclear measurement schools were conducted.
Actinide Research and Processing[b]	Process up to 5,000 Curies/yr plutonium-238/beryllium and americium-241/beryllium neutron sources. Process neutron sources other than sealed sources. Stage up to 1,000 Curies/yr plutonium-238/beryllium and americium-241/beryllium sources in Wing 9 floor holes.	Mechanical or chemical processing of sources are not allowed in the CMR per the facility Authorization Basis. No work was done on this program in CY 2006.
	Introduce research and development effort on spent nuclear fuel related to long-term storage and analyze components in spent and partially spent fuels.	This project was completed in February 1997 when the final shipment of spent fuel from the Omega West Reactor that was in dry storage in Wing 9 was packaged and shipped to Savannah River Site for reprocessing.
	Metallurgical microstructural/ chemical analysis and compatibility testing of actinides and other metals. Primary mission to study long-term aging and other material effects. Characterize about 100 samples/yr. Conduct research and development in hot cells on pits exposed to high temperatures.	In 2006, microstructural characterization tests were performed on 75 samples.
	Analysis of TRU waste disposal related to validation of the Waste Isolation Pilot Plant (WIPP) performance assessment models. TRU waste characterization. Analysis of gas generation such as could occur in TRU waste during transportation to WIPP. Performance Demonstration Program to test nondestructive analysis/nondestructive examination equipment. Demonstrate actinide decontamination technology for soils and materials. Develop actinide precipitation method to reduce mixed wastes in LANL effluents.	Project was completed in 2001. No activity in CY 2006.

Table 2.3.2-1. (cont.)

Capability	SWEIS ROD[a]	2006 Operations
Fabrication and Metallography	Produce 1,080 targets/yr, each containing approximately 20 grams uranium-235, for the production of molybdenum-99, plus an additional 20 targets/wk for 12 weeks. Separate fission products from irradiated targets to provide molybdenum-99. Ability to produce 3,000 six-day curies of molybdenum-99/wk.[c]	Project was terminated in CY 1999. No process activity in 2006.
	Support complete highly enriched uranium processing, research and development, pilot operations, and casting. Fabricate metal shapes, including up to 50 sets of highly enriched uranium components, using 1 to 10 kilograms highly enriched uranium per operation.[d] Material recovered and retained in inventory. Up to 1,000 kilograms annual throughput.	Process activity was never initiated on this project. No activity in 2006.

a Includes completion of Phase I and Phase II Upgrades, except for seismic upgrades, modifications for the fabrication of molybdenum-99 targets, modifications for the Radioactive Source Recovery Program, and modification for safety testing of pits.
b The actinide activities at the CMR Building and at TA-55 are expected to total 400 kilograms/yr. The future split between these two facilities is not known, so the facility-specific impacts at each facility are conservatively analyzed at this maximum amount. Waste projections, which are not specific to the facility (but are related directly to the activities themselves), are only projected for the total of 400 kilograms/yr.
c Molybdenum-99 is a radioactive isotope that decays to form metastable technicium-99, a radioactive isotope that has broad applications in medical diagnostic procedures. Both isotopes are short-lived, with half-lives (the time in which the quantity of the isotope is reduced by 50 percent) of 66 hours and 6 hours, respectively. These short half-lives make these isotopes both attractive for medical use (minimizes the radiation dose received by the patient) and highly perishable. Production of these isotopes is therefore measured in "six-day curies," the amount of radioactivity remaining after six days of decay, which is the time required to produce and deliver the isotope to hospitals and other medical institutions.
d. Uranium casting equipment was removed to provide space for the Bolas Grande Project.

2.3.3 Operations Data for the CMR Building

Operations data from research, services, and production activities at the CMR Building were well below those projected by the SWEIS ROD. Radioactive air emissions were less than those projected by the SWEIS ROD. Table 2.3.3-1 provides details of these and other operational data.

Table 2.3.3-1. CMR Building (TA-03)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:			
Total Actinides[a]	Ci/yr	7.60E-4	1.95E-05
Strontium-90/Yttrium-90	Ci/yr	Not projected[b]	5.83E-08
Krypton-85	Ci/yr	1.00E+2	None detected
Germanium-68/Gallium-68	Ci/yr	Not projected[b]	None detected
Xenon-131m	Ci/yr	4.50E+1	Not measured[c]
Xenon-133	Ci/yr	1.50E+3	Not measured[c]
Tritium Water	Ci/yr	Negligible	Not measured[c]

Table 2.3.3-1 (cont.)

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions (cont.):			
Tritium Gas	Ci/yr	Negligible	Not measured[c]
NPDES Discharge:			
03A–021	MGY	0.53	0.553
Wastes:			
Chemical	kg/yr	10,800	356.2
LLW	m^3/yr	1,820	150.9
MLLW	m^3/yr	19	0.3371
TRU	m^3/yr	28[d]	2.2
Mixed TRU	m^3/yr	13[d]	0.0
Number of Workers	FTEs	204[e]	167[e]

a Includes uranium, plutonium, americium, and thorium.
b The radionuclide was not projected in the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.
c Potential emissions during the period were sufficiently small that measurement of these radionuclides was not necessary to meet facility or regulatory requirements.
d The SWEIS provided the data for TRU and mixed TRU wastes in Chapter 3 and Chapter 5. However, the projections made had to be modified to reflect the decision to produce nominally 20 pits per year.
e The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.4 Pajarito Site (TA-18)

Pajarito Site is currently undergoing decommissioning in accordance 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* (DOE 2002b, 2002c). In 2002, DOE/NNSA staff prepared the TA-18 environmental impact statement (DOE 2002c) for relocating the Pajarito Site Key Facility capabilities and materials. In the ROD, DOE/NNSA announced its decision to relocate Security Category I and II capabilities and related materials to the Device Assembly Facility at the Nevada Test Site, in effect initiating Pajarito Site Key Facility closure. Implementation of the ROD for Security Category I and II removal activities was initiated in 2004. Security Category I and II nuclear materials have been removed from this TA. In 2006, NNSA made the decision to remove the Security Category III and IV material from TA-18 by March of 2007, in order to downgrade the site from the Nuclear Hazard Classification Category 2 to a Radiological Facility. In October 2006, the majority of the SNM was removed from this site and was taken to Nevada Test Site, TA-55, and Y-12 and a small amount to TA-54 for disposition.

The Pajarito Site Key Facility is located entirely at TA-18. This Key Facility 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. Principal activities are design and performance of nuclear criticality

experiments and detector development in support of emergency response, nonproliferation, and arms control.

The SWEIS defined the facility as having a main building (TA-18-30), three outlying, remote-controlled critical assembly buildings then known as "kivas" (TA-18, -23, -32, and -116), and a number of additional support buildings, including the hillside vault (TA-18-26). During 2000, in response to concerns expressed by two Native American Indian Pueblos (Santa Ana and Picuris), the term "kiva" (which has religious significance to these Native Americans) was replaced with the acronym CASA (Critical Assembly and Storage Area) translated from Spanish as 'house.'

As shown in Table 2.4-1, DOE/NNSA lists the whole Key Facility as a Category 2 nuclear facility and identifies seven buildings with Nuclear Hazard Classification. The four buildings identified in the SWEIS (TA-18-23,-26,-32, and -116) have remained Category 2 nuclear facilities. The additions represent buildings with inventories meeting the current nuclear facility classification guidelines. At the time of the SWEIS ROD, the IAEA classroom (Building TA-18-258) was a capability that was originally at TA-18, transferred to the CMR Building, and then brought back to TA-18 in 2000. The IAEA schools were returned to CMR in 2002 where they remain today.

Table 2.4-1. Pajarito Site Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998[a]	NHC LANL 2007[b]
TA-18	Site Itself		2	2
TA-18-0023	SNM Vault (CASA 1)	2	2	2
TA-18-0026	Hillside Vault	2	2	2
TA-18-0032	SNM Vault (CASA 2)	2	2	2
TA-18-0116	Assembly Building (CASA 3)	2	2	2
TA-18-0127	Accelerator used for weapons x-ray		2	2
TA-18-0129	Calibration Laboratory		2	2
TA-18-0247	Sealed Sources		2	2

a DOE List of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL List of Los Alamos National Laboratory Nuclear Facilities (LANL 2007a).

The new Authorization Basis, comprised of a BIO document and TSRs, was submitted to DOE/NNSA on March 14, 2002, and approved by DOE/NNSA on July 31, 2002. The new Authorization Basis adds safety measures to TA-18 operations in the form of both engineered and administrative controls.

2.4.1 Construction and Modifications at the Pajarito Site

The SWEIS ROD projected replacement of the portable linac machine. This has not been performed. Construction projects for 2006 consisted of security and safety enhancements.

2.4.2 Operations at the Pajarito Site

The SWEIS identified nine capabilities for this Key Facility. No research capabilities have been deleted and none has been added. The major project at TA-18 in 2006 was the relocation of the Security Category III and IV nuclear materials to the Nevada Test Site, Y-12, and other LANL sites in preparation for moving the TA-18 mission to Nevada. During 2006, the TA-18 facility did not conduct any criticality experiments. Some 'Approach to Critical' experimentation was performed. The SWEIS ROD projection is a maximum of 1,050 experiments in any given year. In addition, the nuclear material inventory level has decreased significantly below the SWEIS ROD projection and there was no increase in nuclear weapons components and materials at the facility. Table 2.4.2-1 provides details.

Table 2.4.2-1. Pajarito Site (TA-18)/Comparison of Operations

Capabilities	SWEIS ROD[a]	2006 Operations
Dosimeter Assessment and Calibration	Perform up to 1,050 criticality experiments per year.	No criticality experiments were performed in CY 2006.
Detector Development	Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing. Increase nuclear materials inventory by 20%, and replace portable linac.	No Activity
Materials Testing	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing.	No Activity
Subcritical Measurements	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing. Increase nuclear materials inventory by 20%.	Limited experimentation in support of National Aeronautics and Space Administration and Non-proliferation missions.
Fast-Neutron Spectrum	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing. Increase nuclear materials inventory by 20%, and increase nuclear weapons components and materials.	No Activity

Table 2.4.2-1. (cont.)

Capabilities	SWEIS ROD[a]	2006 Operations
Dynamic Measurements	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, light detection and ranging experiments, and materials processing. Increase nuclear materials inventory by 20%.	No Activity
Skyshine Measurements	Perform up to 1,050 criticality experiments per year.	No Activity
Vaporization	Perform up to 1,050 criticality experiments per year.	No Activity
Irradiation	Perform up to 1,050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, interrogation techniques, and field systems. Increase nuclear materials inventory by 20%.	No Activity
Nuclear Measurement School (relocated from CMR and renamed. At CMR it was called "Nonproliferation Training").[b]	Not in SWEIS ROD (was located in CMR in 1999). IAEA schools are at CMR.	This activity now resides at the CMR Building. See Table 2.3.2-1.

a Includes replacement of the portable linac.

b This activity was located at CMR in 1999 when the SWEIS was issued. In 2000, it was relocated to TA-18 and renamed the Nuclear Measurement School in an effort to reduce the CMR Building to a Category 3 nuclear facility. In 2002, this activity returned to CMR from TA-18 and was active in CYs 2002, 2003, 2004, 2005, and 2006.

2.4.3 Operations Data for the Pajarito Site

Research activities were well below those projected by the SWEIS ROD. Consequently, operations data were also well below SWEIS ROD projections. The chief environmental measure of activities at the Pajarito Site is the estimated radiation dose to a hypothetical member of the public, referred to as the maximally exposed individual. The dose estimated to result from activities was 0.0 millirem, compared to 28.5 millirem per year projected by the SWEIS ROD. No chemical waste was generated at Pajarito Site in CY 2006 compared to the 4,000 kg/yr projected by the ROD. Operations data are detailed in Table 2.4.3-1.

Table 2.4.3-1. Pajarito Site (TA-18)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions: Argon-41[a]	Ci/yr	1.02E+2	0.00E+0
External Penetrating Radiation	mrem/yr	28.5[b]	1.25
NPDES Discharge	MGY	No outfalls	No outfalls
Wastes: Chemical LLW MLLW TRU	 kg/yr m^3/yr m^3/yr m^3/yr	 4,000 145 1.5 0	 0 49.4 .0076 0

Table 2.4.3-1 (cont.)

Parameter	Units	SWEIS ROD	2006 Operations
Wastes (cont.):			
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	70[c]	6[c]

a These values are not stack emissions. The SWEIS ROD projections are from Monte Carlo modeling. Values are from the first 394-foot (120-meter) radius. Other isotopes (nitrogen-13 and oxygen-15) are not shown because of very short half-lives. There were no radiological operations at TA-18 in 2006.

b Page 5-116, Section 5.3.6.1, "Public Health," of the SWEIS.

c The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for 2006 operations is routinely collected information and represents only LANS (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.5 Sigma Complex (TA-03)

The Sigma Complex Key Facility consists of four principal buildings: the Sigma Building (03-66), the Beryllium Technology Facility (TA-03-141), the Press Building (TA-03-35), and the Thorium Storage Building (TA-03-159). Primary activities are the fabrication of metallic and ceramic items, characterization of materials, and process research and development. This Key Facility had two Category 3 nuclear facilities, 03-66 and 03-159, identified in the SWEIS; however, in April 2000, Building TA-03-159 was downgraded from a Hazard Category 3 nuclear facility to a radiological facility and removed from the Nuclear Facilities List. In March 2001, Building TA-03-66 was downgraded from a Hazard Category 3 nuclear facility and removed from the nuclear facilities list (LANL 2002a). As shown in Table 2.5-1, in September 2001, Buildings TA-03-35, -66, -159, and -169 were placed on the radiological facility list (LANL 2002b). Building TA-03-141 is a Non-Nuclear High Hazard Facility.

Table 2.5-1. Sigma Buildings Identified as Radiological Facilities

Building	Description	LANL 2002[a]
TA-03-35	Press Building	RAD
TA-03-66	Sigma Building	RAD
TA-03-159	Thorium Storage Building	RAD
TA-03-169	Butler Building	RAD

a LANl Radiological Facilities List (LANL 2002b)

2.5.1 Construction and Modifications at the Sigma Complex

The SWEIS projected significant facility changes for the Sigma Building itself. Three of five planned upgrades are done, one is essentially done, and one remains undone. They are

- 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 done; and
- seismic upgrades—not started.

In addition to the five planned upgrades, three additional upgrades were completed in 2003. These are

- replacement of liquid nitrogen Dewar;
- painting of the exterior of the Sigma Building; and
- re-installation of the utilities to activate the Press Building.

Construction of the Beryllium Technology Facility (DOE 1993), formerly known as the Rolling Mill Building, was completed during CY 1999. The Beryllium Technology Facility, a state-of-the-art beryllium processing facility, has 16,000 square feet of floor space, of which 13,000 are used for beryllium operations. The remaining 3,000 square feet would be used 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 will also be conducted at the Beryllium Technology Facility and will include energy- and weapons-related use of beryllium metal and beryllium oxide. As discussed in Section 2.8, Machine Shops, beryllium equipment was moved from the shops into the Beryllium Technology Facility in stages during CY 2000. The authorization to begin operations in the Beryllium Technology Facility was granted by DOE/NNSA in January 2001.

Beryllium Technology Facility upgrades include the following:

- Heating, ventilation, and air conditioning system damper replacements—complete;
- Cartridge Filter house enclosure—on hold due to funding;
- PC-3 Vault—on hold due to hazard category change;
- Locker room expansion—complete;
- Facility Management System upgrade—on hold due to hazard category change.
- Rad Liquid Waste upgrades to Rad Liquid Waste System to include telemetry and communications to Rad Liquid Waste Facility—completed in 2006.

2.5.2 Operations at the Sigma Complex

The SWEIS identified three capabilities for the Sigma Complex. No new capabilities have been added, and none has been deleted. As indicated in Table 2.5.2-1, activity levels for all capabilities during the 2006 timeframe were less than levels projected by the SWEIS ROD.

Table 2.5.2-1. Sigma Complex (TA-03)/Comparison of Operations

Capability	SWEIS ROD[a]	2006 Operations
Research and Development on Materials Fabrication, Coating, Joining, and Processing	Maintain and enhance capability to fabricate items from metals, ceramics, salts, beryllium, enriched uranium, depleted uranium, and other uranium isotope mixtures including casting, forming, machining, polishing, coating, and joining.	Capability maintained and enhanced, as projected.
Characterization of Materials	Maintain and enhance research and development activities on properties of ceramics, oxides, silicides, composites, and high-temperature materials. Characterize components for accelerator production of tritium.	Totals of 187 assignments and 830 specimens were characterized.
	Analyze up to 36 tritium reservoirs/yr.	Total of 12 tritium reservoirs analyzed in CY 2006.
	Develop library of aged non-SNM materials from stockpiled weapons and develop techniques to test and predict changes. Store and characterize up to 2,500 non-SNM component samples, including uranium.	Approximately 1,250 non-SNM materials samples and 1,250 non-SNM component samples stored in library.
Fabrication of Metallic and Ceramic Items	Fabricate stainless steel and beryllium components for about 80 pits/yr.	Fabricated approximately 72 stainless steel and beryllium pit components.
	Fabricate up to 200 tritium reservoirs per year.	Fewer than 25 reservoirs fabricated.
	Fabricate components for up to 50 secondaries per year.	Fabricated components for fewer than 50 secondaries.
	Fabricate nonnuclear components for research and development: about 100 major hydrotests and 50 joint test assemblies/yr.	Fabricated components for fewer than 100 major hydrotests and for less than 50 joint test assemblies.
	Fabricate beryllium targets.	Provided material for the production of inertial confinement fusion targets and fabricated fewer than 10 targets.
	Fabricate targets and other components for accelerator production of tritium research.	On hold.
	Fabricate test storage containers for nuclear materials stabilization.	Produced approximately 20 containers.
	Fabricate nonnuclear (stainless steel and beryllium) components for up to 20 pit rebuilds/yr.	Fabricated less than 30 stainless steel and beryllium components.

a Includes Sigma Building renovation and modifications for Beryllium Technology Facility.

2.5.3 Operations Data for the Sigma Complex

Levels of research and operations were less than those projected by the SWEIS ROD; consequently, operations data were also below projections. Waste volumes and NPDES discharge volumes were all lower than projected by the SWEIS ROD. Table 2.5.3-1 provides details.

Table 2.5.3-1. Sigma Complex (TA-03)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:[a]			
Uranium-234	Ci/yr	6.60E-5	Not measured
Uranium-238	Ci/yr	1.80E-3	Not measured
NPDES Discharge:			
Total Discharges	MGY	7.3	1.49833
03A–022	MGY	4.4	1.49833
03A–024	MGY	2.9	0
Wastes:			
Chemical	kg/yr	10,000	1,736.4
LLW	m^3/yr	960	11.0
MLLW	m^3/yr	4	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	101[b]	101[b]

a Stack monitoring at Sigma was discontinued early in CY 2000. This decision was made because the potential emissions from the monitored stack were sufficiently low that stack monitoring was no longer warranted for compliance with Environmental Protection Agency (EPA) or DOE regulations. Therefore, no emissions from monitoring data are available.

b The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.6 Materials Science Laboratory (TA-03)

The MSL Key Facility is a single laboratory building (TA-03-1698) containing 27 labs, 60 offices, 21 materials research areas, and support rooms. The building, a two-story structure with approximately 55,000 square feet of floor space, was first opened in November 1993. Activities are all related to research and development of materials science. In 1998, 1999, and 2000, this Key Facility was categorized as a Low Hazard nonnuclear facility. In September 2001, MSL was placed on the Radiological Facilities List (LANL 2002b) and remained on the list in CY 2006.

2.6.1 Construction and Modifications at the Materials Science Laboratory

The SWEIS identified that completion of the top floor of the MSL was planned and was included in an environmental assessment (DOE 1991), but was not funded.

To date, the completion of the top floor of the MSL remains unscheduled and unfunded. Construction of the Material Science and Technology Office Building was initiated in 2003 and completed in 2004 (DOE 2001a). This project is described in more detail in the previous Yearbook.

Center for Integrated Nanotechnologies
The Center for Integrated Nanotechnologies (CINT) will contain laboratories and office space to accommodate state-of-the-art equipment and research. It will be located near the

Materials Science Complex. The two-story, 36,500-square-foot building will house approximately 50 people. Occupants will be LANL staff plus collaborators from universities, other laboratories, and private industry. CINT will focus on five areas: 1) theory, modeling, and simulation; 2) nanoscale bio-microinterfaces research; 3) nanophotonics and nanoelectronics research; 4) complex functional nanomaterials research; and 5) nanomechanics research.

The project received NEPA coverage through a DOE-approved categorical exclusion (DOE 2002d) issued March 28, 2002. The design-build subcontract was awarded in March 2004. Construction was started in November 2004. CINT was completed in December 2005. Initial operations started in April 2006 and are expected to be in full operation by CY 2007.

2.6.2 Operations at the Materials Science Laboratory

The SWEIS identified four major types of experimentation at MSL: materials processing, mechanical behavior in extreme environments, advanced materials development, and materials characterization. No new capabilities have been added, and none has been deleted.

In CY 2006, there were approximately 102 total researchers and support staff at MSL, about 20 percent more than the 82 projected by the SWEIS ROD[6]. (The primary measurement of activity for this facility is the number of scientists doing research.) Table 2.6.2-1 compares CY 2006 operations to projections made by the SWEIS ROD.

Table 2.6.2-1. Materials Science Laboratory (TA-03)/Comparison of Operations

Capability	SWEIS ROD[a]	2006 Operations
Materials Processing	Maintain seven research capabilities at levels identified during preparation of the SWEIS: • Wet chemistry • Thermomechanical processing • Microwave processing • Heavy equipment materials • Single crystal growth • Amorphous alloys • Powder processing Expand materials synthesis/processing to develop cold mock up of weapons assembly and processing. Expand materials synthesis/processing to develop environmental and waste technologies.	These capabilities were maintained as projected by the SWEIS ROD. Single crystal growth, amorphous alloy research, powder processing, and materials characterization were expanded in CY 2006. Cold mock up of weapons assembly and processing as well as other technologies continued to be expanded in CY 2006.

[6] This number should not be confused with the FTE index shown in Table 2.6.3-1 (52 FTEs) as the two numbers represent different populations of individuals. The 102 total researchers represent students, temporary employees, and visiting staff from other institutions. The 52 FTEs represents only regular full-time and part-time LANL staff.

Table 2.6.2-1. (cont.)

Capability	SWEIS ROD[a]	2006 Operations
Mechanical Behavior in Extreme Environment	Maintain two research capabilities at levels identified during preparation of the SWEIS: • Mechanical testing • Fabrication and assembly Expand dynamic testing to include research and development for the aging of weapons materials. Develop a new research capability (machining technology).	These two capabilities were maintained as projected by the SWEIS ROD and additional capabilities continued to be expanded as projected by the SWEIS ROD. Fabrication, assembly, and prototype experiments were expanded in CY 2006. Improvements were accomplished in the conduct of dynamic load and crack testing and measurement.
Advanced Materials Development	Maintain four research capabilities at levels identified during preparation of the SWEIS: • New materials • Synthesis and characterization • Ceramics • Superconductors	Capability was maintained as projected and improved. Capability for ion beam modification of materials was increased. Superconductivity capability has been expanded to include • Electron Beam Deposition and • Performance measurement capabilities including atomic force microscopy.
Materials Characterization	Maintain four research capabilities at levels identified during preparation of the SWEIS: • Surface science chemistry • X-ray • Optical metallography • Spectroscopy Expand corrosion characterization to develop surface modification technology. Expand electron microscopy to develop plasma source ion implantation.	Improvements occur on a continual basis including Expansion of electron microscopy to include atomic scale microscopy. Improvement of x-ray capabilities.

a Includes completion of the second floor of MSL.

2.6.3 Operations Data for the Materials Science Laboratory

The overall size of the MSL workforce has fluctuated slightly during the years between 1998 and 2006 and is now about 47 workers in CY 2006, 10 less than what was projected by the SWEIS ROD (regular part-time and full-time LANL employees listed in Table 2.6.3-1). Operational effects have been normal relative to SWEIS ROD projections. Generally, waste quantities have been lower than projected by the SWEIS ROD. Industrial solid waste is nonhazardous, may be disposed in county landfills, and does not represent a threat to local environs. Radioactive air emissions continue to be negligible and therefore were not measured. Table 2.6.3-1 provides details.

Table 2.6.3-1. Materials Science Laboratory (TA-03)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions	Ci/yr	Negligible	Not Measured
NPDES Discharge Volume	MGY	No outfalls	No outfalls
Wastes:			
Chemical	kg/yr	600	67
LLW	m^3/yr	0	0
MLLW	m^3/yr	0	0

Table 2.6.3-1. (cont.)

Parameter	Units	SWEIS ROD	2006 Operations
Wastes (cont.):			
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	57[a]	47[a]

a The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.7 Target Fabrication Facility (TA-35)

The TFF is a two-story building (TA-35-213) housing activities related to weapons production and laser fusion research. This Key Facility is categorized as a Low Hazard non-nuclear facility. Exhaust air from process equipment is filtered before exhaust to the atmosphere. Sanitary wastes are piped to the LANL sewage facility at TA-46, and radioactive liquid wastes are piped to the RLWTF at TA-50.

2.7.1 Construction and Modifications at the Target Fabrication Facility

The ROD did not project any facility changes through 2006. In 1998, process discharges from Outfall 04A-127 were rerouted to the sewage facility at TA-46, and the outfall was eliminated from the NPDES permit (DOE 1996b). There were no other significant facility additions or modifications during the 1996–1998 and 1999–2006 time periods.

2.7.2 Operations at the Target Fabrication Facility

The SWEIS identified three capabilities for the TFF Key Facility. The primary measurement of activity for this facility is production of targets for research and testing (laser and physics testing). In the 1998–2006 timeframe, the number of targets and specialized components fabricated for testing purposes was consistently less than the 6,100 targets per year projected by the SWEIS ROD. As seen in Table 2.7.2-1, other operations at the TFF were also below levels projected by the SWEIS ROD. The Characterization of Materials capability has been added to Table 2.7.2-1. This was a capability identified in the SWEIS for the TFF and Sigma Key Facilities but, before the 2001 Yearbook, was listed only for the Sigma Key Facility.

Table 2.7.2-1. Target Fabrication Facility (TA-35)/Comparison of Operations

Capability	SWEIS ROD	2006 Operations
Precision Machining and Target Fabrication	Provide targets and specialized components for about 6,100 laser and physics tests/yr, including a 20% increase over levels identified during preparation of the SWEIS for high-explosive pulsed-power target operations, and including about 100 high-energy-density physics tests.	Provided targets and specialized components for about 800 tests. Provided components to Hydrodynamic Experiments (HX) and Physics Divisions for high-energy-density physics tests. Did not support high-explosive pulsed-power tests at levels identified during preparation of the SWEIS.
Polymer Synthesis	Produce polymers for targets and specialized components for about 6,100 laser and physics tests/yr, including a 20% increase over levels identified during preparation of the SWEIS for high-explosive pulsed-power target operations, and including about 100 high-energy-density physics tests.	Produced polymers for targets and specialized components for about 100 tests. Did not support high-explosive pulsed-power tests or high-energy-density physics tests at levels identified during preparation of the SWEIS.
Chemical and Physical Vapor Deposition	Coat targets and specialized components for about 6,100 laser and physics tests/yr, including a 20% increase over levels identified during preparation of the SWEIS for high-explosive pulsed-power target operations, including about 100 high-energy-density physics tests, and including support for pit rebuild operations at twice the levels identified during preparation of the SWEIS.	Coated targets and specialized components for about 400 tests. Did not support high-explosive pulsed-power tests or high-energy-density physics tests at levels identified during preparation of the SWEIS.
Characterization of Materials[a]	Analyze up to 36 tritium reservoirs/yr.[a]	No tritium reservoirs analyzed.

a The SWEIS indicated that this activity would be accomplished at TFF as well as the Sigma Complex. See Table 2.5.2-1.

2.7.3 Operations Data for the Target Fabrication Facility

TFF activity levels are primarily determined by funding from fusion, energy, and other research-oriented programs, as well as funding from some defense-related programs. These programs, and hence operations at TFF, were at levels similar to those levels identified during preparation of the SWEIS and below levels projected by the SWEIS ROD. This summary is supported by the current workforce and by the 1998–2006 waste volumes, which were less than projected. Table 2.7.3-1 details operations data for CY 2006.

Table 2.7.3-1. Target Fabrication Facility (TA-35)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radiological Air Emissions	Ci/yr	Negligible	Not Measured[a]
NPDES Discharge:	MGY		
4A-127	MGY	0	Eliminated
Wastes:			
Chemical	kg/yr	3,800	139.7
LLW	m^3/yr	10	0.0009
MLLW	m^3/yr	0.4	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	54[b]	49[b]

a The emissions continue to be sufficiently low that monitoring is not required.

b The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.8 Machine Shops (TA-03)

The Machine Shops Key Facility consists of two buildings, the Nonhazardous Materials Machine Shop (Building TA-03-39) and the Radiological Hazardous Materials Machine Shop (Building TA-03-102). Both buildings are located within the same exclusion area. Activities consist of machining, welding, and assembly of various materials in support of major LANL programs and projects, principally those related to weapons manufacturing. In September 2001, Building TA-03-102 was placed on the Radiological Facilities List (LANL 2001c).

2.8.1 Construction and Modifications at the Machine Shops

The SWEIS ROD projected no new construction or major modifications to the shops.

Manufacturing Science and Technology group has constructed modular units in the north side of SM-39 to conduct upgrades on test equipment, tooling, computer numerical control programming, and controls for TA-55 activities. These operations are prototype mock-ups for PF-4, TA-55. All Manufacturing Science and Technology group activities conducted in SM-39 are non-hazardous. Other minor activities conducted in this space include robotics testing, tensile testing, and welding activities.

2.8.2 Operations at the Machine Shops

As shown in Table 2.8.2-1, the SWEIS identified three capabilities at the shops. These same three capabilities continue to be maintained. No new capabilities have been added to this Key Facility. All activities occurred at levels well below those projected by the SWEIS ROD. The workload at the Shops is directly linked to Research and Development and Production requirements.

Table 2.8.2-1. Machine Shops (TA-03)/Comparison of Operations

Capability	SWEIS ROD	2006 Operations
Fabrication of Specialty Components	Provide fabrication support for the dynamic experiments program and explosives research studies. Support up to 100 hydrodynamic tests/yr. Manufacture up to 50 joint test assembly sets/yr. Provide general laboratory fabrication support as requested.	Specialty components were fabricated at levels below those projected by the SWEIS ROD.
Fabrication Utilizing Unique Materials	Continue fabrication utilizing unique and unusual materials.	Fabrication with unique materials was conducted at levels below those projected by the SWEIS ROD.

Table 2.8.2-1. (cont.)

Capability	SWEIS ROD	2006 Operations
Dimensional Inspection of Fabricated Components	Provide appropriate dimensional inspection of above fabrication activities. Undertake additional types of measurements/inspections.	Dimensional inspection was provided for the above fabrication activities. Additional types of measurements and inspections were not undertaken.

2.8.3 Operations Data for the Machine Shops

Since activities were well below projections by the SWEIS ROD, so too were operations data. Chemical waste generated in 2006 was 1.5 kilograms, compared to a ROD projection of 474,000 kilograms per year. Table 2.8.3-1 provides details.

Table 2.8.3-1. Machine Shops (TA-03)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:			
Americium-241	Ci/yr	Not projected[a]	None detected
Thorium-228	Ci/yr	Not projected[a]	None detected
Thorium-230	Ci/yr	Not projected[a]	None detected
Uranium-234	Ci/yr	Not projected[a]	1.736E-09
Uranium-235	Ci/yr	Not projected[a]	None detected
Uranium-238	Ci/yr	1.50E-4	None detected
NPDES Discharge	MGY	No outfalls	No outfalls
Wastes:			
Chemical	kg/yr	474,000	1.58
LLW	m^3/yr	606	16.63
MLLW	m^3/yr	0	0.0001[b]
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	81[c]	120[c]

a The radionuclide was not projected by the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.

b MLLW generated exceeded what was projected in the SWEIS ROD due to a legacy oil sample from oil separator in the basement of TA-3-102. The oil sample was taken for verification purposes.

c The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the wo sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.9 High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, TA-37)

The High Explosives Processing Key Facility is located in all or parts of six TAs. Building types consist of production and assembly facilities, analytical laboratories, explosives storage magazines, and a facility for treatment of explosive-contaminated wastewaters. Activities consist primarily of manufacture and assembly of high explosives components for nuclear weapons and for Science-Based Stockpile Stewardship Program tests and experiments. Environmental and safety tests are performed at TA-11 and TA-09 while TA-08 houses radiography activities.

As identified in the SWEIS, this Key Facility has one Category 2 nuclear building in TA-08 (TA-08-0023). In November 2002, the updated LANL Radiological Facilities List (LANL 2002b) was published and identified Buildings TA-08-22, -70,-120, TA-11-30, TA-16-88,-202, -207, -300, -301, -302, -332, -410, -411,-413, -415, TA-37-10, -14,-16, -22, -24, and -25 as radiological facilities (Table 2.9-1).

Table 2.9-1. High Explosives Processing Buildings Identified as Radiological Facilities

Building	Description	LANL 2002[a]
TA-08-0022	Radiography	RAD
TA-08-0070	Nondestructive Testing and Evaluation	RAD
TA-08-0120	Radiography	RAD
TA-11-0030	Vibration Testing	RAD
TA-16-0088	Component Storage	RAD
TA-16-0202	Laboratory	RAD
TA-16-0207	Component Testing	RAD
TA-16-0300	Component Storage	RAD
TA-16-0301	Component Storage	RAD
TA-16-0302	Component Storage/Training	RAD
TA-16-0332	Component Storage	RAD
TA-16-0410	Assembly Building	RAD
TA-16-0411	Assembly Building	RAD
TA-16-0413	Component Storage	---
TA-16-0415	Component Storage	---
TA-037-0010	Storage Magazine	RAD
TA-037-0014	Storage Magazine	RAD
TA-037-0016	Storage Magazine	RAD
TA-037-0022	Magazine	---
TA-037-0024	Storage Magazine	RAD
TA-037-0025	Storage Magazine	RAD

a LANL Radiological Facilities List (LANL 2002b).

Operations at this Key Facility are performed by two separate Divisions: the HX Division (formerly DX Division) and the Weapon Engineering Technology (WET; formerly Engineering Sciences and Applications Division. WET performs the majority of the high explosives manufacturing and assembly work while HX assesses the parts produced by WET.

The WET Weapon Materials and Manufacturing group brings 99 percent of the explosives into LANL and stores it as raw material. WET presses the raw explosives into solid shapes and machines these shapes to specifications. The completed shapes are shipped to HX for testing (detonation). The HX High Explosives Science and Technology group also produces a small quantity of high explosives during the year from basic chemistry. The HX Detonation Science and Technology group uses a small amount of the raw explosives for making detonators.

There are two major pathways for expending the explosives brought into LANL: wastes from the pressing and machining operations, which are burned; and completed shapes that are detonated as part of the testing program.

As a result, information from both Divisions must be combined to completely capture operational parameters for production of high explosives. To assist the reader, this information is presented both in separate and combined forms.

2.9.1 Construction and Modifications at High Explosives Processing

The ROD projected four facility modifications for this Key Facility. All four projects were completed before 1999. These four modifications were

- construction of the High Explosive Wastewater Treatment Facility—completed and in operation by 1997;
- modification of 17 outfalls and their elimination from the NPDES permit—completed with 19 outfalls actually eliminated during 1997–1998;
- relocation of the Weapons Components Testing Facility—completed before 1999; and
- the TA-16 steam plant conversion—completed.

Although not projected in the 1999 SWEIS, a real-time radiography capability was added to this Key Facility and became operational in 2001. Buildings TA-16-220, -222, -223, -224, -225, and -226 were vacated and demolished. Planning and modification work at TA-09 to consolidate high explosives formulation operations previously conducted at Building TA-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 TA-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 -406, units at the TA-16 Burn Ground. The closure of Material Disposal Area (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 was shipped and used as clean fill at MDA J. The aboveground wastewater storage tank system was placed into service at TA-09 in 1998. The new High Explosives Wastewater Treatment Facility at TA-16 is a centralized treatment plant that became operational in 1997. It 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 for the TA-16-394 burn tray, resulting in a total of about 860 cubic yards (660 cubic meters) of hazardous wastes being removed. A burn unit was upgraded, improving capacity and efficiency and minimizing 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 WETF. No other high explosives processing facilities were destroyed, although some structures were damaged at TA-09, -11, and -37. All high explosives burning operations were consolidated at TA-

16-388 and -399. Burning operations are generally 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 for the Hydrotest Design Facility, TA-22-120 (DOE 2002e, LANL 2002g). Beneficial occupancy occurred in March 2005.

In 2005, construction was completed on the new High-Power Detonator Production Facility, Building TA-22-115, and magazine TA-22-118. The proposed work is within the scope of a DOE-approved NEPA categorical exclusion (DOE 2000b). Construction was delayed because of the LANL shut down. Beneficial occupancy occurred in December 2005.

2.9.2 Operations at High Explosives Processing

The SWEIS ROD identified six capabilities for this Key Facility. No new capabilities have been added, and none has been deleted. Activity levels during 2006 continued below those projected by the SWEIS ROD. These projections were based on the possibility that LANL would take over high explosives production work being performed at Pantex Plant. DOE/NNSA decided, however, to keep high explosives production at Pantex Plant. However, the projections for high explosive processing were retained because DOE/NNSA intends to keep LANL available as a back-up capability for Pantex Plant. As a result of the shut down of LANL operations, production of high explosives components was well below the projected quantities.

As seen in Table 2.9.2-1, high explosives and plastics development and characterization operations remained below levels projected in the SWEIS. Efforts continued in CY 2006 to develop protocols for obtaining stockpile returned materials, develop new test methods, and procure new equipment to support requirements for science-based studies on stockpile materials.

In CY 2006, 3,348 pounds of high explosives and 2,583 pounds of mock high explosives material were used in the fabrication of test components for HX and WET Divisions. The level of high explosives usage was significantly below the SWEIS ROD projection of 82,700 pounds of high explosives, while the usage of mock high explosives was about 89 percent of the SWEIS ROD projection of 2,910 pounds. Mock high explosive waste is shipped off-site for disposal and does not result in environmental impacts at LANL.

During CY 2006, WET Division produced 966 pieces of explosives weighing 3,348 pounds. In machining experimental components, 3,260 pounds of water-saturated explosive scrap were generated and burned. The machined components were sent to HX Division and Lawrence Livermore National Laboratory for test detonations along with an additional 4,532 pounds of raw explosives. During the high explosive processing, 12,818 gallons of explosive-contaminated water were generated, treated, and released. Also, 470 pounds of explosive-contaminated combustible waste were burned. Explosive-contaminated metal is now cleaned and salvaged. In addition, 258 pounds of the solvent

dimethyl-sulfoxide with dissolved high explosives were burned. In order to treat these explosives and contaminated materials, 2,400 gallons of propane were expended.

Three outfalls from High Explosives Processing remain on the NPDES permit: 03A-130, 05A-055 (the High Explosives Wastewater Treatment Facility), and 05A-097.

Table 2.9.2-1. High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, and TA-37)/Comparison of Operations

Capability	SWEIS ROD[a, b]	2006 Operations
High Explosives Synthesis and Production	Continue synthesis research and development, produce new materials, and formulate explosives as needed. Increase production of materials for evaluation and process development. Produce material and components for directed stockpile production.	The high explosives synthesis and production operations were less than those projected by the SWEIS ROD.
High Explosives and Plastics Development and Characterization	Evaluate stockpile returns. Increase (40%) efforts in development and characterization of new plastics and high explosives for stockpile improvement. Improve predictive capabilities. Research high explosives waste treatment methods.	High explosives formulation, synthesis, production, and characterization operations were performed at levels that were less than those projected by the SWEIS ROD.
High Explosives and Plastics Fabrication	Continue traditional stockpile surveillance and process development. Supply parts to Pantex for surveillance, stockpile rebuilds, and joint test assemblies. Increase fabrication for hydrodynamic and environmental testing.	HX Division fabricated less than 5,000 high explosive parts, and WET Division fabricated approximately 528 high explosives parts in CY 2006. Therefore, less than 7,000 parts were fabricated in support of the weapons program, including high explosives characterization studies, subcritical experiments, hydrotests, surveillance activities, environmental weapons tests, and safety tests.
Test Device Assembly	Increase test device assembly to support stockpile related hydrodynamic tests, joint test assemblies, environmental and safety tests, and increased research and development. Approximately 100 major assemblies per year.	WET Division provided fewer than 100 major assemblies for Nevada Test Site subcritical and joint environmental test programs.
Safety and Mechanical Testing	Increase (50%) safety and environmental tests related to stockpile assurance. Improve predictive models. Approximately 15 safety and mechanical tests per year.	HX Division performed fewer than 15 stockpile related safety and mechanical tests during CY 2006.
Research, Development, and Fabrication of High-Power Detonators	Increase operations to support assigned stockpile stewardship management activities; manufacture up to 40 major product lines per year. Support DOE complex for packaging and transportation of electro-explosive devices.	High-power detonator activities by HX Division resulted in the manufacture of fewer than 40 product lines in CY 2006.

a The total amount of explosives and mock explosives used across all activities is an indicator of overall activity levels for this Key Facility. Amounts projected by the SWEIS ROD are 82,700 pounds of explosives and 2,910 pounds of mock explosives. Actual amounts used in CY 2006 were 3,348 pounds of high explosive and 2,583 pounds of mock high explosives.

b Includes construction of the High Explosives Wastewater Treatment Facility, the steam plant conversion, relocation of the Weapons Testing Facility, and outfall modifications.

2.9.3 Operations Data for High Explosives Processing

The details of operations data for CY 2006 are provided in Table 2.9.3-1. The NPDES discharge volume was about 0.01 million gallons, compared to a projection of 12 million gallons. Waste quantities were well below projections made by the SWEIS ROD.

Table 2.9.3-1. High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, TA-28, and TA-37)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:			
Uranium-238	Ci/yr	9.96E-7	Not Measured[a]
Uranium-235	Ci/yr	1.89E-8	Not Measured[a]
Uranium-234	Ci/yr	3.71E-7	Not Measured[a]
NPDES Discharge:[b]			
Number of outfalls		22	3
Total Discharges	MGY	12.4	0.014575
03A-130 (TA-11)	MGY	0.04	0.001757
05A-055 (TA-16)	MGY	0.13	0.012818
05A-097 (TA-11)	MGY	0.01	0
Wastes:			
Chemical	kg/yr	13,000	11,260
LLW	m^3/yr	16	0.2839
MLLW	m^3/yr	0.2	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	96[c]	103[c]

a No stacks require monitoring; all non-point sources are measured using ambient monitoring.

b Outfalls eliminated before 1999: 02A-007 (TA-16), 04A-070 (TA-16), 04A-083 (TA-16), 04A-092 (TA-16), 04A-115 (TA-08), 04A-157 (TA-16), 05A-053 (TA-16), 05A-056 (TA-16), 05A-066 (TA-9), 05A-067 (TA-9), 05A-068 (TA-09), 05A-069 (TA-11), 05A-071 (TA-16), 05A-072 (TA-16), 05A-096 (TA-11), 06A-073 (TA-16), 06A-074 (TA-08), and 06A-075 (TA-08).

c The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.10 High Explosives Testing (TA-14, TA-15, TA-36, TA-39, TA-40)

The High Explosives Testing Key Facility is located in all or parts of five TAs, comprises more than one-half (22 of 40 square miles) of the land area occupied by LANL, and has 16 associated firing sites. All firing sites are in remote locations and/or within canyons. Major buildings are located at TA-15 and include the Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility (building TA-15-312) and the Vessel Preparation Building (Building TA-15-534). (Note, the Pulsed High-Energy Radiation Machine Emitting X-rays [PHERMEX; Building TA-15-184]) is being phased out, R306 is not currently an active firing site.). Building types consist of preparation and assembly facilities, bunkers, analytical laboratories, high explosives storage magazines, and offices. Activities consist primarily of testing high explosives components for nuclear weapons and for Science-Based Stockpile Stewardship Program tests and experiments.

In September 2001, Building TA-15-R183 was placed on the LANL Radiological Facilities List (LANL 2001c).

2.10.1 Construction and Modifications at High Explosives Testing

Failing accelerator cells of DARHT Axis II were refurbished to bring them up to design specifications that will provide high-resolution radiographic imaging for hydrodynamic experiments in support of the Science-Based Stockpile Stewardship Program (DOE 1995b, LANL 2005e). Construction of an access door into DARHT Axis II and a concrete ramp to access this door began in 2005. Construction of the ramp was completed in 2006, the access to this door has not been completed. This access door will facilitate the accelerator cell and equipment maintenance within DARHT Axis II (DOE 1995b, LANL 2004c).

Several facilities within the High Explosives Testing Key Facility were decommissioned and removed during CY 2006, these facilities include TA-15-138, -141, TA-40-4, -43 (DOE 2004b, DOE 2004c, LANL 2004d, LANL 2004e, and LANL 2005f). The remaining concrete slabs for structures TA-15-46 and TA-40-19 were also removed in CY 2006. A non-operational high explosives wastewater sump, TA-14-31, was closed out (LANL 2006b).

HX Division Strategic Plan for the Future

In 2002, DOE/NNSA determined that an environmental assessment would be required for the HX Division strategic plan including the new structures to be built at TA-22 and the subsequent D&D and replacement of old buildings located in TA-15. NEPA coverage for the strategic plan was provided by the *Environmental Assessment for the Proposed Consolidation of Certain Dynamic Experimentation Activities at the Two-Mile Mesa Complex, Los Alamos National Laboratory, Los Alamos, New Mexico*, and subsequent Finding of No Significant Impact issued in November 2003 (DOE 2003e).

2.10.2 Operations at High Explosives Testing

The ROD identified seven capabilities for this Key Facility. None of these has been deleted, and no new capabilities have been introduced. Levels of research were below those predicted by the SWEIS ROD. Table 2.10.2-1 identifies the operational capabilities discussed in the SWEIS and presents 2006 operational data for comparative purposes. The total amount of depleted uranium expended during testing (all capabilities) is an indicator of overall activity levels at this Key Facility. Less than 35 kilograms of depleted uranium were expended in 2006, compared to approximately 3,900 kilograms projected by the SWEIS ROD.

Table 2.10.2-1. High Explosives Testing (TA-14, TA-15, TA-36, TA-39, and TA-40)/Comparison of Operations

Capability	SWEIS ROD	2006 Operations
Hydrodynamic Tests	Conduct up to 100 hydrodynamic tests/yr. Develop containment technology. Conduct baseline and code development tests of weapons configuration. Depleted uranium use of 6,900 lb/yr (over all activities).	Hydrodynamic tests were conducted at a level below those projected by the SWEIS ROD.
Dynamic Experiments	Conduct dynamic experiments to study properties and enhance understanding of the basic physics of state and motion for materials used in nuclear weapons including some experiments with SNM.	Dynamic experiments were conducted at a level below those projected by the SWEIS ROD.
Explosives Research and Testing	Conduct high explosives tests to characterize explosive materials.	Explosives research and testing were conducted at a level below those projected by the SWEIS ROD.
Munitions Experiments	Continued support of Department of Defense in conventional munitions. Conduct experiments with projectiles and study other effects on munitions.	Munitions experiments were conducted at a level below those projected by the SWEIS ROD.
High-Explosives Pulsed-Power Experiments	Conduct experiments and development tests.	Experiments were conducted at a level below those projected by the SWEIS ROD.
Calibration, Development, and Maintenance Testing	Conduct tests to provide calibration data, instrumentation development, and maintenance of image processing capability.	Calibration, development, and maintenance testing were conducted at a level below those projected by the SWEIS ROD.
Other Explosives Testing	Develop advanced high explosives or weapons evaluation techniques.	Other explosives testing were conducted at a level below explosives testing projected by the SWEIS ROD.

2.10.3 Operations Data for High Explosives Testing

The operational data presented in Table 2.10.3-1 indicate that the materials used and effects of research during 2006 were considerably less than projections made by the SWEIS ROD.

Table 2.10.3-1. High Explosives Testing (TA-14, TA-15, TA-36, TA-39, and TA-40)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:			
Depleted Uranium	Ci/yr	1.5E-1[a]	Not Measured[b]
Chemical Usage:[c]			
Aluminum[d]	kg/yr	45,450	217.16
Beryllium	kg/yr	90	1.63
Copper[d]	kg/yr	45,630	8.6
Depleted Uranium	kg/yr	3,130[e]	30.54
Lead	kg/yr	240	0
Tantalum	kg/yr	300	0.0012
Tungsten	kg/yr	300	0
NPDES Discharge:			
Number of outfalls[f]	----	14	2
Total Discharges	MGY	3.6	0.9076
03A–028 (TA-15)[g]	MGY	2.2	0.0003

Table 2.10.3-1. (cont.)

Parameter	Units	SWEIS ROD	2006 Operations
NPDES Discharge (cont.): 0.9076 03A–185 (TA-15)[g]	MGY	0.73	0.9073
Wastes:			
Chemical	kg/yr	35,300	5,518
LLW	m^3/yr	940	0.3785
MLLW	m^3/yr	0.9	0
TRU[h]	m^3/yr	0.2	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	227[i]	202[i]

a The isotopic composition of depleted uranium is approximately 99.7 percent uranium-238, approximately 0.3 percent uranium-235, and approximately 0.002 percent uranium-234. Because there are no historic measurements of emissions from these sites, projections are based on estimated release fractions of the materials used in tests.

b No stacks require monitoring; all non-point sources are measured using ambient monitoring.

c Usage listed for the SWEIS ROD includes projections for expanded operations at DARHT as well as the other TA-15 firing sites (the highest foreseeable level of such activities that could be supported by the LANL infrastructure). No proposals are currently before DOE to exceed the material expenditures at DARHT evaluated in the DARHT environmental impact statement (DOE 1995b).

d The quantities of copper and aluminum involved in these tests are used primarily in the construction of support structures. These structures are not expended in the explosive tests, and thus, do not contribute to air emissions.

e The SWEIS ROD projection for depleted uranium emission has been erroneously reported in previous Yearbooks (1998–2003) due to a discrepancy between the ROD and Table 3.6.1-20 in the SWEIS. The additive volume for depleted uranium in the table is 8,666 lbs/yr (3,930 kg/yr), however the ROD states the annual amount of depleted uranium will increase to 6,900 lbs/yr (3,130 kg/yr).

f Outfalls eliminated before 1999: 04A-101 (TA-40), 04A-139 (TA-15), 04A-141 (TA-039), 04A-143 (TA-15), 04A-156 (TA-039), 06A-080 (TA-40), 06A-081 (TA-40), 06A-082 (TA-40), 06A-099 (TA-40), and 06A-123 (TA-15). Consolidation and removal of outfalls has resulted in projected NPDES volumes underestimating actual discharges from the existing outfalls.

g The annual quantity of discharge was calculated by using the average daily flow and multiplying by 365 days in the year; this results in an overestimate of volume. Totalizing water meters have now been installed on both 03A-185 (TA-15) and 03A-28 (TA-15), which will allow for much more accurate water usage calculations for reporting.

h TRU waste (steel) will be generated as a result of DARHT's Phased Containment Option (see DARHT environmental impact statement [DOE 1995b]).

i The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.10.4 Cerro Grande Fire Effects at High Explosives Testing

Continuing Effects

The Water Quality and Hydrology team (ENV-RCRA) continues to monitor the storm water control placements and re-vegetation efforts (best management practices) that were conducted immediately after the fire. To date, these efforts, a direct consequence of the fire, appear to be successful in stabilizing soils on the Weapons Facilities Operations-Facility Operations Director (WFO-FOD)-controlled area of LANL by minimizing run-off and reducing storm flows onto WFO-FOD property. These inspection and monitoring efforts will continue through CY 2007.

Other fire-related activities involve fuel wood mitigation efforts that include continued tree and undergrowth thinning throughout WFO-FOD. The overall goals of the Wildfire Hazard Reduction Plan (LANL 2001k) are to 1) protect the public, LANL workers, facilities, and the environment from catastrophic wildfire; 2) prevent interruptions of LANL operations from wildfire; 3) minimize impacts to cultural and natural resources

while conducting fire management activities; and 4) improve forest health and wildlife habitat at LANL and, indirectly, across the Pajarito Plateau. These goals are accomplished through reducing fuel loads within LANL forests to decrease wildfire hazards, treating fuel to decrease the risk of wildfire escapes at LANL-designated firing sites, and improving wildland fire suppression capability through fire road improvements.

2.11 Los Alamos Neutron Science Center (TA-53)

The LANSCE Key Facility lies entirely within TA-53. The facility has more than 400 buildings, including one of the largest at LANL. Building TA-53-3, which houses the linac, has 315,000 square feet under roof. Activities consist of neutron science and nuclear physics research, proton radiography, the development of accelerators and diagnostic instruments, and production of medical radioisotopes. Isotope production had not occurred since 1998; however, the new Isotope Production Facility threw its first beam on December 23, 2003, as part of the facility commissioning activities that continued into 2004. The Isotope Production Facility completed its second complete run cycle in 2006. The majority of the LANSCE Key Facility (the User Facility) is composed of the 800-million-electron-volt linac, a Proton Storage Ring, and three major experimental areas: the Manuel Lujan Neutron Scattering Center, the Weapons Neutron Research (WNR) facility, and Experimental Areas B & C.

Experimental Area C is the location of proton radiography experiments for the Science-Based Stockpile Stewardship Program. A new experimental facility for the production of ultracold neutrons was commissioned in 2005 in Area B, and completed its first full run cycle in 2006 (DOE 2002f). Experimental Area A, formerly used for materials irradiation experiments and isotope production, is currently inactive. A second accelerator facility located at TA-53, the Low-Energy Demonstration Accelerator (LEDA), was decommissioned and dismantled in 2006.

This Key Facility has three Category 3 nuclear activities (Table 2.11-1): experiments using neutron scattering by actinides in Experimental Area ER-1/ER-2, the 1L neutron production target in Building TA-53-7, and Area A East in Building TA-53-3M (LANL 2001b), which is used for passive storage of activated materials. There are no Category 2 nuclear facilities at TA-53. In September 2001, TA-53-945 and -954 were placed on the LANL Radiological Facilities List (LANL 2001c). Experimental Area ER-1/ER-2 is categorized as a Moderate Hazard facility. The remainder of the LANSCE User Facility is categorized as Low Hazard. DOE approved an Interim Safety Assessment Document for the LANSCE accelerator and experimental areas in May 2002. LANSCE began work on a two-year project to update and consolidate existing Authorization Basis documents for the User Facility. In September 2006, the DOE concurred with LANSCE's request to be considered as an accelerator facility regulated under DOE Order 420.2B. It is expected to be removed from the nuclear hazard facility list in CY 2007.

Table 2.11-1. LANSCE Buildings with Nuclear Hazard Classification

BUILDING	DESCRIPTION	NHC SWEIS ROD	NHC DOE 1998[a]	NHC LANL 2007[b]
TA-53-1L	1L Target		3	3
TA-53-3M	Experimental Science	3		
TA-53-A-6	Area A East		3	3
TA-53-ER1/ER-2	Actinide scattering experiments		3	3
TA-53-P3E	Pion Scattering Experiment		3	

a DOE list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2007a)

2.11.1 Construction and Modifications at Los Alamos Neutron Science Center

The ROD projected significant facility changes and expansion to occur at LANSCE by December 2006. Table 2.11.1-1 below indicates that four projects have been completed, and no additional projects started in 2006.

Table 2.11.1-1. Status of Projected Facility Changes at LANSCE

DESCRIPTION	SWEIS ROD REF.	COMPLETED
Closure of two former sanitary lagoons	2-88-R	Yes[a]
LEDA to become operational in late 1998	2-89-R	Yes – 1999[b]
Short-Pulse Spallation Source enhancements	2-90-L	Yes[c]
One-megawatt target/blanket	2-91-L	No
New 100-MeV Isotope Production Facility	2-92-L	Yes[d]
Long-Pulse Spallation Source (LPSS), including decontamination and renovation of Area A	3-25-L	No
Dynamic Experiment Laboratory	3-25-R	No[e]
Los Alamos International Facility for Transmutation	3-25-R	No
Exotic Isotope Production Facility	3-27-L	No
Decontamination and renovation of Area A-East	3-27-L	No

a Characterization started in CY 1999 and continued into CY 2000. Clean up at the south lagoon began in CY 2000 with the removal of the sludge and liner. Data analysis and sampling continued through CY 2001 for both lagoons and an Interim Action Plan was written for remediation of the north lagoon. Clean up of the north lagoon was done in CY 2002. The lagoons (SWMU 53-002[a]-99) have been remediated, with the complete removal of all contaminated sludge and liners; the nature and extent of residual contamination have been defined, and it has been shown that the residual contamination does not pose a potential unacceptable risk to humans or the environment. Currently the site is located within an industrial area under LANL (institutional) control. The site 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 New Mexico Environment Department (NMED) approved the final report in 2006.

b LEDA started high-power conditioning of the radio-frequency quadrupole power supply in November 1998. The first trickle of proton beam was produced in March 1999, and maximum power was achieved in September 1999. It has been designed for a maximum energy of 12 million electron volts, not the 40 million electron volts projected by the SWEIS ROD. LEDA was shut down in December 2001 and will remain inactive until funding is resolved. [Note: The 2003 omnibus bill passed by Congress included funding for LEDA D&D. The plan is to remove all support equipment and leave the building and the accelerator itself in place. This was accomplished/completed in 2006.]

c 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 upgrade to the Proton Storage Ring to handle the higher beam current. The Spectrometer E Enhancement completed in January 2004 subproject provided three new neutron scattering spectrometers to the Lujan Center and upgraded the capability of one instrument.

d Preparations began in the spring of CY 1999 for construction of the new 100-million-electron-volt Isotope Production Facility. Construction started in CY 2000 and the facility was completed in CY 2002. The Isotope Production Facility threw its first beam on December 23, 2003. Commissioning was completed in 2004, and the facility has completed two full production run cycles as of the end of 2006.

e The Science-Based 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. The concept of combining these experiments in a new Dynamic Experiment Laboratory has been replaced by the concept to construct a $1.6 billion Advanced Hydrotest Facility, which is currently in the conceptual phase. Conceptual planning for the Advanced Hydrotest Facility is being done consistent with the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE

1996c) and ROD (DOE 1996d). Before DOE decides to build and operate the Advanced Hydrotest Facility at LANL or some other site, an environmental impact statement and ROD would be prepared.

In addition to these projected construction activities, a new warehouse was constructed in CY 1998 to store equipment and other materials formerly stored outside, a new waste treatment facility for radioactive liquids generated at LANSCE was constructed during CY 1999, and construction of a new cooling tower was completed in CY 2000. These projects received NEPA review through Categorical Exclusions LAN-98-110 (DOE 1998b), LAN-98-109 (DOE 1998c), and LAN-96-022 (DOE 1999b). The new cooling towers (structure #53-963, 53-952) replace cooling towers 53-60, 53-62, and 53-64, which have been taken off line. The new towers discharge through Outfall 03A-048, as had their predecessors. Construction of two new instruments on Flight Paths 12 and 13 at the Lujan Center started in CY 2002. The cold neutron Flight Path 12 was commissioned 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 new liquid hydrogen target was fabricated, installed, and tested in CY 2005. During 2006, construction on Flight Path 13 was complete; however, the project is currently on hold due to funding deficiencies.

2.11.2 Operations at Los Alamos Neutron Science Center

The SWEIS identified seven capabilities for the LANSCE Key Facility. No new capabilities have been added, and none has been deleted. During CY 2006, LANSCE operated the accelerator and four of the five experimental areas. Area A has been idle for more than seven years. The primary indicator of activity for this facility is production of the 800-million-electron-volt LANSCE proton beam as shown in Table 2.11.2-1. These production figures are all less than the 6,400 hours at 1,250 microamps projected by the SWEIS ROD. In addition, there were no experiments conducted for transmutation of wastes. Table 2.11.2-1 provides details.

Table 2.11.2-1. Los Alamos Neutron Science Center (TA-53)/ Comparison of Operations

CAPABILITY	SWEIS ROD[a]	2006 OPERATIONS
Accelerator Beam Delivery, Maintenance, and Development	Deliver LANSCE linac beam to Areas A, B, C, WNR facility, Manuel Lujan Center, Dynamic Experiment Facility, and Isotope Production Facility for 10 months/yr (6,400 hrs). Positive ion current 1,250 microampere and negative ion current of 200 microampere.	In 2006, H+ beam was delivered to the Isotope Production Facility for 3,892 hours at an average current of 190.3 microamperes with 86% reliability. H- beam was delivered as follows: (a) to the Lujan Center for 3,779 hours at an average current of 86.84 microamperes with 81% total availability. (b) to WNR Target 2 for 287 hours in a "pulse on demand" mode of operation, with an average current below 1 femtoampere with 97% total availability. (c) to WNR Target 4 for 3,908 hours at an average current of 1.9microamperes with 86% total availability.

Table 2.11.2-1. (cont.)

CAPABILITY	SWEIS ROD[a]	2006 OPERATIONS
Accelerator Beam Delivery, Maintenance, and Development (cont.)		(d) through Line X to Line B (ultracold neutron) for 1,465 hours in a "pulse on demand" mode of operation, with an average current below 1 femtoampere with 90% total availability. (e) through Line X to Line C (pRad) for 878 hours in a "pulse on demand" mode of operation, with an average current below 1 femtoampere with 92% total availability.
	Reconfigure beam delivery and support equipment to support new facilities, upgrades, and experiments.[a]	No major upgrades to the beam delivery complex.
	Commission/operate/maintain LEDA for 10 to 15 yrs; operate up to approximately 6,600 hrs/yr.	LEDA was shutdown in December 2001; decomissioning and dismantlement was accomplished in 2006.
Experimental Area Support	Full-time remote handling and radioactive waste disposal capability required during Area A interior modifications and Area A-East renovation.	Full-time capability for remote handling has not been maintained due to loss of funding to support material and equipment upkeep and replacement of retiring workers. Modifications and renovations were not undertaken.
	Support of experiments, facility upgrades, and modifications.	Support activities were conducted per the projections of the SWEIS ROD.
	Increased power demand for LANSCE linac and LEDA radio-frequency operation.	Average beam current to the Lujan Center was increased to over 110 microamps.
Neutron Research and Technology[b]	Conduct 1,000 to 2,000 experiments/yr using Manuel Lujan Center, WNR facility, and LPSS. Establish LPSS in Area A (requires modification).	301 experiments were conducted at the Lujan Center and 84 experiments at WNR. LPSS was not constructed.
	Construct Dynamic Experiment Laboratory adjacent to WNR Facility. Support contained weapons-related experiments: - With small quantities of actinides, high explosives, and sources (up to approximately 80/yr) - With nonhazardous materials and small quantities of high explosives (up to approximately 200/yr) - With up to 4.5 kilograms high explosives and/or depleted uranium (up to approximately 60/yr) - Shock wave experiments involving small amounts, up to (nominally) 50 grams plutonium.	The Dynamic Experiment Laboratory was not constructed, but weapons-related experiments were conducted: - Some with actinides - Some with nonhazardous materials and high explosives - Some with high explosives, and depleted uranium - Some shock wave experiments.
	Provide support for static stockpile surveillance technology research and development.	Support was provided for surveillance research and development.
Accelerator Transmutation of Wastes[c]	Conduct lead target tests for two years at Area A beam stop.	No tests in CY 2006. No lead tests are expected for at least five years unless funding becomes available from DOE-Office of Nuclear Energy.

Table 2.11.2-1. (cont.)

CAPABILITY	SWEIS ROD[a]	2006 OPERATIONS
Accelerator Transmutation of Wastes (cont.)[c]	Implement the Los Alamos International Facility for Transmutation (Establish one-megawatt, then five-megawatt Accelerator Transmutation of Wastes target/blanket experiment areas adjacent to Area A.)	No Accelerator Transmutation of Waste tests are planned for the future.
	Conduct five-megawatt experiments for 10 months/yr for four years using about three kilograms of actinides.	No experiments.
Subatomic Physics Research	Conduct 5 to 10 physics experiments/yr at Manuel Lujan Center, WNR facility, and LPSS.	During CY 2006 LANSCE beam operations supported the initial two experiments conducted in the ultra-cold neutron experimental area (B).
	Conduct proton radiography experiments, including contained experiments with high explosives.	46 of 47 experiments conducted in CY 2006 involved the use of propellants containing either black powder or high explosives.
Medical Isotope Production	Irradiate up to approximately 50 targets/yr for medical isotope production.	A total of 64 targets were irradiated in 2006 (48 RbCl targets for Sr-82; 13 Gallium targets for Ge-68 production; 1 Aluminum target for Na-22 production; 1 Niobium target for Y-88 production and 1 Germanium target for As-73 production).
Medical Isotope Production, continued	Added production of exotic, neutron-rich, and neutron-deficient isotopes (requires modification of an existing target area).	No production in 2006.
High-Power Microwaves and Advanced Accelerators	Conduct research and development in these areas, including microwave chemistry research for industrial and environmental applications.	Research and development were conducted.

a Includes the completion of proton and neutron radiography facilities, the LEDA, the Isotope Production Facility relocation, the Short-Pulsed Spallation Source, and the LPSS.
b Numbers of neutron experiments represent plausible levels of activity. Bounding conditions for the consequences of operations are primarily determined by 1) length and power of beam operation and 2) maintenance and construction activities.
c Formerly Accelerator-Driven Transmutation Technology.

The most significant accomplishment in CY 2006 for LANSCE was the successful completion of the run cycle for the three primary experimental facilities: the WNR, the Proton Radiography area, and the Manuel Lujan Center. LANSCE hosted over 1,171 user visits during the eight-month 2006 run cycle. The facility operated at an average 81 percent availability for the Lujan Center and 91.5 percent for WNR, allowing the completion of 385 experiments for internal and external neutron scattering and neutron nuclear physics users. Another significant accomplishment was the first production run for the ultra-cold neutron experimental area.

2.11.3 Operations Data for Los Alamos Neutron Science Center

Since both construction activities, which contribute to waste quantities, and levels of operations were less than those projected by the SWEIS ROD, operations data were also less than projected. Radioactive air emissions are a key parameter since LANSCE emissions have historically accounted for more than 95 percent of the total LANL off-site dose. The total point source emissions were approximately 249 curies which represents a 98 percent decrease from 2005. As in recent years, the Area A beam stop did not operate

during 2006; however, operations in Line D resulted in the majority of emissions reported for 2006. Waste generation and NPDES discharge volumes were well below projected quantities. Table 2.11.3-1 provides details.

Table 2.11.3-1. Los Alamos Neutron Science Center (TA-53)/Operations Data

PARAMETER	UNITS	SWEIS ROD	2005 OPERATIONS
Radioactive Air Emissions:			
Argon-41	Ci/yr	7.44E+1	1.42E+01
Arsenic-72	Ci/yr	Not projected [a]	None detected
Arsenic-73	Ci/yr	Not projected [a]	4.07E-05
Beryllium-7	Ci/yr	Not projected [a]	9.19E-07
Bromine-76	Ci/yr	Not projected [a]	2.32E-03
Bromine-77	Ci/yr	Not projected [a]	2.99E-04
Bromine-82	Ci/yr	Not projected [a]	2.81E-03
Carbon-10	Ci/yr	2.65E+0	1.72E-01
Carbon-11	Ci/yr	2.96E+3	1.92E+02
Mercury-193	Ci/yr	Not projected[a]	None detected
Mercury-197m	Ci/yr	Not projected[a]	4.36E-03
Mercury-197	Ci/yr	Not projected[a]	4.36E-03
Mercury-203	Ci/yr	Not projected[a]	None detected
Nitrogen-13	Ci/yr	5.35E+2	1.37E+01
Nitrogen-16	Ci/yr	2.85E-2	None detected
Sodium-24	Ci/yr	Not projected[a]	1.14E-06
Osmium-191	Ci/yr	Not projected[a]	4.29E-05
Oxygen-14	Ci/yr	6.61E+0	3.53E-01
Oxygen-15	Ci/yr	6.06E+2	2.01E-01
Tritium as Water	Ci/yr	Not projected[a]	8.67E+00
LEDA Projections (eight-yr average):			
Oxygen-19	Ci/yr	2.16E-3	No operations in 2006
Sulfur-37	Ci/yr	1.81E-3	No operations in 2006
Chlorine-39	Ci/yr	4.70E-4	No operations in 2006
Chlorine-40	Ci/yr	2.19E-3	No operations in 2006
Krypton-83m	Ci/yr	2.21E-3	No operations in 2006
Others	Ci/yr	1.11E-3	No operations in 2006
NPDES Discharge:			
Total Discharges	MGY	81.8	20.16457
03A-047	MGY	7.1	0
03A-048	MGY	23.4	19.741
03A-049	MGY	11.3	0
03A-113	MGY	39.8	0.42357
Wastes:			
Chemical	kg/yr	16,600	1,773.2
LLW	m^3/yr	1,085	49.4
MLLW	m^3/yr	1	0.881
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	560[b]	370[b]

a The radionuclide was not projected by the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.

b The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the ten-year window represented by the SWEIS ROD.

2.12 Bioscience Facilities (TA-43, TA-03, TA-16, TA-35, and TA-46)

The Bioscience Key Facility definition includes the main HRL facility (Buildings TA-43-1, -37, -45, and -20) plus additional offices and labs located at TA-35-85, -254, and -2, and TA-03-562 and -1076. Additionally, Bioscience has small operations located at TA-16-460. Operations at TA-43 and TA-35-85 and -02 include chemical, laser, and limited radiological activities that maintain hazardous materials inventory and generate hazardous chemical wastes and very small amounts of LLW. Activities at TA-03-562 and TA-16 have relatively minor impacts because of low numbers of personnel and limited quantities of materials. Bioscience research capabilities focus on the study of intact cells (conducted at Biosafety Levels 1 and 2 [BSL-1 and -2]), cellular components (RNA, DNA, and proteins), instrument analysis (laser and mass spectroscopy), and cellular systems (repair, growth, and response to stressors). All Bioscience activities are classed as Low Hazard non-nuclear in all buildings within this Key Facility; there are no Moderate Hazard non-nuclear facilities or nuclear facilities (LANL 2007a). TA-43-1 is on the Radiological Facilities List (LANL 2002b).

The Bioscience Key Facility is a consolidation of bioscience functions and capabilities that represent the dynamic nature of the Yearbook, responding to the growth and decline of research and development across LANL.

2.12.1 Construction and Modifications at the Bioscience Facilities

The SWEIS ROD projected no new construction or major modifications to this Key Facility.

In CY 2006, only minor interior changes to accommodate operational changes occurred (office reconfigurations; heating, ventilation, and air conditioning renovations; laser lab decommissioning; and the institutional Electrical Infrastructure Safety Upgrades [EISU] Project. As in previous years, the volume of radioactive work at HRL has continued to diminish. This decline is attributed to technological advances and new methods of research, such as the use of laser-based instrumentation and chemiluminescense, which do not require the use of radioactive materials. For example, DNA sequencing predominantly uses laser analysis of fluorescent dyes hooked onto DNA bases instead of radioactive techniques.

The HRL facility has BSL-1 and -2 work, which includes very limited work with potentially infectious microbes. All activities involving infectious microorganisms are regulated by the Centers for Disease Control, National Institutes of Health, LANL's Institutional Biosafety Committee, and the Institutional Biosafety Officer. BSL-2 work is expanding as part of LANL's growing Chemical and Biological Nonproliferation Program.

During CY 2004, Bioscience finalized construction on the BSL-3 facility. Progress on final engineering requirements, the Authorization Basis, and readiness assessments continue. BSL-3 is a 3,202-square-foot, stand-alone, containment facility located

remotely from the Los Alamos town site, in the canyon west of Diamond Drive and south of Sigma Road (south of MSL and Sigma Buildings). The building will include two BSL-3 and one BSL-2 suites plus associated administrative space designed to safely handle and store infectious organisms. The mechanical system will accommodate directional airflow and negative pressure from the areas of lesser to greater risk, plus door interlocks and high-efficiency particulate air (HEPA) filtration.

Because of the building's small size and the small quantities of samples studied, there is no expected increase in quantities of sewage, solid wastes, or chemical wastes, nor should there be increased demand for utilities. NEPA coverage for this project was initially provided by the *Environmental Assessment for the Proposed Construction and Operation of a Bio-Safety Level 3 Facility at Los Alamos National Laboratory*, dated February 26, 2002, and a Finding of No Significant Impact (DOE 2002g). However, the Finding of No Significant Impact for this project was withdrawn by DOE/NNSA on January 22, 2004, due to the need to re-evaluate new circumstances concerning BSL-3 operations. Additional NEPA coverage for this project in the form of an environmental impact statement is in progress.

2.12.2 Operations at Bioscience Facilities

The SWEIS identified eight capabilities for the HRL (now called the Bioscience Facilities). In 1999, creation of Bioscience Division led to definitional changes in the existing capabilities and continues to restructure and redirect to enhance growth. Since the issuance of the SWEIS ROD in 1999, one core research capability was added in 2005, and two more core research capabilities were added in 2006.

Following these changes, Bioscience Division now has 11 core research capabilities:

- Bio-Materials
- Cell Biology
- Computational Biology
- Environmental Microbiology
- Genomic and Proteomic Science
- Measurement Science and Diagnostics
- Molecular Synthesis & Isotope Applications
- Structural Biology
- Pathogenesis;
- Metabolomics (added as a core capability in CY 2006)
- Proteomic Science (added as a core capability in CY 2006)

The In-Vivo Monitoring facility and capability continue to be located in TA-43, HRL-1. At the onset of the July 2004 work suspension, the In-Vivo activities were approved as an essential activity and therefore the work level was not impacted.

Table 2.12.2-1 compares CY 2006 operations to those predicted by the SWEIS ROD. The table includes the number of FTEs per capability to measure activity levels compared to the SWEIS ROD. These FTEs are not measured the same as the index shown in Table 2.12.3-1 and these numbers cannot be directly compared.

Table 2.12.2-1. Bioscience Facilities/Comparison of Operations

Capabilities	SWEIS ROD	2006 Operations
Bio-Materials and Chemistry	Not in SWEIS ROD. Conduct research utilizing materials that mimic the functions of living systems based upon the relationships found between structure, function, and formation. (5 FTEs)	In CY 2006, 5 FTEs[a] were associated with Biologically Inspired Materials and Chemistry.
Cell Biology	Conduct research utilizing whole cells and cellular systems, both in-vivo and in-vitro, to investigate the effects of natural and catastrophic cellular events like response to aging, harmful chemical and physical agents, and cancer. The work includes using isolated cells to investigate DNA repair mechanisms. (35 FTEs)	In CY 2006, 30 FTEs were associated with Molecular Cell Biology.
Computational Biology	Not in SWEIS ROD. Conduct research developing tools for managing, analyzing, and interpreting biological data and on modeling simple and complex biological systems. (10 FTEs)	In CY 2006, 10 FTEs were associated with Computational Biology.
Environmental Microbiology	Research to characterize the extent of diversity in environmental microbes and to understand their functions and occurrences in the environment. (25 FTEs)	In CY 2006, 15 FTEs were associated with Environmental Microbiology.
Genomic and Proteomic Science	Conduct research at current levels utilizing molecular and biochemical techniques to determine and analyze the sequences of genomes (human, microbes, and animal). Develop strategies to analyze the nucleotide sequence of individual genes, especially those associated with genetic disorders and infectious disease organisms. (50 FTEs)	In CY 2006, 40 FTEs were associated with Genomic and Proteomic Science.
Measurement Science and Diagnostics	Conduct research utilizing imaging and spectroscopy systems to analyze the structures and functions of subcellular systems and components. (40 FTEs)	In CY 2006, 35 FTEs were associated with Measurement Science and Diagnostics.
Molecular Synthesis and Isotope Applications	Generate biometric organic materials and construct synthetic biomolecules.	In CY 2006, 10 FTEs were associated with Molecular Synthesis.
Structural Biology	Conduct research utilizing chemical and crystallographic techniques to isolate and characterize the properties and three-dimensional shapes of protein molecules. (15 FTEs)	In CY 2006, 15 FTEs were associated with Structural Biology.

Table 2.12.2-1. (cont.)

Capabilities	SWEIS ROD	2006 Operations
Pathogenesis	Not in SWEIS ROD. Perform genome-scale, focused and computationally enhanced experimental studies to gain a quantitative understanding of various aspects of pathogen life cycle. The focus is on infections in humans, animals, and plants, as well as understanding the epidemiology and life cycle of pathogens in the environment. (15 FTEs)	In CY 2006, 15 FTEs were associated with Pathogenesis.
Proteomic Science	Not in SWEIS ROD. Technology development to better analyze proteins at the cellular level. This includes how the proteins are expressed, their structure and function as well as their interaction with other proteins.	New capability developed in CY 2006. In CY 2006, 5 FTEs were associated with Proteomic Science.
Metabolomics	Not in SWEIS ROD. Development of assays and platforms for pathogen detection, diagnosis of infection and disease, and therapy monitoring.	New capability developed in CY 2006. In CY 2006, 5 FTEs were associated with Metabolomics.
In-Vivo Monitoring. This is not a Bioscience Division capability; however, it is located at TA-43-HRL-1. Therefore, it is a capability within this Key Facility and is included here.	Performs whole-body scans as a service to the LANL personnel monitoring program, which supports operations with radioactive materials conducted elsewhere at LANL. (5 FTEs)	Conducted more than 1,140 lung and whole-body scans and about 750 other counts (detector studies, quality assurance measurements, etc.). In CY 2006, 3 FTEs were associated with this capability.

a FTEs: full-time-equivalent scientists, researchers, and other staff supporting a particular research capability.

2.12.3 Operations Data for Bioscience Facilities

Table 2.12.3-1 presents the operations data as measured by radioactive air emissions, NPDES discharges, generated waste volumes, and number of workers. The generation of most waste (chemical, administrative, and MLLW) has decreased from historical levels and was smaller than projections.

Table 2.12.3-1. Bioscience Facilities/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions	Ci/yr	Not estimated	Not measured
NPDES Discharge:[a] 03A-040	 MGY	 2.5[b]	 Eliminated in 1999
Wastes: Chemical Biomedical Waste LLW MLLW TRU Mixed TRU	 kg/yr kg/yr m^3/yr m^3/yr m^3/yr m^3/yr	 13,000 280[c] 34 3.4 0 0	 635.6 Eliminated in 1999 0 0 0 0
Number of Workers	FTEs	98[d]	98[d]

a Outfall 03A-040 consisted of one process outfall and nine storm drains.
b Storm water only.
c Animal colony and the associated waste. The animal colony was eliminated in CY 1999.

d The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.13 Radiochemistry Facility (TA-48)

The Radiochemistry Key Facility includes all of TA-48 (116 acres). It is a research facility that fills 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 six major research buildings: the Radiochemistry Laboratory (Building TA-48-1), the Assembly Checkout Building (TA-48-17), the Diagnostic Instrumentation and Development Building (TA-48-28), the Clean Chemistry/Mass Spectrometry Building (TA-48-45), the Weapons Analytical Chemistry Facility (48-107), and the Machine and Fabrication Shop (TA-48-8). During CY 2004, the Radiochemistry Laboratory, TA-48-1, was downgraded to a radiological Category C (low hazard) facility. Buildings TA-48-8, -17, -28, -45, and -107, are classified as low hazard chemical facilities (LANL 2007a).

2.13.1 Construction and Modifications at the Radiochemistry Facility

The SWEIS ROD projected no facility changes through CY 2006, although a few have occurred over the years (LANL 2003). During CY 2005 the fire notification system was upgraded under the institutional program. During CY 2006 the Building RC-1 roof replacement project was initiated and is expected to be complete in CY 2007. A National Fire Protection Standard (NFPA 45) compliant perchlorate system was installed in RC1 room 421 and placed into operation in CY 2006. In March 2006, a new chiller system and a stand-by diesel generator were installed in Building 45.

2.13.2 Operations at the Radiochemistry Facility

The SWEIS identified 10 capabilities for the Radiochemistry Key Facility. No new capabilities have been added, and none has been deleted. The primary measure of activity for this Key Facility is the number of personnel conducting research. In CY 2006, approximately 170 chemists and scientists were employed, far below the 250 projected by the SWEIS ROD[7]. As seen in Table 2.13.2-1, only four of the 10 capabilities were active at levels projected by the SWEIS ROD: Radionuclide Transport Studies, Isotope Production, Actinide/TRU Chemistry, and Sample Counting.

During 2005, work was initiated to validate a LANL procedure to measure beryllium on contaminated surfaces. This activity received NEPA coverage in the SWEIS. Most of the beryllium work involves solutions of wetted solids or one-piece solids such as coupons or

[7] The 170 chemists and scientists listed cannot be directly compared to the FTEs shown in Table 2.13.3-1, because the two numbers represent two different populations of individuals. The 170 chemists and scientists listed include temporary staff, students, and visiting scientists, whereas, the FTEs in Table 2.13.3-1include only full-time and part-time regular LANL staff.

articles and does not require participation in the LANL Chronic Beryllium Disease Prevention Program per LIR 402-560-01.0 (LANL 2004f), because there is no potential for airborne solids. The work includes analysis, ligand binding, materials characterization, field sampling, fundamental beryllium chemistry, and beryllium mitigation. There is a small amount of work done with beryllium solids that has the potential for airborne material, including weighing of beryllium solids such as beryllium metal, beryllium carbonate, and beryllium oxide, and ashing of adhesive films used in sampling. Weighing and manipulation of dry powders are carried out in HEPA-filtered boxes and involve less than 10 grams of beryllium. Ashing of films is done in a HEPA-filtered hood and involves micrograms of beryllium per sample. Five-percent-acid baths up to 20 liters in volume are used in the cleaning process. This activity involved two and half FTEs in 2006.

Table 2.13.2-1. Radiochemistry Facility (TA-48)/Comparison of Operations

Capability	SWEIS ROD	2006 Operations
Radionuclide Transport Studies	Actinide transport, sorption, and bacterial interaction studies. Development of models for evolution of groundwater. Assessment of performance or risk of release for radionuclide sources at proposed waste disposal sites. (28 to 34 FTEs[a])	During CY 2006, operations continued at approximately twice the levels identified in the SWEIS. (36 FTEs)
Environmental Remediation Support	Background contamination characterization pilot studies. Performance assessments, soil remediation research and development, and field support. (34 FTEs)	During CY 2006, operations continued at approximately half the levels identified in the SWEIS. (10 FTEs)
Ultra-Low-Level Measurements	Isotope separation and mass spectrometry. (30 FTEs [a])	Level of operations increased during 2006 to 1.5 times the levels identified in the SWEIS. (20 FTEs)
Nuclear/ Radiochemistry	Radiochemical operations involving quantities of alpha-, beta-, and gamma-emitting radionuclides for non-weapons and weapons work. (44 FTEs)	Decrease in quantities of alpha-emitting radionuclides used in operations. (35 FTEs)
Isotope Production	Target preparation. High-level beta/gamma chemistry and target processing to recover isotopes for medical and industrial application. (15 FTEs)	Slightly increased level of operations, but approximately the same as levels identified in the SWEIS. (18 FTEs)
Actinide/TRU Chemistry	Radiochemical operations involving significant quantities of alpha-emitting radionuclides. (12 FTEs)	Slightly increased level of operations, but approximately the same as levels identified in the SWEIS. (14 FTEs)
Data Analysis	Re-examination of archive data and measurement of nuclear process parameters of interest to weapons radiochemists. (10 FTEs)	Less than projected by the SWEIS ROD. (6 FTEs)
Inorganic Chemistry	Synthesis, catalysis, actinide chemistry: • Chemical synthesis of new organo-metallic complexes • Structural and reactivity analysis, organic product analysis, and reactivity and mechanistic studies • Synthesis of new ligands for radiopharmaceuticals Environmental technology development: • Ligand design and synthesis for selective extraction of metals • Soil washing • Membrane separator development • Ultrafiltration (49 FTEs—total for both activities)	Below projections of the SWEIS ROD. (35 FTEs)
Structural Analysis	Synthesis and structural analysis of actinide complexes at current levels. X-ray diffraction analysis of powders and single crystals at current levels. (22 FTEs)	Decreased levels of those projected by the SWEIS ROD. (7 FTEs)

Table 2.13.2-1 (cont.)

Capability	SWEIS ROD	2006 Operations
Sample Counting	Measurement of the quantity of radioactivity in samples using alpha-, beta-, and gamma-ray counting systems. (5 FTEs)	During 2006, maintained slightly higher sample processing than the number of samples projected by the SWEIS ROD. (10 FTEs)

a FTEs: full-time-equivalent. It is imperative that these FTE numbers are not confused with the FTEs identified in Table 2.13.3-1. Two different populations of individuals are represented. The FTEs in this table include students, visitors, and temporary staff. The FTEs in Table 2.13.3-1 only include full-time and part-time regular LANL staff.

2.13.3 Operations Data for the Radiochemistry Facility

The overall level of activity at the Radiochemistry Facility was below that projected by the SWEIS ROD. Four of the 10 capabilities at this Key Facility were conducted at levels projected by the SWEIS ROD; the others were at or below activity levels identified during preparation of the SWEIS. As a result, most of the operations data were also below those projected by the SWEIS ROD, as shown in Table 2.13.3-1.

Table 2.13.3-1. Radiochemistry Facility (TA-48)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:			
Mixed Fission Products	Ci/yr	1.4E-4	Not measured[a]
Plutonium-239	Ci/yr	1.1E-5	None detected[b]
Uranium-234 & U-235	Ci/yr	4.4E-7	None detected[b]
Mixed Activation Products	Ci/yr	3.1E-6	None detected[a]
Arsenic-72	Ci/yr	1.1E-4	None detected[b]
Arsenic-73	Ci/yr	1.9E-4	None detected[b]
Arsenic-74	Ci/yr	4.0E-5	None detected[b]
Beryllium-7	Ci/yr	1.5E-5	None detected[b]
Bromine-77	Ci/yr	8.5E-4	1.44E-.4
Germanium-68	Ci/yr	1.7E-5	3.76E-03
Gallium-68	Ci/yr	1.7E-5	3.76E-03
Rubidium-86	Ci/yr	2.8E-7	None detected[b]
Selenium-75	Ci/yr	3.4E-4	1.17E-08
NPDES Discharge:[c]			
Total Discharges	MGY	4.1	0
03A-045	MGY	0.87	Eliminated
04A-016	MGY	None	Eliminated
04A-131	MGY	None	Eliminated
04A-152	MGY	None	Eliminated
04A-153	MGY	3.2	Eliminated
Wastes:			
Chemical	kg/yr	3,300	38,494[d]
LLW	m^3/yr	270	28.18
MLLW	m^3/yr	3.8	0.08
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	128[e]	123[e]

a Emission categories of 'mixed fission products' and 'mixed activation products' are no longer used. Instead, where fission or activation products are measured, they are reported as specific radionuclides, e.g., cesium-137 or cobalt-60.

b Although stack sampling systems were in place to measure these emissions, any emissions were sufficiently small to be below the detection capabilities of the sampling systems.

c Outfalls eliminated before 1999: 04A-016 (TA-48), 04A-131 (TA-48), 04A-152 (TA-48), and 04A-153 (TA-48); outfall 03A-045 was eliminated in 1999.

d Chemical waste generated at the Radiochemistry Facility exceeded what was projected in the SWEIS ROD due to the disposition of roofing debris associated with the RC1 re-roofing project.

e The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.14 Radioactive Liquid Waste Treatment Facility (TA-50)

The RLWTF is located at TA-50 and consists of the treatment facility (Building TA-50-1), support buildings, and liquid and chemical storage tanks. The primary activity is treatment of radioactive liquid wastes generated at other LANL facilities. The facility also houses analytical laboratories to support waste treatment operations.

This Key Facility is a Nuclear Hazard Category 2 facility, and consists of the following structures (Table 2.14-1): the RLWTF itself (Building TA-50-01), the tank farm and pumping station (TA-50-2), the acid and caustic waste storage tank farm (TA-50-66), and a 100,000-gallon influent holding tank (TA-50-90) (Table 2.14-1).

There are no other nuclear facilities and no Moderate Hazard non-nuclear buildings within this Key Facility (LANL 2007a).

Table 2.14-1. Radioactive Liquid Waste Treatment Facility Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998[a]	NHC LANL 2007[b]
TA-50-0001	Main Treatment Plant	2	3	2
TA-50-0002	LLW Tank Farm		3	2
TA-50-0066	Acid and Caustic Tank Farm		3	2
TA-50-0090	Holding Tank		3	2

a DOE List of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE /LANL List of Los Alamos National Laboratory Nuclear Facilities (LANL 2007a).

2.14.1 Construction and Modifications at the Radioactive Liquid Waste Treatment Facility

The SWEIS ROD projected three modifications to the RLWTF Key Facility, and all three have been completed. The tank farm was upgraded in 1998. The new UF/RO (ultrafiltration and reverse osmosis) process was installed in 1998 and became operational in March 1999. Nitrate reduction equipment was installed in 1998, became operational in March 1999, and was subsequently removed from service during 2001. Engineering evaluation had shown that more than 70 percent of the nitrates in the LANL radioactive liquid waste were found in less than 1 percent of the waste volume. These low-volume, high-nitrate liquid wastes are now segregated by waste generators and shipped to commercial hazardous waste treatment facilities.

Facility personnel also installed an electrodialysis reversal unit in 1999 and an evaporator in 2000. Both units process the waste stream from the reverse osmosis unit. They

received NEPA coverage through Categorical Exclusions #7428, approved 02/23/99 (DOE 1999c), and #7737, approved 10/29/99 (DOE 1999d). The SWEIS ROD projected neither of these modifications.

In addition, decontamination operations were relocated during 2000 from Building TA-50-01 to TA-54 and moved to the west end of TA-54. Radioactive liquid wastes generated during decontamination operations are collected in two holding tanks at TA-54 and are trucked to the RLWTF at TA-50. The lead decontamination trailer, formerly located between Buildings TA-50-83 and TA-50-02, has been decommissioned. The quantity of lead that needed decontamination had become so small that maintaining this operation was no longer cost effective.

During 2002, the RLWTF shop building, TA-50-83, was relocated to TA-54 to make room for the construction of a new 300,000-gallon influent storage facility funded by the Cerro Grande Rehabilitation Project. Construction of the new facility started during 2004. In 2006, construction was about 75 percent complete and is expected to be finished in 2008.

2.14.2 Operations at the Radioactive Liquid Waste Treatment Facility

The SWEIS identified five capabilities for the RLWTF Key Facility. The primary measurement of activity for this facility is the volume of radioactive liquid processed through the main treatment equipment. From 1998 through 2006, all discharge volumes have been less than the projected discharge volume of 35 million liters per year in the SWEIS ROD:

- 1998: 23 million liters
- 1999: 20 million liters
- 2000: 19 million liters
- 2001: 14 million liters
- 2002: 11 million liters
- 2003: 11 million liters
- 2004: 8 million liters
- 2005: 7 million liters
- 2006: 6 million liters

Two factors have contributed to reduced waste volumes—source reduction and process improvements. Source reduction efforts, for example, included the re-routing of two significant waste streams, non-radioactive discharge waters from a cooling tower at TA-21 and a boiler at TA-48, to the LANL sewage plant during the summer of 2001. Process improvements included recycling of radioactive liquid waste within the RLWTF. For example, process waters are now used instead of tap water for the dissolution of chemicals needed in the treatment process and for filter backwash operations. This recycle has eliminated approximately 2.5 million liters per year of fresh water use.

In March 2002, a perchlorate removal system was added to the main treatment plant at TA-50. Ion exchange resin columns were installed and placed in service. To date, the resins have effectively removed perchlorates to less than the 4 parts per billion detection limit in all waters discharged since installation. These actions were taken despite the fact that there are no EPA or New Mexico discharge standards for perchlorate. This project received NEPA review through Categorical Exclusion #8632 (DOE 2002h).

Table 2.14.2-1 provides details.

Table 2.14.2-1. Radioactive Liquid Waste Treatment Facility (TA-50)/ Comparison of Operations

Capability	SWEIS ROD[a]	2006 Operations
Waste Characterization	Support, certify, and audit generator characterization programs.	As projected.
Packaging, Labeling	Maintain waste acceptance criteria for radioactive liquid waste treatment facilities.	As projected.
Waste Transport, Receipt, and Acceptance	Collect radioactive liquid waste from generators and transport to TA-50.	As projected.
Radioactive Liquid Waste Pretreatment	Pretreat 900,000 liters/yr of radioactive liquid waste at TA-21.	No pretreatment took place at TA-21.
	Pretreat 80,000 liters/yr of radioactive liquid waste from TA-55 in Room 60.	Pretreated 6,080 liters of water during CY 2006.[b]
	Solidify, characterize, and package 3 cubic meters/yr of TRU waste sludge in Room 60.	No TRU waste sludge was solidified in 2006.
Radioactive Liquid Waste Treatment Main Plant	Install UF/RO equipment in 1997. Install equipment for nitrate reduction in 1999.	UF/RO equipment installed in 1998. Nitrate reduction equipment installed in 1998 and subsequently removed in 2001. Ion exchange columns for perchlorate treatment installed in 2002 (not projected).
	Treat 35 million liters/yr of radioactive liquid waste.	Processed 6.2 million liters of radioactive liquid waste.
	De-water, characterize, and package 10 cubic meters/yr of LLW sludge.	Generated 3.3 cubic meters of LLW sludge during 2006.
	Solidify, characterize, and package 32 cubic meters/yr of TRU waste sludge.	No TRU waste sludge was solidified as a result of main plant operations.
Decontamination Operations	Decontaminate LANL personnel respirators for reuse (approximately 700/month).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54.[c]
	Decontaminate air-proportional probes for reuse (approximately 300/month).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54.[c]
	Decontaminate vehicles and portable instruments for reuse (as required).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54.[c]
	Decontaminate precious metals for resale (acid bath).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54.[c]

Table 2.14.2-1. (cont.)

Capability	SWEIS ROD[a]	2006 Operations
Decontamination Operations (cont.)	Decontaminate scrap metals for resale (sandblast).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54.[c]
	Decontaminate 200 cubic meters of lead for reuse (grit blast).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54.[c]

a Includes installation of UF/RO and nitrate reduction processes in Building 50-01 and installation of aboveground tanks for the collection of influent radioactive liquid waste.
b TA-55, Room 60 is in the process of a three-year/seven-million-dollar renovation, which is expected to become operational in CY 2008. The liters of water (6,080) represent de-inventory water left in the equipment.
c Decontamination operations are reported as part of the Solid Radioactive and Chemical Waste Key Facility.

2.14.3 Operations Data for the Radioactive Liquid Waste Treatment Facility

In 1998, liquid effluent from the RLWTF did not meet DOE's discharge criteria for water quality. In order to improve effluent quality, the treatment process was upgraded in 1999 to include UF/RO equipment. During CY 2006, there were zero violations of the State of New Mexico discharge limit for nitrate, fluoride, and total dissolved solids, zero violations of NPDES permit limits, and zero violations of the DOE discharge standards for radioactive liquid wastes. For the past seven years, NMED groundwater standards for nitrates, fluoride, and total dissolved solids have been met for all but two weeks; NPDES permit limits have been met 84 of 84 months; and DOE discharge standards have been met for 82 of 84 months. 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 the less-than-10-milligram-level through 2006. Similarly, annual average radioactive discharges were reduced from greater than 250 picocuries alpha activity per liter during the period 1993–1999 to less than 20 picocuries per liter since.

The SWEIS ROD did not project the quality of effluent, only quantity. Radioactive air emissions continued to be negligible (less than one microcurie), and NPDES discharge volume (6.8 million liters) continued to be less than the projected 35 million liters. The quantities of solid wastes varied from projections, but were overall less than projected quantities. Table 2.14.3-1 provides further details.

Table 2.14.3-1. Radioactive Liquid Waste Treatment Facility (TA-50)/ Comparison of Operations

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:			
Americium-241	Ci/yr	Negligible	None detected
Plutonium-238	Ci/yr	Negligible	None detected
Plutonium-239	Ci/yr	Negligible	None detected
Thorium-228	Ci/yr	Negligible	None detected
Thorium-230	Ci/yr	Negligible	None detected
Uranium-234	Ci/yr	Negligible	None detected
NPDES Discharge:			
051	MGY	9.3	1.63

Table 2.14.3-1. (cont.)

Parameter	Units	SWEIS ROD	2006 Operations
Wastes:			
Chemical	kg/yr	2,200	1.3
LLW	m^3/yr	160	116
MLLW	m^3/yr	0	0
TRU	m^3/yr	30	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	62[a]	82[a]

a The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.15 Solid Radioactive and Chemical Waste Facilities (TA-50 and TA-54)

The Solid Radioactive and Chemical Waste Key Facility is located at TA-50 and TA-54. Activities are all related to the management (packaging, characterization, receipt, transport, storage, and disposal) of radioactive and chemical wastes generated at LANL facilities.

It is important to note that LANL's waste management operation captures and tracks data for waste streams (whether or not they go through the Solid Radioactive and Chemical Waste Facilities), regardless of their points of generation or disposal. This includes information on the waste generating process; quantity; chemical and physical characteristics of the waste; regulatory status of the waste; applicable treatment and disposal standards; and the final disposition of the waste. The data are ultimately used to assess operational efficiency, help ensure environmental protection, and demonstrate regulatory compliance.

There is one Category 3 nuclear building within this Key Facility: the Waste Characterization, Reduction, and Repackaging (WCRR) Facility (Building TA-50-69). In addition, there are also several Category 2 nuclear facilities/operations; the LLW disposal cells, shafts, and trenches and fabric domes and buildings within Area G; the Radioactive Assay and Nondestructive Test Facility (Building TA-54-38), and outdoor operations at the WCRR Facility. In addition to the nuclear facilities, the Decontamination and Volume Reduction System (DVRS), TA-54-412, was added to the radiological facility list in CY 2002 (LANL 2002b). ARTIC, formerly the Radioactive Materials Research Operations and Demonstration facility was downgraded from a Category 3 nuclear facility to a radiological facility.

As shown in Table 2.15-1, the SWEIS recognized 22 structures as having Category 2 nuclear classification (Area G was recognized as a whole and then individual buildings and structures were also recognized). The WCRR Facility was identified as a Category 2

in the SWEIS, but because of inventories and the newer guidelines, it was downgraded to a Category 3. Area G has remained a Category 2 facility when taken as a whole.

Table 2.15-1. Solid Waste Buildings with Nuclear Hazard Classification

Building	Description	SWEIS ROD	DOE 1998[a]	LANL 2007[b]
TA-50-0069	WCRR Facility Building	2	3	3
TA-50-0069 Outside	Nondestructive Analysis Mobile Activities			2
TA-50-0069 Outside[c]	Drum Storage			
TA-54-Area G[d]	LLW Storage/Disposal	2	2	2
TA-54-0002	TRU Storage Building		3	2
TA-54-0008	Storage Building			
TA-54-0033	TRU Drum Preparation	2		2
TA-54-0038	Radioassay and Nondestructive Testing Facility	2	3	2
TA-54-0048	TRU Waste Management Dome	2	3	2
TA-54-0049	TRU Waste Management Dome	2	3	2
TA-54-0153	TRU Waste Management Dome	2	3	2
TA-54-0224	Mixed Waste Storage Dome			2
TA-54-0226	TRU Waste Management Dome	2		2
TA-54-0229	TRU Waste Management Dome	2		2
TA-54-0230	TRU Waste Management Dome	2		2
TA-54-0231	TRU Waste Management Dome	2		2
TA-54-0232	TRU Waste Management Dome	2		2
TA-54-0283	TRU Waste Management Dome	2		2
TA-54-0375	TRU Waste Management Dome	2		2
TA-54-1027	Hazardous, Chemical, Mixed, and Tritiated Waste Storage Dome			2
TA-54-1028	Hazardous, Chemical, Mixed, and Tritiated Waste Storage Dome			2
TA-54-1030	Hazardous, Chemical, Mixed, and Tritiated Waste Storage Dome			2
TA-54-1041	Hazardous, Chemical, Mixed, and Tritiated Waste Storage Dome			2
TA-54-Pad10[e]	Storage Pad	2		2

a DOE list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2007a).
c In the most recent Nuclear Facilities List (LANL 2007b), "Drum Storage" includes drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69.
d This includes LLW (including mixed waste) storage and disposal in domes, pits, shafts, and trenches; TRU waste storage in domes and shafts (does not include TRU Waste Inspection and Storage Program [TWISP]); TRU legacy waste in pits and shafts; low-level disposal of asbestos in pits and shafts. Operations building: TRU waste storage.
e Pad 10 was originally designated as Pads 2 and 4 in the SWEIS ROD.

2.15.1 Construction and Modifications at the Solid Radioactive and Chemical Waste Facility

The SWEIS ROD projected two construction activities for this Key Facility: the construction of four additional fabric domes for the storage of TRU wastes retrieved from earth-covered pads and the expansion of Area G.

Only one of the two construction activities projected by the SWEIS ROD has been completed. The construction of four additional fabric domes for the storage of TRU wastes retrieved from earth-covered pads was completed in 1998. Although expansion of Area G has not yet begun, the possibility exists for initiation of radioactive and mixed waste storage and disposal operations in Zone 4 within the next year. During CY 2006, this project was put on hold due to funding.

The Off-Site Source Recovery (OSR) Project recovers and manages unwanted radioactive sealed sources and other radioactive material that

- present a risk to public health and safety;
- present a potential loss of control by a US Nuclear Regulatory Commission or agreement state licensee;
- are excess and unwanted and are a DOE responsibility under Public Law 99-240[8] (42 USC); or
- are DOE-owned.

The project is sponsored by DOE's Office of Technical Program Integration and the Albuquerque Operations Office Waste Management Division that operates from LANL. It focuses on the problem of sources and devices held under US Nuclear Regulatory Commission or agreement state licenses for which there is no disposal option. The project was reorganized in 1999 to more aggressively recover and manage the estimated 18,000 sealed source devices that will become excess and unwanted over the next decade. This reorganization combined three activities, the Radioactive Source Recovery Program, the Off-Site Waste Program, and the Plutonium-239/Beryllium Neutron Source Project. Approximately 1,656 sources were collected for storage at TA-54 during CY 2006. Eventually, these sources will be shipped to the WIPP for final disposition. The OSR Project received NEPA coverage under an environmental assessment and subsequent Finding of No Significant Impact (DOE 1995c), Accession Numbers 6279 (DOE 1996c), 7405 (DOE 1999e), and 7570 (DOE 1999f), the 1999 SWEIS (DOE 1999a), and a Supplement Analysis to the 1999 SWEIS (DOE 2000c).

In CY 2002, LANL submitted a closure plan for three RCRA-regulated storage units at TA-50. These units were TA-50, Building 1, room 59, TA-50-114, and TA-50-37. The first two units are located at the RLWTF and the third is at ARTIC. NMED approved LANL's closure of these three units in CY 2004.

2.15.2 Operations at the Solid Radioactive and Chemical Waste Facility

The SWEIS identified eight capabilities for this Key Facility. No new capabilities have been added, and none has been deleted. The primary measurements of activity for this facility are volumes of newly generated chemical, low-level, and TRU wastes to be

[8] Public Law 99-240: an act to amend the Low-Level Radioactive Waste Policy Amendments Act of 1985. Introduced in the Senate and House of Representatives of the United States of America in Congress assembled, Ninety-Ninth Congress, January 15, 1986. The Policy Act was designed to stimulate development of new facilities by encouraging states to form interstate compacts for disposal on a regional basis.

managed and volumes of legacy TRU waste and MLLW in storage. A comparison of CY 2006 to projections made by the SWEIS ROD can be summarized as follows:

Chemical wastes: Approximately 1,600 metric tons of chemical waste were generated at LANL during CY 2006. This compares to an average quantity of 3,250 metric tons per year projected by the SWEIS ROD.

LLW: Approximately 7,575 cubic meters were placed into disposal cells and shafts at Area G, compared to an average volume of 12,230 cubic meters per year projected by the SWEIS ROD. No new disposal cells were constructed, and disposal operations did not expand into either Zone 4 or Zone 6 at TA-54.

MLLW: During CY 2006, 26 cubic meters were generated and delivered to TA-54, compared to an average volume of 632 cubic meters per year projected by the SWEIS ROD. This volume is well under the projection in the SWEIS ROD.

TRU wastes: During CY 2006, 619 cubic meters of TRU wastes were shipped to WIPP, and 117 cubic meters of newly generated TRU wastes (non-hazardous) were added to storage.

Mixed TRU Wastes: During CY 2006, 333 cubic meters of mixed TRU wastes were shipped to WIPP, approximately 33 cubic meters of mixed TRU wastes were received for storage.

In summary, chemical and radioactive waste management activities were at levels below those projected by the SWEIS ROD at this Key Facility. These and other operational details appear in Table 2.15.2-1.

Table 2.15.2-1. Solid Radioactive and Chemical Waste Facilities (TA-50 and TA-54)/Comparison of Operations

Capability	SWEIS ROD[a]	2006 Operations
Waste Characterization, Packaging, and Labeling	Support, certify, and audit generator characterization programs.	As projected.
	Maintain waste acceptance criteria for LANL waste management facilities.	As projected.
	Characterize 760 cubic meters of legacy MLLW.	No legacy MLLW was characterized in 2006.
	Characterize 9,010 cubic meters of legacy TRU waste.	Characterized approximately 842 cubic meters of TRU waste in 2006.
	Verify characterization data at the Radioactive Assay and Nondestructive Test Facility for unopened containers of LLW and TRU waste.	Did not verify characterization data at Radioactive Assay and Nondestructive Test Facility. Verification of characterization data for unopened TRU containers is currently occurring at TA-54 Area G, on Pad 10.
	Maintain waste acceptance criteria for off-site treatment, storage, and disposal facilities.	As projected.
	Over-pack and bulk waste as required.	As projected.

Table 2.15.2-1. (cont.)

Capability	SWEIS ROD[a]	2006 Operations
Waste Characterization, Packaging, and Labeling (cont.)	Perform coring and visual inspection of a percentage of TRU waste packages.	Performed visual examinations on 93 TRU waste packages in CY 2006; no drums were cored in 2006.
	Vent 16,700 drums of TRU waste retrieved during TWISP.	Drums were not vented in CY 2006.
	Maintain current version of WIPP waste acceptance criteria and liaison with WIPP operations.	As projected.
Compaction	Compact up to 25,400 cubic meters of LLW.	Approximately 422 cubic meters of LLW was compacted into approximately 83 cubic meters.
Size Reduction	Size reduce 2,900 cubic meters of TRU waste at WCRR Facility and the Drum Preparation Facility.	No waste was processed through the DVRS.
Waste Transport, Receipt, and Acceptance	Collect chemical and mixed wastes from LANL generators and transport to TA-54.	Collected and transported chemical and mixed wastes.
	Begin shipments to WIPP in 1999.	Shipments to WIPP began 3/26/1999.
	Over the next 10 years, ship 32,000 metric tons of chemical wastes and 3,640 cubic meters of MLLW for off-site land disposal restrictions, treatment, and disposal.	Approximately 1,600 metric tons of chemical waste and approximately 20 cubic meters of MLLW were shipped for off-site treatment and disposal from the Solid Radioactive and Chemical Waste Facility.
	Over the next 10 years, ship no LLW for off-site disposal.	Approximately 9 cubic meters of tritiated water for treatment and 4 cubic meters of lead for recycle. No LLW was sent off-site for disposal.
	Over the next 10 years, ship 9,010 cubic meters of legacy TRU waste to WIPP.	495 cubic meters of legacy TRU wastes were shipped to WIPP in 2006.
	Over the next 10 years, ship 5,460 cubic meters of operational and environmental restoration TRU waste to WIPP.	Approximately 123 cubic meters of operational (newly generated) TRU wastes were shipped to WIPP in CY 2006. No environmental restoration TRU wastes were shipped to WIPP.
	Over the next 10 years, ship no environmental restoration soils for off-site solidification and disposal.	No environmental restoration soils were shipped for off-site solidification and disposal in 2006. [b]
	Annually receive, on average, 5 cubic meters of LLW and TRU waste from off-site locations in 5 to 10 shipments.	26 cubic meters of LLW was received from off-site locations. 9 cubic meters of the LLW were uranium chips received for storage and eventual stabilization.[c]
Waste Storage	Stage chemical and mixed wastes before shipment for off-site treatment, storage, and disposal.	Chemical and mixed wastes were staged before shipment.
	Store legacy TRU waste and MLLW.	Legacy TRU waste and MLLW were stored.
	Store LLW uranium chips until sufficient quantities have accumulated for stabilization.	There were 9 cubic meters of uranium chips in storage awaiting stabilization in CY 2006.
Waste Retrieval	Begin retrieval operations in 1997.	Retrieval begun in 1997.
	Retrieve 4,700 cubic meters of TRU waste from Pads 1, 2, 4 by 2004.	Retrieval activities completed in 2001. No retrieval occurred in 2006.
Other Waste Processing	Demonstrate treatment (e.g., electrochemical) of MLLW liquids.	No activity.

Table 2.15.2-1. (cont.)

Capability	SWEIS ROD[a]	2006 Operations
Other Waste Processing (cont.)	Land farm oil-contaminated soils at Area J.	Closure of Area J is now complete.
	Stabilize 870 cubic meters of uranium chips.	No uranium chips were stabilized in CY 2006.
	Provide special-case treatment for 1,030 cubic meters of TRU waste.	None.
	Solidify 2,850 cubic meters of MLLW (environmental restoration soils) for disposal at Area G.	No environmental restoration soils were solidified in CY 2006.
Disposal	Over next 10 years, dispose of 420 cubic meters of LLW in shafts at Area G.	Approximately 23 cubic meters of LLW were disposed of in shafts at Area G.
	Over next 10 years, dispose of 115,000 cubic meters of LLW in disposal cells at Area G. (Requires expansion of on-site LLW disposal operations beyond existing Area G footprint.)	Approximately 7,575 cubic meters of LLW was disposed of in cells. Area G was not expanded.
	Over next 10 years, dispose of 100 cubic meters per year administratively controlled industrial solid wastes[d] in pits at Area J.	Closure of Area J is now complete.
	Over next 10 years, dispose of non-radioactive classified wastes in shafts at Area J.	Closure of Area J is now complete.
Decontamination Operations[e]	Decontaminate LANL personnel respirators for reuse (approximately 700/month).	In 2006, decontaminated approximately 400 personnel respirators per month at TA-54-1009.
	Decontaminate air-proportional probes for reuse (approximately 300/month).	In 2006, decontaminated 40 faces and 40 bodies per month at TA-54-1009.
	Decontaminate vehicles and portable instruments for reuse (as required).	No activity in 2006.
	Decontaminate precious metals for resale (acid bath).	No activity.[f]
	Decontaminate scrap metals for resale (sandblast).	No activity.[f]
	Decontaminate 200 cubic meters of lead for reuse (grit blast).	No activity.[f]

a Includes the construction of four new storage domes for the TWISP.
b The Environmental Restoration Project (now called the Environmental Remediation and Surveillance [ERS] Program) usually ships soils removed in remediation of a potential release site (PRS) directly to an off-site disposal facility. These wastes do not typically require processing at TA-54 and do not go through the TA-54 operations for shipment.
c The amount of LLW exceeded what was projected in the ROD, however, there was no LLW or TRU waste receipts from offsite locations from 1998–2002, a small amount of LLW was received in 2003, and there were no waste receipts in 2004.
d In the SWEIS, the term "industrial solid waste" was used for construction debris, chemical waste, and sensitive paper records.
e The Decontamination Operations capability was identified with the Radioactive Liquid Waste Treatment Key Facility in the SWEIS. Activities before 2000 are reported in Section 2.14.2 of the Yearbook. In 2000, this capability was relocated to TA-54 and the Solid Radioactive and Chemical Waste Facility.
f Although there has been no activity in CYs 2001, 2002, 2003 and 2004, this decontamination operation is now part of the Solid Radioactive and Chemical Waste Facility capabilities.

2.15.3 Operations Data for the Solid Radioactive and Chemical Waste Facility

Levels of activity in CY 2006 were less than projected by the SWEIS ROD and so were air emissions. The exception is chemical waste generation at the Solid Chemical and Radioactive Waste Key Facility. Table 2.15.3-1 provides details.

Table 2.15.3-1. Solid Radioactive and Chemical Waste Facilities (TA-54 and TA-50)/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:[a]			
Tritium	Ci/yr	6.09E+1	Not monitored[a]
Americium-241	Ci/yr	6.60E-7	2.61E-10
Plutonium-238	Ci/yr	4.80E-6	8.93E-11
Plutonium-239	Ci/yr	6.80E-7	2.28E-09
Uranium-234	Ci/yr	8.00E-6	None detected[a]
Uranium-235	Ci/yr	4.10E-7	None detected[a]
Uranium-238	Ci/yr	4.00E-6	None detected[a]
Strontium-90/Yttrium-90	Ci/yr	Not projected[b]	None detected[a]
Thorium isotopes	Ci/yr	Not projected[b]	None detected
NPDES Discharge	MGY	No outfalls	0
Wastes:[c]			
Chemical	kg/yr	920	0
LLW	m^3/yr	174	140.7
MLLW	m^3/yr	4	0
TRU	m^3/yr	27	0
Mixed TRU	m^3/yr	0	0.62[d]
Number of Workers	FTEs	65[e]	62[e]

a Data shown are measured emissions from WCRR Facility and the ARTIC Facility at TA-50. No stacks require monitoring at TA-54. All non-point sources at TA-50 and TA-54 are measured using ambient monitoring.

b These radionuclides were not projected in the SWEIS ROD because they were either dosimetrically insignificant or not isotopically identified.

c Secondary wastes are generated during the treatment, storage, and disposal of chemical and radioactive wastes. Examples include repackaging wastes from the visual inspection of TRU waste, HEPA filters, personnel protective clothing and equipment, and process wastes from size reduction and compaction.

d SWEIS ROD projections for Mixed TRU waste generated at the Solid Chemical and Radioactive Waste Facility were exceeded during CY 2006 due to the disposition of two-55-gal drums that came from the WCRR facility.

e The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.16 Non-Key Facilities

The balance, and majority, of LANL buildings are referred to in the SWEIS as Non-Key Facilities. Non-Key Facilities house operations that do not have potential to cause significant environmental impacts. These buildings and structures are located in 30 of LANL's 49 TAs and comprise approximately 14,224 of LANL's 26,480 acres.

As shown in Table 2.16-1, the SWEIS identified six buildings within the Non-Key Facilities with Nuclear Hazard Categories. The High-Pressure Tritium Facility (Building TA-33-86), classified in 2001 as a Category 2 nuclear facility, was removed from the Nuclear Facilities List in March 2002 and downgraded to a radiological facility. The D&D of the formerly used tritium facility, TA-33-86, the High-Pressure Tritium Laboratory, was completed in 2002. In November 2003, five PRSs located within Non-Key Facilities were added to the Nuclear Facilities List.

Table 2.16-1. Non-Key Facilities with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998[a]	NHC LANL 2007[b]
TA-03-0040	Physics Building	3		
TA-03-0065	Source Storage	2		
TA-03-0130	Calibration Building	3		
TA-33-0086	Former Tritium Research	3	2	
TA-35-0002	Non-American National Standards Institute Uranium Sources	3	3	
TA-35-0027	Safeguard Assay and Research	3	3	
TA-10 PRS 10-002(a)-00	Former Liquid Disposal Complex			3
TA-35 PRS 35-001	MDA W—Sodium Storage Tanks			3
TA-35 PRS 35-003(a)-99	Wastewater Treatment Plant			3
TA-35 PRS 35-003(d)-00	Wastewater Treatment Plant (Pratt Canyon)			3
TA-49 PRS 49-00(a)-00	MDA AB			2

a DOE List of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a).
b DOE/LANL List of Los Alamos National Laboratory Nuclear Facilities (LANL 2007a).

Additionally, several Non-Key Facilities were identified as radiological facilities in September 2002 (Table 2.16-2; LANL 2002b). These include the Omega West Reactor, Building 2-1; the Cryogenics Building B, 3-34: the Physics Building (HP), 3-40; the Lab Building, 21-5; Nuclear Safeguards Research, 35-2; Nuclear Safeguards Lab, 35-27; and the Underground Vault, 41-1. Table 2.16-2 lists all the Non-Key Facilities identified as radiological in CY 2006.

Table 2.16-2. Non-Key Facilities with Radiological Hazard Classification

Building	Description	LANL 2001[a]	LANL 2002[b]
TA-2-1	Omega Reactor	RAD	RAD
TA-3-16	Ion Exchange	---	RAD
TA-3-34	Cryogenics Bldg. B	RAD	RAD
TA-3-40	Physics Bldg. (HP)	RAD	RAD
TA-3-169	Warehouse	---	RAD
TA-3-1819	Experiment Mat'l Lab	---	RAD
TA-21-5	Lab Bldg	RAD	RAD
TA-21-150	Molecular Chemical	RAD	---
TA-33-86	High Pressure Tritium	---	RAD
TA-35-2	Nuclear Safeguards Research	RAD	RAD
TA-35-27	Nuclear Safeguards Lab	RAD	RAD
TA-36-1	Laboratory and offices	---	RAD
TA-36-214	Central HP Calibration Facility	---	RAD
TA-41-1	Underground Vault	RAD	RAD
TA-41-4	Laboratory	RAD	---

a LANL Radiological Facilities List (LANL 2001c).
b LANL Radiological Facilities List (LANL 2002b).

2.16.1 Construction and Modifications at the Non-Key Facilities

The SWEIS ROD had projected just one major construction project (Atlas) for the Non-Key Facilities. In contrast, however, LANL plans for the next 10 years call for the construction or modification of many buildings due to programmatic requirements and replacement of damaged or destroyed facilities following the Cerro Grande Fire (LANL 2001k). Major projects that have been completed are listed in Table 2.16.1-1. Complete descriptions of these projects can be found in previous Yearbooks (LANL 2003, 2004g, 2005g, and 2006c).

Table 2.16.1-1. Non-Key Facilities Completed Construction Projects

Description	Year Completed	NEPA Review
Los Alamos Research Park	2001	DOE 1997b
Strategic Computing Complex	2001	DOE 1998d
Chemistry Division Office Building (Chemistry Technical Support Building)	2002	DOE 2001b
Security Truck Inspection Station	2002	DOE 2002i
Nonproliferation and International Security Center	2003	DOE 1999g
TA-72 Live Fire Shoot House	2003	DOE 2000d
Emergency Operations Center	2003	DOE 2001c
Multi-Channel Communications Project	2003	DOE 2001c
Security Systems Group Security Systems Support Facility	2003	DOE 2001d
Decision Applications Division Office Building	2003	DOE 2002j
LANL Medical Facility	2004	DOE 2001e
Facility and Waste Operations Division Office Building	2004	DOE 2001f
Pajarito Road Access Control Stations	2004	DOE 2002k
NSSB (TA-03) Parking Structure	2004	DOE 2003f

New projects that are still under construction are discussed in the following paragraphs.

a) Atlas

Description: Atlas was constructed in parts of five buildings at TA-35 (35-124, -125, -126, -294, and -301). Atlas was designed for research and development in the fields of physics, chemistry, fusion, and materials science that will contribute to predictive capability for the aging and performance of primary and secondary components of nuclear weapons. The heart of the Atlas facility is a pulsed-power capacitor bank that will deliver a large amount of electrical and magnetic energy to a centimeter-scale target in less than 10 microseconds. Each experiment will require extensive preparation of the experimental assembly and diagnostic instrumentation.

The facility will require up to five megawatt-hours of electrical energy annually (less than one percent of total LANL consumption); will have a peak electrical demand of four megawatts for about one minute per week; and will employ about 15 people. This facility has its own NEPA coverage provided by Appendix K of the Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (DOE 1996c).

Status: Construction was completed in September 2000. Major testing of the capacitor banks (about 30 mega-amps) was successfully completed in December 2000. Critical

Decision 4 (authorization to commence operation) was received from DOE/NNSA in March 2001. An Independent Verification Panel process was completed to assure readiness for operations in July 2001, and the first experiments were performed in September 2001 and continued through September 2002.

During 2002, a new building was constructed at the Nevada Test Site to accommodate the relocation of Atlas. The relocation of Atlas to the Nevada Test Site had its own NEPA coverage in the form of an environmental assessment and Finding of No Significant Impact issued 06/05/2001 (DOE 2001g). The physical transfer of the Atlas machine to Bechtel Nevada at the Nevada Test Site began in October 2002. The formal property transfer took place at about the same time. Reassembly of the machine began in November 2002 and continued through April 2004. NNSA/Nevada Site Office issued Critical Decision 4 to Bechtel Nevada for the relocated Atlas machine on April 26, 2004. In May 2004 LANL again assumed ownership and management of the Atlas facility at the Nevada Test Site from Bechtel Nevada; LANL personnel will continue to be involved in experimentation activities at the Nevada Test Site. Machine characterization testing began in May 2004 to evaluate performance (compared to experience at LANL), reliability, and reproducibility. After interruption due to the 2004 LANL operational stand-down, characterization testing resumed in March 2005. Atlas became technically fully operational in 2005 when the first Atlas implosion physics experiment was conducted in July 2005 and has been operational ever since.

b) NPDES Outfall Project

The NPDES Outfall Project (DOE 1996b) is an on-going project and is described in detail in the 2002 SWEIS Yearbook (LANL 2003), section 2.16.

c) National Security Sciences Building

The NSSB within TA-03 provides approximately 275,000 square feet of space for theoretical and applied physics, computation science and program, and senior-management functions. The NSSB is an eight-story-high building to house about 700 personnel and their functions, which would move from building TA-03-0043. It also includes a one-story, 600-seat lecture hall and a separate multilevel parking structure that will provide 400 spaces. The facility will cost approximately $97 million dollars to build. When personnel are completely removed from building TA-03-0043 to the new NSSB, TA-03-0043 is scheduled to be demolished. This project has its own NEPA coverage provided by the *Environmental Assessment for Proposed Construction and Operation of the New Office Building and Related Structures within TA-03 at Los Alamos National Laboratory* (NNSA 2001) along with a Finding of No Significant Impact.

Because the use of energy-efficient lighting and equipment and the use of water-conservation measures were incorporated in the construction design, operation of the new office building is expected to use less water and electricity than Building TA-03-0043.

Status: Senator Pete Domenici and LANL senior managers attended a groundbreaking ceremony on August 20, 2003, to turn the first yards of earth for the building. Construction on the NSSB began in February 2004 and was completed in CY 2006. The

subcontractor broke ground on the parking structure in April 2004; the parking structure was completed in May 2005. The NSSB was occupied in June 2006.

d) Los Alamos Site Office Building

Description: The Los Alamos Site Office Building is proposed to consolidate core personnel within DOE/NNSA into a centralized and modernized office building to meet the long-term needs of DOE/NNSA activities, while improving working conditions and thereby the efficiency and productivity of DOE. This building will be located on the south side of West Jemez Road at the west end of the Wellness Center in TA-03. The facility will be single story, approximately 25,000 total gross square feet. The plans and specifications include structural, architectural, mechanical, electrical, and civil designs. The special systems designs include the fire protection system, the security system, and the building telecommunication system. The building services utility designs include sewer, water, and natural gas.

Status: This project received NEPA coverage through an existing DOE-approved categorical exclusion (DOE 2005b). The notice of contract award was January 24, 2007, and it is estimated that building occupancy will be July 2008.

e) Security Perimeter Project

Description: As a result of the events of September 11, 2001, DOE/NNSA and LANL Management determined that there was a critical need to upgrade the security around the core technical area of the Laboratory. Unauthorized access needed to be restricted and controlled to minimize the possibility of a terrorist threat. The long-term solution was to establish a security perimeter around the core area of the Laboratory by installing Vehicle Access Portals (VAPs), closing and rerouting a section of Diamond Drive, and constructing a new road to connect West Road to the existing Ski Hill Road in order to maintain public access and provide an alternative evacuation route. The VAPs were proposed to allow all vehicle traffic attempting to enter the LANL core area to be routed through access control stations. All vehicles coming into TA-3, from either the Los Alamos town site or from West Jemez Road have to drive through the new VAPs where they are screened. Public access is allowed during lower security levels. The VAPs are located on East Jemez Road, near the southeast corner of Diamond Drive and Jemez Road, and also at West Jemez Road at the Camp May Road intersection.

Status: This project received NEPA coverage through the *Environmental Assessment for Proposed Access Control and Traffic Improvements at Los Alamos National Laboratory*, and subsequent supplemental analyses (DOE 2002k). Construction for this project began in 2005. The VAPs began operating January 8, 2007. The Project received Critical Decision 4 from DOE/NNSA in July 2007. The new road connecting West Road to the Ski Hill Road is expected to be complete 2008 and is being constructed as a separate project.

2.16.2 Operations at the Non-Key Facilities

Non-Key Facilities are host to seven of the eight categories of activities at LANL (DOE 1999a) as shown in Table 2.16.2-1. The eighth category, environmental restoration, is discussed in Section 2.17. During CY 2006, no new capabilities were added to the Non-Key Facilities, and none of the eight was deleted.

The 6,063 employees in the Non-Key Facilities at the end of CY 2006 reflect a decrease of 120 employees over the employees reported in the 2005 SWEIS Yearbook (LANL 2006c).

Table 2.16.2-1. Operations at the Non-Key Facilities

Capability	Examples
1. Theory, modeling, and high-performance computing.	Modeling of atmospheric and oceanic currents. Theoretical research in areas such as plasma and beam physics, fluid dynamics, and superconducting materials.
2. Experimental science and engineering.	Experiments in nuclear and particle physics, astrophysics, chemistry, and accelerator technology. Also includes laser and pulsed-power experiments (e.g., Atlas).
3. Advanced and nuclear materials research and development and applications	Research and development into physical and chemical behavior in a variety of environments; development of measurement and evaluation technologies.
4. Waste management	Management of municipal solid wastes. Sewage treatment. Recycle programs.
5. Infrastructure and central services	Human resources activities. Management of utilities (natural gas, water, electricity). Public interface.
6. Maintenance and refurbishment	Painting and repair of buildings. Maintenance of roads and parking lots. Erecting and demolishing support structures.
7. Management of environmental, ecological, and cultural resources	Research into, assessment of, and management of plants, animals, cultural artifacts, and environmental media (groundwater, air, surface waters).

2.16.3 Operations Data for the Non-Key Facilities

The Non-Key Facilities occupy more than half of LANL and now employ about 73 percent of the workforce. In 2006, the Non-Key Facilities generated about 90 percent of the total LANL chemical waste volume; about 8 percent of the total LLW waste volume; about 59 percent of the MLLW volume; and about 55 percent of the total TRU waste volume. Table 2.16.3-1 presents details of the operations data from CY 2006.

The combined flows of the sanitary waste treatment plant and the TA-03 Steam Plant account for about 65 percent of the total discharge from Non-Key Facilities and about 50 percent of all water discharged by LANL. Section 3.2 has more detail.

Table 2.16.3-1. Non-Key Facilities/Operations Data

Parameter	Units	SWEIS ROD	2006 Operations
Radioactive Air Emissions:[a]			
Tritium	Ci/y	9.1E+2	None measured
Plutonium	Ci/y	3.3E-6	None measured
Uranium	Ci/y	1.8E-4	None measured
NPDES Discharge:			
Total Discharges	MGY	142	135.03
001	MGY	114	112.437
013	MGY	[b]	[b]
03A-027	MGY	5.8	10.764
03A-160	MGY	5.1	7.884
03A-199	MGY	---	17.009[c]
NPDES Discharge (cont.):			
22 others	MGY	17	[d]
Wastes:			
Chemical	kg/yr	651,000	1,521,694[e]
LLW	m^3/yr	520	792.4[e]
MLLW	m^3/yr	30	17.2
TRU	m^3/yr	0	42.4[f]
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	4,601[g]	6,063[g]

a Stack emissions from previously active facilities (TA-33 and TA-41); these were not projected as continuing emissions in the future. Does not include non-point sources.

b Outfall 013 is from the TA-46 sewage plant. Instead of discharging to Mortandad Canyon, however, treated waters are pumped to TA-3 for re-use and ultimate discharge through Outfall 001 into Sandia Canyon. This transfer of water has resulted in projected NPDES volumes underestimating actual discharges from the exiting outfall.

c New Outfall 03A-199 was permitted by the EPA on 12/29/00.

d The Non-Key Facilities formerly had 28 total outfalls (DOE 1999a, p. A-5). Twenty-two of these, with projected total flow of 17 million gallons per year, were eliminated from LANL's NPDES permit during 1998 and 1999.

e Chemical and LLW generation at the Non-Key Facilities exceeded the SWEIS ROD projection due to heightened activities and new construction.

f TRU waste generated at the Non-Key Facilities during CY 2006 was the result of the OSR Project. Because this waste comes from Shipping and Receiving, it is attributed to that location as the point of generation.

g The number shown in the "SWEIS ROD" column is the index number representing CY 1999 (the year the SWEIS ROD was published). The number of employees for CY 2006 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the SWEIS ROD represent total workforce size and include PTLA, KSL, and other subcontractor personnel. The number of employees for CY 2006 operations is routinely collected information and represents only LANS employees (regular full-time and part-time). Because the two sets of numbers (SWEIS ROD versus the new index) do not represent the same entity, a direct comparison to numbers projected by the SWEIS ROD (see Section 3.6, Socioeconomics) is not appropriate. However, because this index is going to be used in each subsequent Yearbook, selecting CY 1999 as the base year establishes an index that can be compared over the 10-year window represented by the SWEIS ROD.

2.17 Environmental Remediation and Surveillance Program (previously the Environmental Restoration Project)

The ERS Project, previously called the Environmental Restoration (ER) Project, may generate a significant amount of waste during cleanup activities; therefore, the project is included as a section in Chapter 2. The SWEIS ROD forecasted that the ERS Project would contribute 60 percent of the chemical waste, 35 percent of the LLW, and 75 percent of the MLLW generated at the Laboratory over the 11 years from 1996–2006.

The DOE established the ER Project in 1989 to characterize and, if necessary, remediate over 2,100 SWMUs and areas of concern (AOCs) known, or suspected, to be contaminated from historical Laboratory operations. Many of the sites remain under DOE/NNSA control; however, some have been transferred to Los Alamos County or to

private ownership (at various locations within the Los Alamos town site). Remediation and cleanup efforts are regulated by and coordinated with the NMED for chemical constituents and/or DOE/NNSA for radionuclides.

In CY 2006, ERS Project activities included drafting and finalizing numerous characterization and remediation plans and reports for NMED in accordance with the Final Order on Consent signed on March 1, 2005, and the February 3, 2005, Federal Facility Compliance Agreement (FFCA). In addition, accelerated characterization and remediation activities were implemented at sites that could potentially be affected by upcoming infrastructure and construction projects. All work performed was formally tracked.

Some of the major plans and reports completed include the following:

- Accelerated Corrective Action (ACA) Work Plan for the Investigation and Remediation of SWMU 61-002;
- Addendum to the ACA Work Plan for Investigation and Remediation (03-001(i), 03-029, & 61-002);
- Historical Information Report for Upper Los Alamos Canyon Aggregate Area;
- Investigation Work Plan (IWP) for Upper Los Alamos Canyon Aggregate Area;
- ACA Work Plan for the Investigation and Remediation of AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) at TA-16;
- Well Completion Reports for Regional Monitoring Wells LADP-5, LAOI-3.2, LAOI-7, R-10/R10a, R-16(a), R-17, R-23i, R-24, and R-27;
- Drilling Work Plan for Regional Monitoring Well R-35 (R-28);
- Interim Measures Work Plan for Groundwater Contaminants Detected in the Regional Aquifer at R-28;
- Interim Measures Report for Regional Well R-28;
- Quarterly FFCA Status Reports;
- Investigation Report for Mortandad Canyon;
- Pajarito Canyon Biota IWP;
- Monthly Stormwater Screening Action Level Exceedance Reports;
- IWP for the Middle Los Alamos Canyon Aggregate Area, Revision 1;
- MDA V Investigation Report;
- MDA U Investigation Report;
- MDA U Revised Investigation Report;
- MDA T Investigation Report;
- MDA A Investigation Report;
- Investigation Report for MDA L, SWMU 54-006, at TA-54, Revision 1;
- Work Plan for Further Investigation and Closure of MDA L (SWMU 54-006);
- Corrective Measures Evaluation (CME) Plan for MDA G at TA-54;
- Annual Storm Water Pollution Prevention Modification;
- IWP for South Canyons: Water/Cañon de Valle (includes Ancho/Chaquehui/Indio/Fence/Potrillo Canyons);
- Historical Information Report for South Canyons: Water/Cañon de Valle (includes Ancho/Chaquehui/Indio/ Fence/Potrillo Canyons);

- Periodic Monitoring Reports for Sandia and Mortandad Watersheds;
- Periodic Monitoring Reports for MDA L, MDA H, MDA G;
- Periodic Monitoring Report for Vapor-Sampling Activities at MDA H;
- Work Plan for Supplemental Sampling at MDA L and Sampling Analysis Plan for Impoundments B, C, and D at MDA L, SWMU 54-006, Revision 1;
- Work Plan for Supplemental Sampling at MDA G;
- Investigation Report for MDA C at TA-50;
- IWP for MDA B at TA-21;
- Monthly Groundwater Monitoring Data Summary;
- Workplan for R-Well Rehabilitation and Replacement;
- Well Rehabilitation Pilot Study Execution Plan;
- Integrated Facility-Wide Monitoring Plan;
- Hydrogeologic Synthesis Report;
- Groundwater Background Investigation Report, Rev. 1;
- General Facility Information Report;
- Hydrogeologic Site Atlas;
- Supplemental IWP for Delta Prime (DP) Site Aggregate Area at TA-21;
- Remedy Completion Report for SWMU 33-013;
- Historical Information Report for Cañon de Valle Aggregate Area;
- IWP for Cañon de Valle Aggregate Area;
- QA Project Plans for Groundwater Sampling, Well Drilling, and Groundwater Level Monitoring;
- Final FY07 Groundwater Protection Management Plan;
- Monthly Corrective Measures Study Progress Reports for 16-021(c)-99 the 260 Outfall;
- Investigation Report for Intermediate and Regional Groundwater, Consolidated Unit 16-012(c)-99;
- Investigation Report for 16-003(o) Fish Ladder;
- TA-21 DP West characterization activities;

Ongoing field activities included the following:

- Borehole drilling and sampling for TA-16 Ponds (16-008(a)99 [90's Line], 16-007(a)-99 [30s Line]) investigation;
- Well Rehabilitation at R-12, R-16, and R-20;
- ACA activities to complete the characterization and remediation of AOC 16-024(v) and SWMU 16-026(r);
- Borehole drilling, investigation, and sampling activities at MDAs A, G, H, L, and T;
- MDA C investigation;
- MDA B site preparation for investigation and remediation activities;
- DP Aggregate Area site preparation for investigation and remediation activities;
- Phase 1 Sediment Investigation for North Canyons (Guaje/Barrancas/Rendija Canyons);
- Phase 2 Sediment Investigation for Pajarito Canyon;
- Voluntary Corrective Measure activities at SWMU 73-002 Airport ashpile;
- Characterization well development for R-23i and R-27;

- Characterization well drilling for LADP-5 and LAOI-3.2a;
- Characterization well site restoration for R-10 and R-24;
- Quarterly sampling of the TA-16 260 Outfall in support of the Corrective Measures Study;
- Characterization well quarterly sampling at wells LAOI-3, LAOI-3a, LAOI-7, R-3i, R-17, R-23i, and R-27;
- Sandia Canyon Alluvial well and borehole drilling;
- Well rehabilitation at R-12, R-16, and R-20;
- Chromium surface and groundwater investigations at Los Alamos, Mortandad, and Sandia Watersheds;
- Watershed groundwater monitoring at White Rock Canyon Springs, Water/Cañon de Valle, Ancho, Pajarito, Sandia, Mortandad, Los Alamos, and Pueblo Canyons);
- ACA activities to complete the remediation and characterization of SWMU 61-002;
- ACA activities to complete the remediation and characterization of SWMU 33-013;
- Quarterly subsurface vapor monitoring at MDA H at TA-54.

2.17.1 Operations of the Environmental Remediation and Surveillance Program

In 1990, 2,124 SWMUs and AOCs were originally identified; 1,099 of the original sites were listed in Hazardous and Solid Waste Amendments (HSWA) Module of the Laboratory's Hazardous Waste Facility Permit and subject to HSWA corrective action requirements (originally under the authority of the EPA and later the NMED). The remaining 1,025 were identified as AOCs by LANL as potentially requiring investigation and/or remediation, but were not regulated under the HSWA Module. Since 1990, five additional sites have been identified. During 1999 and 2000 there was an effort to consolidate sites. This effort was undertaken to resolve deficiencies noted in reports which were reviewed by NMED. Specifically noted was the cumulative risk as a result of adjacent SWMUs and AOCs and identification of the nature and extent of releases at those sites. The other benefits of consolidation included the correction of a faulty numbering scheme implemented during the late 1980s by the ERS Project predecessors. All sites were evaluated and those which were in the same geographic proximity with similar contaminant types and migration pathways were combined. The discrete SWMUs and AOCs were grouped into consolidated units based on geographic proximity, similar operating history, etc. This resulted in a revised total of 1,601 consolidated and discrete SWMUs and AOCs. This deviation from the original identification system for SWMUs and AOCs results in a significant difference in tracking numbers from prior years. However, reporting the numbers of SWMUs and AOCs as discrete units is more representative of the regulatory process used to track site closure via NMED Certificates of Completion through the Corrective Action Operations.

In March 2005, the NMED, DOE/NNSA, and the University of California entered into a Compliance Order on Consent (Consent Order) that replaces the HSWA Module and

regulates all sites being addressed[9]. Consolidated units are still used to facilitate the discussion of investigation and remediation activities, but under the Consent Order discrete units comprising the consolidated units are tracked and removed from the Laboratory's Hazardous Waste Facility Permit rather than the consolidated unit as a whole. Since the Consent Order and through the end of CY 2006, 667 units have been approved for no further action (NFA) [10], including 148 units that have been removed from the Laboratory's Hazardous Waste Facility Permit. Of these, 114 non-HSWA Module sites previously had been approved for NFA by DOE/NNSA and, under the terms of the Consent Order, the NFA determinations for these sites will be re-evaluated by NMED. Based on prior NFA approvals and consolidation of geographically proximate sites, a total of 1407 SWMUs and AOCs remain within the Project. Pursuant to the Consent Order the NFA determination has been replaced with a Certificate of Completion. In 2006 the Project received Certificates of Completion for 14 SWMUs and 14 AOCs.

Security Perimeter Project – SWMU 61-002

In December 2005 the ERS Project submitted a Remedy Completion Report for 2005 ACA Work Plan activities at SWMUs 61-002 and 03-029 and AOC 03-001(i) in support of the Security Perimeter Project. This report concluded that further remediation to remove additional contaminated soil and tuff was required at SWMU 61-002. The ERS Project submitted a supplemental investigation and remediation work plan for SWMU 61-002 to NMED in April 2006 and fieldwork resumed in June 2006. Security Perimeter Project construction continued in and around this site; D&D of the TA-03 Radio Shop was completed in April 2006 allowing the ERS Project access to the residual petroleum hydrocarbon contamination found as a result of 2005 ACA activities at SWMU 61-002. The ERS Project implemented the 2006 ACA Work Plan for SWMU 61-002 in August of 2006. Field activities at SMWU 61-002 included conducting additional confirmation sampling and further characterization to determine the nature and extent of any residual contamination at SWMU 61-002 to support a request for a Certificate of Completion for the site. Results of this ACA to be presented in the remedy completion report in 2007 confirm that the site poses no present-day unacceptable risk to site workers.

AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f)

The ERS Project implemented the ACA Work Plan for AOC 16-024(v) and SWMUs 16-026(r) and 16-031(f) submitted to NMED January 2006. AOC 16-024(v) was a former magazine at TA 16, SWMU 16-026(r) is potentially contaminated soil associated with overflow lines from an oil-water separator at TA-16, and 16-031(f) was potentially contaminated soil associated with an outfall from a former chlorination station. Based on known operations and activities conducted at 16-031(f), environmental sampling did not appear to be warranted and no field activities were conducted at 16-031(f) during the ACA activities. Field activities at AOC 16-024(v) and SWMU 16-026(r) occurred between June and August of 2006 and included removing potentially contaminated soil from both sites and overflow drainlines associated with 16-0246(r) and performing confirmation samples to determine the nature and extent of residual contamination to

[9] The Consent Order does not regulate radionuclides, however; the investigation and remediation of radionuclide contamination by ERS is regulated by DOE under the Atomic Energy Act.

[10] NFA means that the ERS Project has no further regulatory requirements for the site. Requirements may exist under other LANL projects, however, and the site may not be suitable for unrestricted use.

support a request for Certificate of Completion for all three sites. Results of this ACA to be presented in the remedy completion report in 2007 confirm that the sites pose no present-day unacceptable risk to site workers.

MDA V, SWMU 21-018(a)-99
The primary objective of the MDA V IWP implemented by the ERS Project from 2005 to 2006 was to remove infrastructure, primarily underground pipes, and contaminated soil. Additional objectives included an effort to finalize surface and subsurface chemical and geotechnical characterization and determine the extent of contamination to support a request of Certificate of Completion for the site. Field activities included characterization drilling and logging of boreholes and sampling to characterize the vertical and lateral extent of contamination. The MDA V Investigation Report submitted to NMED in October 2006 indicates that the nature and extent of contamination in both surface and subsurface media have been defined and that neither a substantial fracture zone nor saturation was encountered during drilling. The report also indicates that the site poses no unacceptable risk to human health under a residential scenario and recommends that all five sites within consolidated unit 21-018(a)-99 be designated as Corrective Action Complete without Controls.

SWMU 21-022(f) (a parent unit of consolidated SWMU 21-018(a)-99) was not included as part of the MDA V investigation or part of the request for a Certificate of Completion. SWMU 21-022(f) is being addressed in corrective actions being conducted for the DP Site Aggregate Area.

MDA U, SWMU 21-017(a)-99
MDA U is a subsurface disposal site for radioactively contaminated liquid waste at TA-21. MDA U consists of two absorption beds, an associated distribution box between the absorption beds, and a sump used to collect wastewater and discharged to the absorption beds through the distribution box. The objectives of the MDA U IWP implemented by the ERS Project in 2005 were to finalize surface and subsurface chemical and geotechnical characterization and determine the extent of contamination to support a request of Certificate of Completion for the site. Field activities included characterization drilling and logging of boreholes, core sampling, field screening for radiation and volatile organic chemicals, and surface and subsurface sampling for chemical characterization. The MDA U Investigation Report submitted to NMED in February 2006 indicates that the nature and extent of contamination in both surface and subsurface media have been defined and that there is no perched saturation zone beneath the site. The results of the investigation also indicate that MDA U does not pose a potential unacceptable risk to human health under an industrial scenario and the report recommended that the site be designated as “Complete with Controls.” The ERS Project received a Certificate of Completion for MDA U from NMED in December 2006.

MDA T, SWMU 21-016(a)-99
MDA T is a fenced area of approximately 2.2 acres at TA-21. MDA T consists of four inactive absorption beds, buried sumps and pipelines, up to 64 shafts, a former Retrievable Waste Storage Area, former and current waste treatment plant locations, and

portable incinerators. The objectives of the 2004 IWP for MDA T that were implemented by ERS Project in 2005 were to complete the RCRA Facility Investigation (RFI) of MDA T by addressing remaining investigation objectives after past RFI fieldwork was conducted between 1992 and 1997 at MDA T. The objectives of this past RFI were to determine if a release of hazardous constituents and/or radionuclides had occurred, and, if so, to establish the nature and extent of any releases. Additional investigation requirements for the 2004 Work Plan, which was implemented in 2005, included conducting a site-wide radiation mapping survey to document surface conditions and to focus sample collection activities and sample the area to determine the nature and extent of surface and subsurface contamination at MDA T. CY 2005–2006 investigation activities focused primarily on drilling campaigns to analyze soil and rock from MDA T and to determine if the nature and extent of contamination for all site chemicals of potential concern have been characterized. Sampling results presented in the September 2006 Investigation Report indicate that there is no potential unacceptable risk to industrial and recreational receptors at MDA T. The report also indicated that the nature and extent of contamination at MDA T have been defined and recommended proceeding with a planned CME for MDA T.

MDA C, SWMU 50-009

MDA C is a decommissioned disposal area for LANL-derived waste. MDA C consists of seven pits and 108 shafts. The objectives of the 2004 IWP for MDA C were to finalize surface and subsurface chemical/radionuclide and geotechnical characterization. This characterization data were used to determine the nature and extent of contamination at MDA C. Field implementation of the 2004 IWP was conducted between 2004 and 2006. The Investigation Report submitted to NMED in December 2006 states that the nature and extent of surface and subsurface contamination have been defined. The results presented in the report also indicate that the site poses no unacceptable risk to human health under an industrial scenario. The report also recommended that future surface sampling be conducted to confirm the nature and extent of inorganic chemical contamination and that vapor-monitoring wells be installed to monitor subsurface concentrations of volatile organic chemicals and tritium. An addendum to the Investigation Report will be prepared for the results of additional sampling. The report also recommended that a CME be performed to evaluate alternatives for remediation and long-term disposal of this site.

MDA A, SWMU 21-014

MDA A is a 1.25-acre area at TA-21 that was used to dispose of radioactively contaminated solid and liquid waste, debris from D&D activities, and radioactive liquids generated at TA-21. MDA A consists of two subsurface storage tanks, two rectangular storage pits, and a large central pit. The ERS Project implemented the 2004 IWP for MDA A in 2006. One of the objectives of the plan was to confirm results measured in the 1992/1994 RFI at 16 locations at MDA A. Another objective was to determine if the nature and extent of contamination from chemicals of potential concern were characterized. Field activities included a drilling campaign to collect and analyze surface and subsurface samples. Surface radiological and geophysical surveys, downhole geophysical measurements, pore gas sampling, and surface/shallow-subsurface sampling

was also performed. The ERS Project submitted an Investigation Report in November 2006 which stated that the nature and extent of chemicals of potential concern have been defined and that no potential risk to human health is present. Sampling results also confirm that there have been no releases or migration of chemicals of potential concern beyond the boundaries of MDA A. The report recommends proceeding with a CME for MDA A.

SWMU 16-021(c)-99

SWMU 16-021(c)-99 consists of 13 high explosives sumps and drain lines and the associated outfall that serve Building 16-260. In 2006 an Investigative Report was written to discuss the impacts from SWMU 16-021(c)-99 on intermediate and regional groundwater. Data from 11 neighboring wells and boreholes and three municipal drinking water wells collected from 2000–2005 was evaluated. The Investigation also served to determine the rate at which contamination is moving downgradient, to investigate the directions of groundwater flow and the hydrologic gradients within the intermediate and regional zones at TA-16, and to identify chemicals of potential concern for an upcoming CME for TA-16 regional groundwater. The SWMU 16-021(c)-99 Investigation Report submitted to NMED in August 2006 contained recommendations to decrease monitoring and sampling frequency of LANL wells from quarterly to a semi-annual basis, abandon one monitoring well, and continue sampling municipal wells in the area. A CME report to be submitted to NMED in August of 2007 will examine the remedial options for the COPCs defined in the Investigation Report.

SWMU 16-003(o) Fish Ladder

SWMU 16-003(o) consists of six high explosives sumps and associated outfall that served Building 16-340. The ERS Project implemented an IWP at SWMU 16-003(o) between October 2004 and December 2005. Investigation activities took place during and after demolition and decommissioning activities of Building 16-340 that occurred between October 2004 and April 2005. Field activities included removing human-made fixtures (sumps, manholes, and drainlines) and contaminated soil. Field-screening samples were also collected to define the nature and extent of any residual contamination. Historical data from previous investigations conducted between 1995 and 1997 were also incorporated into the Investigation Report submitted to NMED January 2006. Based on the confirmation sampling results, the Investigation Report indicated that the investigation activities did not adequately define the extent of contamination for SWMU 16-003(o). It was proposed in the report to conduct additional remediation and sampling activities to remove additional contaminated soil and to verify that all contaminated soil has been removed.

SWMU 33-013 at TA-33 33-013

The ERS Project implemented an ACA at SWMU 33-013, a former drum storage area at TA-33. This ACA was prompted by the planned construction of the LANL's new High Bay Complex at TA-33. SWMU 33-013 is located within the proposed construction design footprint of the TA-33 High Bay Complex and was investigated and remediated before the commencement of construction activities, as described in the ACA Work Plan for SWMU 33-013 at TA-33, submitted to and approved by NMED in April 2005.

During the summer of 2005 the ERS Project implemented the ACA Work Plan at SWMU 33-013 by removing asphalt and potentially contaminated soil from the site and collecting confirmation samples to define the nature and extent of any residual contamination at SWMU 33-013 to support a request for a Certificate for Completion for the site. Results of the 2005 data evaluation presented in the 2006 Remedy Completion Report show that the nature and extent of contamination have been defined for SWMU 33-013 and that the results indicate there is no potential unacceptable risk posed to human health or the environment for industrial land use and construction activities. In the Remedy Completion Report, the Laboratory requested a Certificate for Completion for the site and received approval in August 2006.

Interim Facility-wide Groundwater Monitoring Plan, Revision 1
The Interim Facility-wide Groundwater Monitoring Plan, Revision 1, submitted to NMED in April 2006 and approved in June 2006, fulfilled a requirement of the Consent Order. Four modes of water will be monitored: base flow, alluvial groundwater, intermediate perched groundwater, and regional aquifer groundwater. Monitoring within current LANL boundaries will take place in seven major watersheds or watershed groupings: Los Alamos/Pueblo Canyons, Sandia Canyon, Mortandad Canyon, Pajarito Canyon, Water Canyon/Cañon de Valle, Ancho/Chaquehui/Frijoles Canyons, and White Rock Canyon. Monitoring outside LANL boundaries will be conducted in areas that LANL operations have affected in the past and in areas that have not been affected by LANL operations thereby providing baseline data. Monitoring data will be published in routine reports in accordance with the Consent Order compliance schedule.

Canyons Projects
The Canyons Projects implemented in 2006 focused primarily on investigations in Mortandad Canyon. The 2005 investigation in Mortandad Canyon involved installation of several new regional and perched intermediate-depth groundwater monitoring wells, drilling of characterization coreholes, an infiltration investigation, and geochemical characterization of sediment and groundwater.

Additional investigations were ongoing in Pajarito Canyon with the main emphasis being on the second phase of the sediment characterization that uses a watershed-scale approach to evaluate nature and extent of contamination as well as distribution of contaminant inventory. Phase 1 sediment investigations were begun for the North Canyons (Guaje/Barrancas/Rendija Canyons).

2.17.2 Cerro Grande Fire Effects on the Environmental Remediation and Surveillance Program

The Los Alamos and Pueblo Canyons Investigation Report was submitted to the NMED in 2004 and it addressed, among other things, the impact of the Cerro Grande fire on COPC concentrations in canyon media. The results of this investigation indicate that for contaminants released from LANL SWMUs and AOCs, the human health risks are below NMED's and DOE's target levels for present-day and foreseeable future land uses, and

that adverse ecological effects have not been observed in terrestrial and aquatic systems in the watershed.

No new Environmental Sites were added to the DOE/LANL Nuclear Facilities List (LANL 2007a) during CY 2006. The existing Environmental Sites that are categorized as Hazard Category 2 and Hazard Category 3 Nuclear Facilities are shown in Table 2.17.2-1.

Table 2.17.2-1. Environmental Sites with Nuclear Hazard Classification

Zone	SWMU/AOC	Description	HAZ CAT
TA-10	SWMU 10-002(a)-99	PRS 10-002(a)-99 is associated with the former liquid disposal complex serving the radiochemistry laboratory at TA-10. The complex discharged to leach fields and pits. The entire complex underwent D&D in 1963. The remaining materials were placed in a pit that remains in place.	3
TA-21	SWMU 21-014	MDA A is a 1.25-acre site that was used intermittently from 1945 to 1949 and from 1969 to 1977 to dispose of radioactively contaminated solid wastes, debris from D&D activities, and radioactive liquids generated at TA-21. The area contains two buried 50,000-gal. storage tanks (the "General's Tanks") on the west side of MDA A, two rectangular disposal pits (each 18 ft long by 12.5 ft wide by 12.5 ft deep) on the east side of MDA A, and a large central pit (172 ft long by 134 ft wide by 22 ft deep).	2
TA-21	SWMU 21-015	MDA B is an inactive 6.03-acre disposal site. It was the first common disposal area for radioactive waste generated at LANL and operated from 1945 to 1952. The site runs along the fence line on DP Road and is located about 1,600 ft east of the intersection of DP Road and Trinity Drive. The site comprises four major pits (each 300 ft by 15 ft by 12 ft deep), a small trench (40 ft by 2 ft by 3 ft deep), and miscellaneous small disposal sites.	3
TA-21	SWMU 21-016(a)-99	MDA T, an area of about 2.2 acres, consists of four inactive absorption beds, a distribution box, a subsurface retrievable waste storage area disposal shaft, a former waste treatment plant, and cement paste spills on the surface and within the retrievable waste storage area.	2
TA-35	AOC 35-001	MDA W consists of two vertical shafts or "tanks" that were used for the disposal of sodium coolant used in LAMPRE-1 sodium cooled research reactor. The two tanks are 125-ft-long stainless steel tubes that were half filled and inserted into carbon steel casings separated by approximately 3 ft. Until 1980, a metal control shed was located above the tanks, but this feature was removed and replaced with a concrete cover. The predominant radionuclide of concern in the sodium is plutonium-239 that may have been introduced from a breach of one or two fuel elements during the operational life of LAMPRE-1.	3

Table 2.17.2-1. (cont.)

Zone	SWMU/AOC	Description	HAZ CAT
TA-35	SWMU 35-003(a)-99	The Waste Water Treatment Plant was located at the east end of Ten Site Mesa and operated from 1951 until 1963. It consisted of an array of underground waste lines, storage tanks, and chemical treatment precipitation tanks. The plant treated liquid waste that originated from the radiochemistry laboratories and operation of the radioactive lanthanum-140 hot cells in Building 35-2. The liquid wastes from the laboratories were acidic, and the radioactivity in the waste came from barium-140, lanthanum-140, strontium-89, strontium-90, and yttrium-90.	3
TA-35	SWMU 35-003(d)-00	The former structures associated with the Pratt Canyon component of the Waste Water Treatment Plant. All buildings, foundations, and structures were removed during D&D activities in 1981 and 1985, then backfilled with 20 ft of clean fill material.	3
TA-49	SWMU 49-001(a)-00	This underground, former explosive test site comprises four distinct areas, each with a series of deep shafts used for subcritical testing. Radioactively contaminated surface soil exists at one of the test areas [SWMU 49-001(g)].	2
TA-50	SWMU 50-009	MDA C was established in 1948 to replace MDA B. MDA C covers 11.8 acres and consists of seven pits (four are 610 ft by 40 ft by 25 ft, one is 110 ft by 705 ft by 18 ft, one is 100 ft by 505 ft by 25 ft, and one is 25 ft by 180 ft by 12 ft), 107 shafts (each typically 2 ft diameter by 10 to 25 ft deep), and one unnumbered shaft used for a single strontium-90 source disposal. Pits and shafts were used for burial of hazardous chemicals, uncontaminated classified materials, and radioactive materials. TRU waste also was buried in unknown quantities in the pits. The landfill was used until 1974. Chemicals of potential concern included inorganic chemicals, volatile organic chemicals, semi-volatile organic compounds, and radionuclides.	2
TA-53	SWMU 53-006(b)-99	Three inactive underground tanks exist and are associated with the former radioactive liquid waste system at TA-53. One tank (Structure 53-59) is 28 ft in diameter and 65 ft long and contains spent ion exchange resin. Two empty tanks are 6 ft in diameter and 12 ft long and are not included here.	2
TA-54	SWMU 54-004	MDA H is a 0.3-acre site on Mesita del Buey that contains nine inactive shafts that were used for disposal of LANL waste. Each shaft is 6 ft diameter by 60 ft deep.	3
TA-54	SWMU 54-013(b)-99	MDA G is located within a 63-acre area known as Area G. MDA G was established in 1957 for disposal of LLW, and later was also used for retrievable storage of TRU waste. The site is composed of 32 pits, 194 shafts, and 4 trenches that received waste until 1997. Other units at Area G continue to be used for LLW disposal and storage and processing of TRU waste for disposal at the WIPP.	2

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3.0 Site-Wide 2006 Operations Data

The Yearbook's role is to provide data that could be used to develop an impact analysis. However, in two cases, worker dose and dose from radioactive air emissions, the Yearbook specifically addresses impacts as well. In this chapter, the Yearbook summarizes operational data at the site-wide level. These impact assessments are routinely undertaken by LANL, using standard methodologies that duplicate those used in the SWEIS; hence, they have been included to provide the base for future trend analysis.

Chapter 3 compares actual operating data to projected effects for about half of the parameters discussed in the SWEIS, including effluent, workforce, regional, and long-term environmental effects. Some of the parameters used for comparison were derived from information contained in both the main text and appendices of the SWEIS. Many parameters cannot be compared because data are not routinely collected. In these cases, projections made by the SWEIS ROD (DOE 1999) resulted only from expenditure of considerable special effort, and such extra costs were avoided when preparing the Yearbook.

3.1 Air Emissions

3.1.1 Radioactive Air Emissions

Radioactive airborne emissions from point sources (i.e., stacks) during 2006 totaled approximately 1,450 curies, approximately 7% of the 10-year average of 21,700 curies projected by the ROD.

As in recent years, the two largest contributors to radioactive air emissions were tritium from the Tritium Facilities (both Key and Non-Key) and activation products from LANSCE. Stack emissions from the Tritium Key Facilities were about 845 curies.

Emissions of activation products from LANSCE were much reduced in 2006 as a result of repairing the emission control system. The total point source emissions from LANSCE were approximately 249 curies.

Non-point sources of radioactive air emissions are present at LANSCE, Area G, TA-18, and other locations around LANL. Non-point emissions, however, are generally small compared to stack emissions. For example, non-point air emissions from LANSCE were approximately 157 curies. Additional detail about radioactive air emissions is provided in LANL's 2006 annual compliance report to the EPA (LANL 2007a), submitted on June 30, 2006, and in the 2006 Environmental Surveillance Report (LANL 2007b).

Maximum off-site dose for 2006 to the maximum exposed individual was 0.47 millirem. The EPA radioactive air emissions limit for DOE facilities is 10 millirem per year. This dose is calculated to the theoretical "maximum exposed individual" who lives at the nearest off-site receptor location 24 hours per day, eating food grown at that same site, etc. No actual person received a dose of this magnitude.

3.1.2 Non-Radioactive Air Emissions

3.1.2.1 Emissions of Criteria Pollutants

Criteria pollutants include nitrogen oxides, sulfur oxides, carbon monoxide, and particulate matter. LANL, in comparison to industrial sources and power plants, is a relatively small source of these non-radioactive air pollutants. As such, LANL is required to estimate emissions, rather than perform actual stack sampling. As Table 3.1.2.1-1 illustrates, CY 2006 emissions of criteria pollutants are within the estimated emissions presented in the SWEIS ROD.

Table 3.1.2.1-1. Emissions of Criteria Pollutants as Reported on LANL's Annual Emissions Inventory[a]

Pollutants	Units	SWEIS ROD	2002 Operations	2003 Operations	2004 Operations	2005 Operations	2006 Operations
Carbon monoxide	Tons/year	58	28.1	31.9	17.1	17.5	17.6
Nitrogen oxides	Tons/year	201	64.7	49.6	24.5	24.5	24.5
Particulate matter	Tons/year	11	15.5 [b]	22.1[b]	3.0	3.2	3.4
Sulfur oxides	Tons/year	0.98	1.3 [b]	1.3[b]	0.3	0.3	0.36

a Emissions included on the annual emissions inventory report do not include insignificant sources.
b The increased emissions are attributed to operation of three air curtain destructors used to burn wood and slash from fire mitigation activities around LANL. Operation of the air curtain destructors ceased in 2003.

Criteria pollutant emissions from LANL's fuel burning equipment are reported in the annual Emissions Inventory Report as required by the New Mexico Administrative Code, Title 20, Chapter 2, Part 73 (20.2.73 NMAC). The report provides emission estimates for the steam plants, nonexempt boilers, and the asphalt plant. In addition, emissions from the data disintegrator, carpenter shops, degreasers, oil storage tanks, and permitted beryllium machining operations are reported. For more information, refer to LANL's 2004 and 2005 Emissions Inventory Reports (LANL 2005a and 2006a). In CY 2006, over one-half of the most significant criteria pollutants, nitrogen oxides, and carbon monoxide resulted from the TA-03 steam plant.

In April 2004, LANL received a Title V Operating Permit from the NMED. This permit included facility-wide emission limits and additional recordkeeping and reporting requirements. Table 3.1.2.1-2 summarizes the facility-wide emission limits in the Title V Operating Permit and the SWEIS ROD emissions and presents the 2006 emissions from all sources included in the permit. *Note that emissions from insignificant sources of boilers, heaters, and emergency generators are included in these totals.* All emissions were below the levels evaluated in the SWEIS ROD except sulfur oxides. The higher sulfur oxide emissions in the Title V Operating Permit emissions report are due to inclusion of emissions from over 200 small boilers and heaters and approximately 50 stationary standby generators located throughout the LANL facility.

Table 3.1.2.1-2. 2004 through 2006 Emissions for Criteria Pollutants as Reported on LANL's Title V Operating Permit Emissions Reports[a]

Pollutants	Units	SWEIS ROD	Title V Operating Permit Facility-Wide Emission Limits	2004 Emissions	2005 Emissions	2006 Emissions
Carbon monoxide	Tons/year	58	225	35.4	35.1	34.2
Nitrogen oxides	Tons/year	201	245	50.5	50.5	57.0
Particulate Matter	Tons/year	11	120	4.8	5.0	5.3
Sulfur oxides	Tons/year	0.98	150	1.5	1.9	4.2[b]

a The Title V Operating Permit Emissions report includes two categories of sources not required in the annual emission inventory: small, exempt boilers and heaters and exempt stand-by emergency generators.
b Result of 200 small boilers and heaters and 50 stationary stand-by generators.

3.1.2.2 Chemical Usage and Emissions

The 1999 edition of the Yearbook (LANL 2000a) proposed to report chemical usage and calculated emissions for Key Facilities obtained from the LANL's Automated Chemical Inventory System. (*Note: In CY 2002, LANL transitioned to a new chemical inventory system called ChemLog and no longer uses the Automated Chemical Inventory System.)* The quantities presented in this approach represent all chemicals procured or brought on site in the respective CY. This methodology is identical to that used by LANL for reporting under Section 313 of the Emergency Planning Community Right-to-Know Act (42 USC 11023) and for reporting regulated air pollutants estimated from research and development operations in the annual Emissions Inventory Reports (LANL 2005a and 2006a).

Air emissions shown in Tables A-1 through A-14 of Appendix A are divided into emissions by Key Facility. Emission estimates (expressed as kilograms per year) were performed in the same manner as that reported in the 1999 through 2006 Yearbooks (LANL 2000a, 2001a, 2002a, 2003a, 2004a, 2005b, and 2006b). First, usage of listed chemicals was summed by facility. It was then estimated that 35 percent of the chemical used was released to the atmosphere. Emission estimates for some metals, however, were based on an emission factor of less than one percent. This is appropriate because these metal emissions are assumed to result from cutting or melting activities. Fuels such as propane and acetylene were assumed to be completely combusted; therefore, no emissions are reported.

Information on total volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) estimated from research and development operations is shown in Table 3.1.2.2-1. Projections by the SWEIS ROD for VOCs and HAPs were expressed as concentrations rather than emissions; therefore, direct comparisons cannot be made, and projections from the SWEIS ROD are not presented. The VOC emissions reported from research and development activities reflect quantities procured in each CY. The HAP emissions

reported from research and development activities generally reflect quantities procured in each CY. In a few cases, however, procurement values and operational processes were further evaluated so that actual air emissions could be reported instead of procurement quantities.

Table 3.1.2.2-1. Emissions of VOCs and HAPs from Chemical Use in Research and Development Activities

Pollutant	Emissions (Tons/year)					
	2001	2002	2003	2004	2005	2006
Hazardous Air Pollutants	7.4	7.74	7.32	5.71	5.4	4.8
Volatile Organic Compounds	18.6	14.9	11.2	7.95	11.2	10.1

Emissions of VOCs and HAPs from chemical use in research and development activities in 2006 are similar to previous years.

3.2 Liquid Effluents

LANL may discharge wastewater from its activities via 21 outfalls that are regulated under NPDES Permit No. NM0028355. The current NPDES permit expired on January 31, 2005. LANL applied for a renewed permit in August 2004. The EPA is allowing LANL to continue discharging industrial wastewater under the current permit until a new permit is issued in CY 2007. Based on discharge monitoring reports prepared by LANL's Water Quality and Hydrology group, only 17 of the 21 permitted outfalls had recorded flows in CY 2006. Effluent flow through the 17 NPDES outfalls totaled an estimated 221.70 million gallons in CY 2006. This is approximately 23.24 million gallons more than the CY 2005 total of 198.26 million gallons. The 2006 total volume of discharge is below the maximum flow of 278.0 million gallons that was projected in the SWEIS ROD. Treated wastewater released from LANL's NPDES outfalls rarely leaves the site.

Historically, instantaneous flows were measured in the field and then extrapolated over a 24-hour day/seven-day week. Pursuant to the current NPDES permit requirements, actual flows are now being recorded by flow meters at most outfalls. At those outfalls that do not have meters, flows continue to be calculated from instantaneous flow measurements and extrapolated as before resulting in overestimated totals. These include Non-Key Facility Outfall 03A160 discharging to Mortandad Canyon, Key Facility (Sigma) Outfall 03A022 discharging to Mortandad Canyon, and Key Facility (Tritium) Outfall 02A129 discharging to Los Alamos Canyon. Details on NPDES noncompliance during 2006 will be provided in the 2006 Annual Environmental Surveillance Report (LANL 2007b).

CY 2006 discharges are summarized by watershed and compared with watershed totals projected in the SWEIS ROD in Table 3.2-1. The bulk of the CY 2006 discharges came from Non-Key Facilities (see Table 3.2-2).

Table 3.2-1. NPDES Discharges by Watershed (Millions of Gallons)

Watershed	# Outfalls (SWEIS ROD)	# Outfalls 2006 [a]	Discharge (SWEIS ROD)	Discharge 2006
Cañada del Buey	3	1 [b]	6.4	0
Guaje	7	0	0.7	0
Los Alamos	8	5	44.8	46.39975
Mortandad	7	5	37.4	37.98019
Pajarito	11	0	2.6	0
Pueblo	1	0	1.0	0
Sandia	8	5	170.7	140.63357
Water	10	5 [c]	14.2	0.922175
Totals	**55**	**21**	**278.0**	**221.7053**

a Twenty-one outfalls were permitted to discharge during 2006.
b Includes Outfall 13S from the Sanitary Wastewater System, which is registered as a discharge to Cañada del Buey or Sandia. The effluent is actually piped to TA-03 and ultimately discharged to Sandia Canyon via Outfall 001.
c Includes 05A-055 discharge to Cañon de Valle, a tributary to Water Canyon.

Key Facilities accounted for approximately 50 million gallons of the 2006 total. LANSCE discharged approximately 20.1 million gallons in 2006, about 0.83 million gallons less than in 2005, accounting for about 40.4 percent of the total discharge from all Key Facilities (see Table 3.2-2). Table 3.2-2 compares NPDES discharges by Key and Non-Key Facilities. See Section 2.11 for more information.

LANL has three principal wastewater treatment facilities—the sanitary treatment plant (called the Sanitary Wastewater System [SWWS]) at TA-46, a Non-Key Facility, the RLWTF at TA-50, a Key Facility, and the High Explosives Wastewater Treatment Facility at TA-16, a Key Facility.

The RLWTF (one of the Key Facilities), TA-50 Building 01, Outfall 051 discharges into Mortandad Canyon. During CY 2006, about 1.63 million gallons of treated radioactive liquid effluent, about 0.20 million gallons less than CY 2005, were released to Mortandad Canyon from the RLWTF, compared to 9.3 million gallons projected in the SWEIS ROD.

Table 3.2-2. NPDES Discharges by Facility (Millions of Gallons)

Facility	# Outfalls (SWEIS ROD)	# Outfalls 2006	Discharge (SWEIS ROD)	Discharge 2006
Key Facilities				
Plutonium Complex	1	1	14.0	2.75986
Tritium Facility	2	2	0.3	22.42836
CMR Building	1	1	0.5	0.553
Sigma Complex	2	2	7.3	1.49833

Table 3.2-2. (cont.)

Facility	# Outfalls (SWEIS ROD)	# Outfalls 2006	Discharge (SWEIS ROD)	Discharge 2006
High Explosives Processing	11	3	12.4	0.014575
High Explosives Testing	7	2	3.6	0.9076
LANSCE	5	4	81.8	20.16457
Biosciences	1	0	2.5	0
Radiochemistry Facility	2	0	4.1	0
RLWTF	1	1	9.3	1.633
Pajarito Site	None	0	0	0
MSL	None	0	0	0
TFF	None	0	0	0
Machine Shops	None	0	0	0
Waste Management Operations	None	0	0	0
Non-Key Facilities	22	5	142.1	171.746[a]
Totals	**55**	**21**	**278.0**	**221.7053**

a Mainly due to discharge from SWWS and the TA-03 Steam Plant.

The TA-16 High Explosives Wastewater Treatment Facility (one of the Key Facilities) discharged about 0.0146 million gallons in CY 2006. This is significantly less than the 12.4 million gallons projected in the SWEIS ROD.

Discharges from the Non-Key Facilities made up the majority of the total CY 2006 discharge from LANL. This total, 171.74 million gallons, was about 29.65 million gallons more than the 142.1-million-gallon total discharge from the Non-Key Facilities that was projected in the SWEIS ROD. Two Non-Key Facilities, the TA-46 sanitary waste treatment plant and the TA-03 steam plant, account for about 65.5 percent of the total discharge from Non-Key Facilities and about 50.7 percent of all water discharged by LANL. The SWWS at TA-46 processed about 103.25 million gallons of treated wastewater during CY 2006, all of which was pumped to TA-03, to be either recycled at the TA-03 power plant (as make-up water for the cooling towers), or discharged into Sandia Canyon via Outfall 001. The discharge of about 9.19 million gallons from the TA-03 power plant to Outfall 001 was more than the 2005 discharge of 3.31 million gallons. While the 2006 contribution from TA-46 (Outfall 13S) to the Outfall 001 discharge decreased by about 4.05 million gallons over the 2005 value, the total discharge from Outfall 001 increased by 1.83 million gallons.

The NPDES Industrial Storm Water Permit Program regulates storm water discharges from identified industrial activities (including runoff from inactive SWMUs) and their associated facilities. These activities include metal fabrication; hazardous waste treatment, storage, and disposal; landfilling operations; vehicle and equipment maintenance; recycling activities; electricity generation; and asphalt manufacturing.

The University of California (UC) and the DOE were co-permittees under the EPA 2000 NPDES Storm Water Multi-Sector General Permit for Industrial Activities (MSGP-2000). The MSGP-2000 expired October 30, 2005, without EPA issuing a new permit. Administrative continuance of the MSGP-2000, which requires continued compliance with the expired permit requirements, was granted to existing permit holders. This continuance will remain in effect until a new permit is issued. There is currently no identified date for issuance of a new permit.

The MSGP-2000 required the development and implementation of site-specific Storm Water Pollution Prevention Plans (SWPPPs), which must include identification of potential pollutants and the implementation of best management practices (BMPs). SWPPPs are intended to help ensure that LANL surface waters receiving storm water runoff meet EPA and state water quality standards. Permit requirements also include the monitoring of storm water discharges from permitted sites.

Currently LANL implements and maintains 15 SWPPPs under the MSGP-2000 requirements, covering 26 facilities and site-wide SWMUs. Compliance with the MSGP-2000 requirements for these sites is achieved primarily by implementing the following:

- Identifying potential pollutants and activities that may impact surface water quality and identifying and providing structural and non-structural controls (BMPs) to limit the impact of those pollutants.
- Developing and implementing facility-specific SWPPPs.
- Monitoring storm water runoff at facility gauging stations for industrial sector-specific benchmark parameters, and visually inspecting storm water runoff to assess color; odor; floating, settled, or suspended solids; foam; oil sheen; and other indicators of storm water pollution.

During CY 2005, LANL and the DOE/NNSA entered into a compliance agreement with the EPA to protect surface water quality at LANL through a FFCA. The purpose of the FFCA is to establish a compliance program for the regulation of storm water discharges from SWMUs and AOCs until such time as those sources are regulated by an individual storm water permit pursuant to the NPDES Permit Program. All SWMUs and AOCs (collectively, Sites) are covered by this agreement. On March 30, 2005, EPA issued an Administrative Order to the UC that coincides with the FFCA.

The FFCA/Administrative Order establishes a schedule for monitoring and reporting requirements and requires the Laboratory to minimize erosion and the transport of pollutants or contaminants from Sites in storm water runoff. The FFCA also requires DOE/LANS to comply with all requirements of the Laboratory's MSGP.

The FFCA/Administrative Order requires two types of monitoring at specified sites, pursuant to two monitoring management plans, including 1) watershed sampling at approximately 60 automated gaging stations at various locations within the Laboratory canyons pursuant to a Storm Water Monitoring Plan and 2) site-specific sampling at approximately 294 Sites, on a rotating basis pursuant to a SWMU/SWPPP over a four-

year period. The purpose of storm water monitoring is to determine if there is a release or transport of pollutants/contaminants into surface water that could cause or contribute to a violation of applicable surface water quality standards. If a release or transport occurs, it may be necessary to implement BMPs to reduce erosion or to re-examine, repair, or modify existing BMPs to reduce erosion. The SWMU/SWPPP must also describe an erosion control program to control and limit contamination migration and transport from Sites and to monitor the effectiveness of controls at the Sites.

To achieve compliance with both the MSGP and the FFCA during CY 2006, LANL operated about 75 stream monitoring and partial-record storm water-monitoring stations located in nine watersheds. Data gathered from these stations show that surface water, including storm water, occasionally flows off DOE/NNSA property. LANL is currently conducting stream monitoring and storm water monitoring at the confluence of major canyons, in certain segments of these canyons, and at a number of specific facilities as well. In addition, LANL conducts voluntary monitoring in the major canyons that enter and leave LANL property. Flow-discharge information is reported in discharge monitoring reports, and flow measurements and water quality data for surface water are published annually in three reports, Environmental Surveillance at Los Alamos (an example is LANL 2007b), SWPPP for SWMUs and AOCs, and *Surface Water Data at Los Alamos National Laboratory* (an example is LANL 2005c).

In 2006, LANL conducted Site-specific monitoring at SWMUs and AOCs at 110 locations as required by the FFCA/Administrative Order. Over 900 inspections were completed to assess BMP effectiveness and follow up maintenance was completed as needed. A draft Individual Storm Water Permit is expected to be issued by EPA in 2007.

LANL also has a NPDES Storm Water Construction Activities Permit Program, which is responsible for compliance with the NPDES Construction General Permit (CGP) regulations for storm water discharges from large and small construction activities. This permit requires the development and implementation of project-specific SWPPPs to ensure storm water runoff from LANL construction sites meets Federal and State water-quality standards. During 2006, the Laboratory implemented and maintained 57 construction site SWPPPs and SWPPP addendums. In addition, storm water personnel completed 609 CGP storm water inspections. The Laboratory uses a geographic information system to manage project information and generate status reports that facilitate reporting under the Director's Portfolio Reviews. The overall CGP compliance record in 2006 was 94 percent for all inspections compared to 93 percent in 2005. During the summer months, when most high-intensity precipitation events occur, the compliance record was 93 percent in 2006. At the end of 2006, 100 percent of the Laboratory's permitted sites were in compliance with the CGP.

During CY 2006, the LANL storm water team continued to support project personnel with CGP noncompliances by finding new solutions to the problems associated with stabilizing disturbed landscapes. These solutions for preventing non-compliances have been incorporated into the team's Quality Improvement Performance Report. To further reduce future CGP non-compliances and to increase awareness of CGP requirements, the

storm water team has updated the compliance requirements of LANL's Engineering Standards Manual and Construction Specification 01560, revised subcontractor document language, and briefed subcontractors on CGP requirements at pre-bid and pre-construction meetings. In addition, construction site representatives, LANL project managers, or their subcontractor technical representatives are required to attend storm water inspections and ensure appropriate corrective measures are implemented. A new form developed by the storm water team certifies that project representatives have been notified of any potential deficiencies or noncompliances immediately upon completion of an inspection. It is anticipated the result of these actions will be increased CGP compliance, improved storm water management and sediment and erosion control, and a reduction in construction contractor Change Order requests.

3.3 Solid Radioactive and Chemical Wastes

Because of the complex array of facilities and operations, LANL generates a wide variety of waste types including solids, liquids, semi-solids, and contained gases. These waste streams are variously regulated as solid, hazardous, LLW, TRU, or wastewater by a host of State and Federal regulations. The institutional requirements relating to waste management at LANL are located in a series of documents that are part of the Laboratory Implementation Requirements. These requirements specify how all process wastes and contaminated environmental media generated at LANL are managed. Wastes are managed from planning for waste generation for each new project through final disposal or permanent storage of those wastes. This ensures that LANL meets all requirements including DOE Orders, Federal and State regulations, and LANL permits.

LANL's waste management operation captures and tracks data for waste streams, regardless of their points of generation or disposal. This includes information on the waste generating process, quantity, chemical and physical characteristics of the waste, regulatory status of the waste, applicable treatment and disposal standards, and final disposition of the waste. The data are ultimately used to assess operational efficiency, help ensure environmental protection, and demonstrate regulatory compliance.

LANL generates radioactive and chemical wastes as a result of research, production, maintenance, construction, and the ERS Program, formerly called the Environmental Restoration Project, as shown in Table 3.3-1. Waste generators are assigned to one of three categories—Key Facilities, Non-Key Facilities, and the ERS Program. Waste types are defined by differing regulatory requirements. No distinction has been made between routine wastes, those generated from ongoing operations, and non-routine wastes such as those generated from the D&D of buildings.

Table 3.3-1. LANL Waste Types and Generation

Waste Type	Units	SWEIS ROD Projection	2005	2006
Chemical	10^3 kg/yr	3,250	1,968	1,683
LLW	m^3/yr	12,200	5,410	9,604
MLLW	m^3/yr	632	70.8	29.1
TRU	m^3/yr	333	74.9	76.4
Mixed TRU	m^3/yr	115	100.1	39.5

Waste quantities from 2006 LANL operations were below SWEIS ROD projections for all waste types, reflecting the levels of operations at both the Key and Non-Key Facilities.

3.3.1 Pollution Prevention Program

The Pollution Prevention (PP) Program improves LANL operations by minimizing environmental damage and adverse regulatory findings (LANL 2004b). LANL's commitment to PP and broader environmental stewardship arises from two goals: (1) maintaining a good environmental and ecological condition for present and future employees, residents, and neighbors and (2) remaining in compliance with the many regulatory requirements required to operate LANL. To attain these goals, LANL's Waste Minimization (WMin)/PP Program approach focuses on the following:

- ensuring that LANL policies and procedures highlight prevention as the preferred methodology to address waste issues;
- integrating WMin and PP principles into the planning process;
- supporting the development of new technologies to minimize waste;
- working with waste generators to identify WMin and PP opportunities;
- using appropriate material substitution and process improvements;
- encourage use of energy- and water-efficient equipment;
- encourage procurement of environmentally preferable products;
- recycling and reusing materials; and
- tracking, projecting, and analyzing waste data to improve waste management.

In 2004, LANL began development and implementation of a prevention-based Environmental Management System (EMS) to comply with DOE Order 450.1 (DOE 2003). EMS is a systematic method for assessing mission activities, determining the environmental impacts of those activities, prioritizing improvements, and measuring results. DOE Order 450.1 defines an EMS as "a continuous cycle of planning, implementing, evaluation, and improving processes and actions undertaken to achieve environmental missions and goals."

The Laboratory's EMS was third-party certified to the ISO 14001:2004 standard in April 2006 by the National Sciences Foundation International Strategic Registration. As part of the EMS, the Laboratory Governing Policy contains the Laboratory's official policy on environment. This policy is the basis for setting annual environmental targets and objectives.

The following is the Laboratory's environmental policy statement:

It is the policy of the LANL that we will be responsible stewards of our environment. It is our policy to manage and operate our site in compliance with environmental laws and standards and in harmony with the natural and human environment; meet our environmental permit requirements; use continuous improvement processes to recognize, monitor, and minimize the consequences to the environment stemming from our past,

present, and future operations; prevent pollution; foster sustainable use of natural resources; and work to increase the body of knowledge regarding our environment.

3.3.1.1 FY 06 EMS Institutional Objectives

1. Conduct the Laboratory mission while demonstrating rigorous compliance with Federal and State environmental regulations and permits.
2. Conduct the Laboratory mission through continuous and measurable environmental risk reduction to protect workers, the public, and the natural environment.
3. Use an ISO 14001 prevention-based EMS to improve environmental performance.
4. Effectively manage waste, excess materials, and equipment generated during historical, current, and future Laboratory operations.

The EMS is extremely important to PP at Los Alamos because both DOE Order 450.1 and the ISO 14001 standard stress PP as a primary mechanism to achieve continual improvement. Implementation of this system will extend PP Program principles to a much broader set of LANL activities.

In 2006, DOE/NNSA presented seven awards to LANL employees for WMin and PP innovations. In addition, the Laboratory gave out its own PP awards to 31 teams in 2006. Details are provided in Appendix D.

3.3.2 Chemical Wastes

As projected by the SWEIS ROD, chemical waste includes not only construction and demolition debris, but also all other non-radioactive wastes passing through the Solid Radioactive and Chemical Waste Facility. In addition, construction and demolition debris is a component of those chemical wastes that in most cases are sent directly to off-site disposal facilities. Construction and demolition debris consists primarily of asbestos and construction debris from D&D projects. Construction and demolition debris is disposed of in solid waste landfills under regulations promulgated pursuant to Subtitle D of RCRA. (Note: Hazardous wastes are regulated pursuant to Subtitle C of RCRA.)

Chemical waste generation in CY 2006 was about 52 percent of the chemical waste volumes projected by the SWEIS ROD. Table 3.3.2-1 summarizes chemical waste generation during CY 2006. ERS Program wastes accounted for about 6 percent of the total chemical wastes generated. All of this volume was generated at Non-Key Facilities.

Table 3.3.2-1. Chemical Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2005	2006
Key Facilities	10^3 kg/yr	600	23.1	61.7
Non-Key Facilities	10^3 kg/yr	650	623.3	1,521[a]
ERS Program	10^3 kg/yr	2,000	1,322	99.6
LANL	10^3 kg/yr	3,250	1,968[b]	1,683[b]

a Chemical waste generation at the Non-Key Facilities exceeded the SWEIS ROD projection due to heightened activities and new construction.
b Discrepancy in the additive chemical waste volumes is due to round-off error.

3.3.3 Low-Level Radioactive Wastes

LLW generation in 2006 exceeded LLW volumes projected by the SWEIS ROD (Table 3.3.3-1). This is due to the large volume of waste generated as a result of heightened activities and new construction at the Non-Key Facilities.

Table 3.3.3-1. LLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2005	2006
Key Facilities	m^3/yr	7,450	1,349	896
Non-Key Facilities	m^3/yr	520	1,046	792.4
ERS Program	m^3/yr	4,260	3,016	7916.3[a]
LANL	m^3/yr	12,230	5,410[b]	9604.8[b]

a LLW generation for the ERS Program exceeded the SWEIS ROD projection due to heightened activities associated with the Consent Order.
b Discrepancy in the additive LLW volumes is due to round-off error.

Significant differences from SWEIS ROD projections occurred at the Sigma Complex (960 cubic meters projected versus 11 actual) and High Explosives Testing (940 cubic meters projected versus 0.3 actual). In addition, LANSCE generated lower volumes than projected (1,085 cubic meters projected versus 49 actual) because decommissioning and renovation of Experimental Area A did not occur. LLW generation for the ERS Program was almost twice the volume projected in the SWEIS ROD due to heightened activities associated with the Consent Order (see Section 2.17).

3.3.4 Mixed Low-Level Radioactive Wastes

Generation in 2006 approximated 5 percent of the MLLW volumes projected by the SWEIS ROD. ERS Program produced only about 7 cubic meters of MLLW in 2006. Table 3.3.4-1 examines these wastes by generator categories.

Table 3.3.4-1. MLLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2005	2006
Key Facilities	m^3/yr	54	17.9	4.2
Non-Key Facilities	m^3/yr	30	2.3	17.2
ERS Program	m^3/yr	548	50.6	7.7
LANL	m^3/yr	632	70.8	29.1

3.3.5 Transuranic Wastes

As projected in the SWEIS, TRU wastes are expected to be generated almost exclusively in four Key Facilities (the Plutonium Facility Complex, the CMR Building, the RLWTF, and the Solid Radioactive and Chemical Waste Facility) and by the ERS Program that did not produce any TRU wastes in 2006. TRU waste generated at the Non-Key Facilities during CY 2006 exceeded the SWEIS ROD projections as a result of the Offsite Source Recovery (OSR) Project. Because this waste comes through Shipping and Receiving, it is attributed to that location as the point of generation. Table 3.3.5-1 examines TRU wastes by generator categories.

Table 3.3.5-1. Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2005	2006
Key Facilities	m^3/yr	322	57.4	33.9
Non-Key Facilities	m^3/yr	0	17.5	42.4[a]
ERS Project	m^3/yr	11	0	0
LANL	m^3/yr	333	74.9	76.4[b]

a TRU waste generated at the Non-Key Facilities during CYs 2004, 2005, and 2006 was the result of the OSR Project. Because this waste comes through Shipping and Receiving, it is attributed to that location as the point of generation.
b Discrepancy in the additive chemical waste volumes is due to round-off error.

3.3.6 Mixed Transuranic Wastes

LANL mixed TRU waste generation in 2006 was below the mixed TRU waste volume projected by the SWEIS ROD. In 2006, mixed TRU wastes were generated at only two facilities—the Plutonium Facility Complex and the Solid Radioactive and Chemical Waste Facility. Table 3.3.6-1 examines mixed TRU wastes by generator categories.

Note: The 5.9 cubic meters of mixed TRU waste reported in the 2003 Yearbook as having been generated by the OSR Project was, in fact, not generated by this project. This waste was generated as a result of recovery operations at Area G that involved non-compactable fiber-glass-reinforced crates. Although this waste was generated at the Solid Radioactive and Chemical Waste Key Facility, it was not generated at any of the buildings listed within the Key Facility, but at another location within TA-54. Consequently, this volume was listed as coming from the Non-Key Facilities, rather than from the Solid Radioactive and Chemical Waste Key Facility.

Table 3.3.6-1. Mixed Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2005	2006
Key Facilities	m^3/yr	115	99.9	39.5
Non-Key Facilities	m^3/yr	0	0.2	0
ERS Project	m^3/yr	0	0	0
LANL	m^3/yr	115	100.1	39.5

3.4 Utilities

Ownership and distribution of utility services continue to be split between DOE/NNSA and Los Alamos County. DOE/NNSA owns and distributes most utility services to LANL facilities, and the County provides these services to the communities of White Rock and Los Alamos. Routine data collection for both gas and electricity are done on a FY basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by FY. Water data, however, are routinely collected and summarized by CY.

3.4.1 Gas

There was a change in ownership to the DOE Natural Gas Transmission Line in August 1999. DOE sold 130 miles of gas pipeline and metering stations to the Public Service Company of New Mexico (PNM). This gas pipeline traverses the area from Kutz Canyon Processing Plant south of Bloomfield, New Mexico, to Los Alamos. Approximately 4 miles of the gas pipeline are within LANL. Table 3.4.1-1 presents gas usage by LANL for FY 2006. Approximately 98 percent of the gas used by LANL was used for heating (both steam and hot air). The remainder was used for electrical production. LANL electrical generation is used to fill the difference between peak loads and the electric import capability and is also used for training of the power plant operators in turbine operation.

As shown in Table 3.4.1-1, total gas consumption for FY 2006 was less than projected by the SWEIS ROD. During FY 2006, slightly less natural gas was used for heating than in FY 2005, and there was more electric generation at the TA-03 power plant than in FY 2005. Table 3.4.1-2 illustrates steam production for FY 2006.

Table 3.4.1-1. Gas Consumption (decatherms[a]) at LANL/Fiscal Year[b] 2006

SWEIS ROD	Total LANL Consumption	Total Used for Electric Production	Total Used for Heat Production	Total Steam Production
1,840,000	1,145,433	26,912	1,118,521	Table 3.4.1-2

a A decatherm is equivalent to 1,000 to 1,100 cubic feet of natural gas.
b Routine data collection for both gas and electricity are done on a FY basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by FY. Water data, however, are routinely collected and summarized by CY.

Table 3.4.1-2. Steam Production at LANL/Fiscal Year[a] 2006

TA-03 Steam Production (klb[b])	TA-21 Steam Production (klb)	Total Steam Production (klb)
350,068 [c]	24,513	374,581

a Routine data collection for both gas and electricity are done on a FY basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by FY. Water data, however, are routinely collected and summarized by CY.
b klb: Thousands of pounds
c TA-03 steam production has two components: that used for electric production (25,855 klb for FY 2006) and that used for heat (324,213 klb in FY 2006).

3.4.2 Electrical

LANL is supplied with electrical power through a partnership arrangement with Los Alamos County, known as the Los Alamos Power Pool, which was established in 1985. The DOE and Los Alamos County have entered into a 10-year contract known as the Electric Coordination Agreement whereby each entity's electric resources are consolidated or pooled. Recent changes (as of August 1, 2002) in transmission agreements with PNM have resulted in the removal of contractual restraints on Power Pool resources import capability. Import capacity is now limited only by the physical capability (thermal rating) of the transmission lines that is approximately 110 to 120 megawatts from a number of hydroelectric, coal, and natural gas power generators throughout the western United States.

On-site electric generating capability for the Power Pool is limited by the existing TA-03 Co-generation Complex (the power plant generates both steam and power), which is capable of producing up to 20 megawatts of electric power that is shared by the Pool under contractual arrangement. The #3 steam turbine at the Co-generation Complex is currently a 10-megawatt unit. Rewinding of this unit began in CY 2003; it is expected that after this is completed, the turbine's new output will be approximately 17 megawatts. Rewinding should be finished and the unit re-installed about September 2007. To get the maximum benefit from this refurbishment, the steam path and cooling tower for the unit need to be improved; this upgrade is scheduled to be completed in FY 2008. Due to cooling water restrictions, the total capacity of the plant will not increase.

The ability to accept additional power into the Los Alamos Power Pool grid is limited by the regional electric import capability of the existing northern New Mexico power transmission system. In recent years, the population growth in northern New Mexico, together with expanded industrial and commercial usage, has greatly increased power demands on the northern New Mexico regional power system. In CY 2002, LANL completed construction of the new Western Technical Area (WTA) 115/13.8-kilovolt substation at TA-06. The main power transformer for WTA, rated at up to 50 megavolt amperes, was delivered in CY 2001. WTA will provide LANL and the Los Alamos town site with redundancy in bulk power transformation facilities to guard against losses of either the Eastern Technical Area (ETA) substation or the TA-03 Substation.

Several proposals for bringing additional power into the region have been considered. One of these proposals is construction of a new transmission line and substation (DOE 2000a). The line would be constructed in two segments: from PNM's Norton substation to a newly constructed substation, Southern Technical Area (STA), to be constructed near White Rock, and from the STA substation to the WTA substation. The segment from Norton to STA would be constructed at 345 kilovolts but operated at 115 kilovolts. Large pulse power loads at LANL will need this higher voltage in the future. The segment from STA to WTA would be constructed and operated at 115 kilovolts. If completed, this would be a third transmission line to LANL; it will add much needed reliability and security to the electric transmission system that serves LANL. The transmission line from the WTA substation to the STA substation and the STA substation construction was finished in February of 2006. The refurbishment of the ETA substation is complete and the uncrossing of the transmission lines is to be finished in about January of 2008. The construction of the portion of the line from the Norton substation to STA is still being negotiated.

Internally within the LANL 13.2-kilovolt distribution system, upgrades to the existing underground ducts are needed to fully utilize the capabilities of the new WTA substation and the newly upgraded ETA substation. This will provide for redundant feeders to critical facilities. Together with this, upgrade to the aging TA-3 substation will complete the major upgrades both in the 13.2-kilovolt distribution and 115-kilovolt transmission systems.

The reliability of the Norton Line and the Reeves Line that serve the Power Pool is compromised because they cross at one location within LANL. In doing so, they do not provide physically separate avenues for the delivery of power from independent power supply sources. The crossing of power lines results in a situation where a single outage event, such as a conductor or structural failure, could potentially cause a major power loss to the Power Pool (the uncrossing of these transmission lines should be done by the end of 2008). If such an event occurred when the TA-03 Co-generation Complex was not operating or was being serviced or repaired, there would be no power available to the Power Pool. A single outage event could have serious and disruptive consequences to LANL and to the citizens of Los Alamos County. This vulnerability was noted by the Defense Nuclear Facilities Safety Board (DOE 2002).

In CY 2002, an *Environmental Assessment for Installation and Operation of Combustion Turbine Generators at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2002) was written to analyze the effects of increasing the TA-03 Co-generation Complex's generating capability by an additional 40 megawatts of power in the near future. Based on this environmental assessment, DOE/NNSA issued a Finding of No Significant Impact in December 2002. Installation of the first 20-megawatt combustion turbine generator at the TA-03 power plant is expected to be completed by the end of FY 2007.

Table 3.4.2-1 shows peak demand and Table 3.4.2-2 shows annual use of electricity for FY 2006. LANL's electrical energy use remains below projections in the SWEIS ROD.

The ROD projected peak demand to be 113,000 kilowatts (with 63,000 kilowatts being used by LANSCE and about 50,000 kilowatts being used by the rest of LANL). In addition, the ROD projected annual use to be 782,000 megawatt-hours with 437,000 megawatt-hours being used by LANSCE and about 345,000 megawatt-hours being used by the rest of LANL. Actual use has fallen below these values, and the projected periods of brownouts have not occurred. However, on a regional basis, failures in the PNM system have caused blackouts in northern New Mexico and elsewhere.

Table 3.4.2-1. Electric Peak Coincident Demand/Fiscal Year[a] 2006

Category	LANL Base	LANSCE	LANL Total	County Total	Pool Total
SWEIS ROD	50,000[b]	63,000	113,000	Not projected	Not projected
FY 2006	41,078	26,916	67,994	18,312	86,130

a Routine data collection for both gas and electricity are done on a FY basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by FY. Water data, however, are routinely collected and summarized by CY.
b All figures in kilowatts.

Table 3.4.2-2. Electric Consumption/Fiscal Year[a] 2006

Category	LANL Base	LANSCE	LANL Total	County	Pool Total
SWEIS ROD	345,000[b]	437,000	782,000	Not projected	Not projected
FY 2006	322,566	122,354	444,920	125,117	570,036

a Routine data collection for both gas and electricity are done on a FY basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by FY. Water data, however, are routinely collected and summarized by CY.
b All figures in megawatt-hours.

Operations at several of the large LANL loads changed during 2004. In FY 2004 LANSCE changed their operating schedule. For the past several years their electric demand peaked with the rest of LANL, usually in July or August. But, now LANSCE's peak demand has been shifted to the winter (around January). This will change the overall electric demand for LANL. Since LANSCE's load is such a large part of LANL's total load (about 46 percent), the peak demand for LANL will change from summer to winter. This was true for LANSCE's operation until about November of 2005. Due to budgetary constraints, LANSCE has since returned to their old schedule of running in the spring and summer.

The National High Magnetic Field Laboratory sat out operations during FY 2001 and FY 2002. This represents a temporary reduction of approximately two megawatts load in FY 2001 and FY 2002. The 60-Tesla superconducting magnet that failed in 2000 has been redesigned and reconstructed and are now back in operation in 2004 at about two megawatts of load.

The DARHT facility began commissioning operations of its first axis in FY 2001. The load level is about 1 megawatt for the first axis. The second axis is to be tested in the summer of 2007 and is expected to become fully operational in 2008 at a load level of about one to two megawatts.

It is expected that in January 2007 ground will be broken on the CMR Replacement building near TA-55 off Pajarito Road. This building will replace the old CMR building, which is served by the TA-03 substation. The CMR Replacement building will be served by a new proposed 115/13.8-kilovolt substation. The load will be switched from the TA-03 substation to this new substation so that very little new load will be added to the system.

The Nicholas C. Metropolis Center is planning to add to their computing power with a 60 TeraOps upgrade. This upgrade should increase their load by four to five megawatts and should come on line by the summer of 2008.

Mitigation of the damage to LANL utilities from the Cerro Grande Fire was for the most part completed in FY 2002. Tree trimming clearance for the power line corridors will take many more years to bring areas up to the desired LANL standard.

Electrical Infrastructure Safety Upgrades Project

Project Overview
The EISU Project seeks to upgrade the electrical infrastructure in buildings throughout LANL to improve electrical safety. Typically, the project seeks to correct National Electrical Code violations; replace aging, unsafe equipment; and improve equipment and facility grounding.

The Conceptual Design Report for the EISU Project was completed in 1998. Thirty-one buildings were identified for upgrades and were prioritized based on the safety hazards they presented. Since then, the EISU Project has been coordinated with the LANL TYCSP and subprojects have been removed from the list as the buildings have been identified for D&D. To date, five subprojects have been removed from the list for a new total of 26 General Plant Projects. An evaluation of the LANL electrical safety maintenance backlog may increase the number of subprojects under the EISU Project. As of 2005, five EISU projects have been completed (TA-03-43, TA-16-200, TA-40-1, TA-03-40 N&E, and TA-03-40 S&W), four projects are in construction (TA-03-261, TA-43-1, TA-46-31, TA-8-21), and four projects were scheduled for design (TA-46-1, TA-53-2, TA-48-1, and TA-35-2).

3.4.3 Water

Before September 8, 1998, DOE supplied all potable water for LANL, Bandelier National Monument, and Los Alamos County, including the towns of Los Alamos and White Rock. This water was obtained from DOE's groundwater right to withdraw 5,541.3 acre-feet per year or about 1,806 million gallons of water per year from the main aquifer. On September 8, 1998, DOE leased these water rights to Los Alamos County. This lease also included DOE's contractual annual right obtained in 1976 to 1,200 acre-feet per year of San Juan-Chama Transmountain Diversion Project water. The lease agreement was effective for three years until September 8, 2001. In September 2001, DOE/NNSA officially turned over the water production system and transferred 70

percent of the water rights to Los Alamos County. Los Alamos County has continued to lease the remaining 30 percent of the water rights from DOE/NNSA. LANL is now considered a customer of Los Alamos County. Los Alamos County is continuing to pursue the use of San Juan-Chama water as a means of maintaining those water rights. Los Alamos County has completed a preliminary engineering study and is currently negotiating a convert contract, which will provide more stability, before further investment.

LANL is in the process of installing additional water meters and has a Supervisory Control and Data Acquisition/Equipment Surveillance System on the distribution system to keep track of water usage and to determine the specific water use for various applications. Data are being accumulated to establish a basis for conserving water. LANL continues to maintain the distribution system by replacing portions of the over-60-year old system as problems arise. In remote areas, LANL is trying to automate the monitoring of the system to be more responsive during emergencies such as the Cerro Grande Fire.

Table 3.4.3-1 shows water consumption in thousands of gallons for CY 2006. Under the 1999 SWEIS Expanded Operations Alternative, water use for LANL was projected to be 759 million gallons per year. LANL consumed about 346 million gallons during CY 2006. Actual use by LANL in 2006 was about 413 million gallons less than the SWEIS ROD projected consumption. A 10-year agreement with Los Alamos County, which started in 1998, has an escalating estimated LANL water consumption. Actual use by LANL in CY 2006 was about 203 million gallons less than the estimated CY 2006 consumption of 549 million gallons. The calculated NPDES discharge of 221.7 million gallons (see Table 3.2-2) in CY 2006 was about 64 percent of the total LANL usage of 346 million gallons.

Table 3.4.3-1. Water Consumption (thousands of gallons) for Calendar Year 2006

Category	LANL	Los Alamos County	Total
SWEIS ROD	759,000	Not Projected	Not Applicable
CY 2006	345,867	Not Available [a]	Not Available [a]

a In September 2001, Los Alamos County acquired the water supply system and LANL no longer collects this information.

The County now bills LANL for water, and all future water use records maintained by LANL will be based on those billings. The distribution system used to supply water to LANL facilities now consists of a series of reservoir storage tanks, pipelines, and fire pumps. The LANL distribution system is gravity fed with pumps for high-demand fire situations at limited locations.

3.5 Worker Safety

It is the policy of LANL to conduct our work safely and responsibly; ensure a safe and healthful working environment for our workers, contractors, visitors, and other on-site personnel; and protect the health, safety, and welfare of the general public. It is our policy that we will not compromise safety for personal, programmatic, operational, or any other

reason. In CY 2006, since the introduction of LANS, many improvements have been made in the approach to worker safety at LANL, including the following objectives and commitments identified: Creation of Worker Safety and Security Teams, DOE Voluntary Protection Program participation, compliance with 10 CFR 851 Worker Safety and Health Program, improved safety and health systems demonstrated through Integrated Safety Management System-based management, chemical management program improvements, and an improved safety culture focusing on integrating a human performance improvement, performance-based leadership, and a management assessment and observations process.

3.5.1 Accidents and Injuries

The three most prevalent work-related injuries and illnesses for LANL workers are slips/trips/falls, repetitive motion, and push/pull/lift injuries. Lessons learned are incorporated into the actions underway to address the current path of risk.

Table 3.5.1-1 summarizes occupational injury and illness rates during CY 2000–CY 2006. Occupational injury and illness rates for workers in CY 2005 decreased from CY 2004 in all categories with the largest decrease occurring in DART cases (Days Away, Restricted, or Transferred) for all LANL workers as shown in Table 3.5.1-1. These rates correlate to reportable injuries and illnesses during the year for 200,000 hours worked or roughly 100 workers.

Table 3.5.1-1. Total Recordable and Lost Workday Case Rates at LANL

Calendar Year	UC Workers Only		LANL (all workers)	
	TRC[a]	DART[b]	TRC	DART
2000	1.53	0.62	1.97	0.94
2001	1.62	0.55	1.96	0.91
2002	2.16	1.24	2.39	1.46
2003	2.11	1.08	2.30	1.26
2004	2.93	1.3	2.86	1.35
2005	2.86	1.22	2.80	0.99
2006	NA[c]	NA[c]	2.56	1.15

a Total recordable cases, number per 200,000 hours worked. Formerly called TRI: Total Recordable Incident rate
b Days Away, Restricted, or Transferred, number of cases per 200,000 hours worked. Formerly called LWC: Lost workday cases
c Due to change in the Laboratory's contract, UC Workers Only category is no longer applicable.

3.5.2 Ionizing Radiation and Worker Exposures

Occupational radiation exposures for workers at LANL during CY 2006 are summarized in Table 3.5.2-1. The collective Total Effective Dose Equivalent, or collective TEDE, for the LANL workforce during CY 2006 was 163.0 person-rem, which is nearly identical to the collective dose of CY 2005. These reported doses in Table 3.5.2-1 could change with time because estimates of committed effective dose equivalent from inhalation of radioactive material in many cases are based on several years of bioassay results, and as new results are obtained the dose estimates may be modified accordingly. Data in Table 3.5.2-1 show 198 fewer radiation workers received measurable dose in CY 2006 as

compared to CY 2005, while the average dose per worker remained constant during these periods. Of the 163.0 person-rem collective TEDE reported for CY 2006, 1.4 person-rem was from internal exposures to radioactive materials, primarily from small plutonium uptakes.

Table 3.5.2-1. Radiological Exposure to LANL Workers

Parameter	Units	SWEIS ROD	CY 2005	CY 2006
Collective TEDE (external + internal)	person-rem	704	163.2[a]	163.
Number of workers with non-zero dose	number	3,548	2,182[a]	1,984
Average non-zero dose:				
• external + internal radiation exposure	millirem	Not projected	75[a]	82
• external radiation exposure only	millirem	Not projected	69[a]	81

a. Value changed with time because estimates of committed effective dose equivalent from inhalation of radioactive material in many cases are based on several years of bioassay results, as new results are obtained, dose estimates may be modified.

The highest individual doses in CY 2006 were typical of doses received since CY 2000. No worker's dose exceeded the DOE's 5 rem/year Radiation Protection Standard and no worker's dose in 2006 was above the two rem/year performance goal set by the Institutional Radiation Safety Committee (formerly known as the ALARA [as low as reasonably achievable] Steering Committee) in accordance with LANL procedures. Table 3.5.2-2 summarizes the highest individual dose data for CYs 2000–2006.

Table 3.5.2-2. Highest Individual Annual Doses (TEDE) to LANL Workers (rem)

CY 2000	CY 2001	CY 2002	CY 2003	CY 2004	CY 2005	CY 2006
1.048	1.284	2.214	25.960[a]	2.500[a]	2.300[a]	1.397
1.013	1.225	1.897	9.309[a]	1.799[a]	2.051[a]	1.330
0.905	1.123	1.783[a]	6.689[a]	1.510[a]	2.000[a]	1.261
0.828	1.002	1.644	3.500[a]	1.148[a]	1.603[a]	1.241
0.815	0.934	1.534[a]	1.935[a]	1.061[a]	1.398[a]	1.209

a. Value changed with time because estimates of committed effective dose equivalent from inhalation of radioactive material in many cases are based on several years of bioassay results, as new results are obtained, dose estimates may be modified.

Comparison with the SWEIS Baseline. The collective TEDE for CY 2006 is about 78 percent of the 208 person-rem per year baseline in the SWEIS. The baseline collective TEDE in the ROD was established using CY 1993–CY 1995 data.

Work and Workload: Changes in workload and types of work at nuclear facilities, and particularly at TA-55, tend to increase or decrease the collective TEDE. Of special importance to the baseline ROD is that the radionuclide (plutonium-238) power source for the Cassini spacecraft was being constructed at TA-55 during the baseline time period. Workers incurred much higher neutron exposures during this project. After the project was completed during CY 1995–CY 1996, the LANL collective TEDE was reduced. Plutonium-238 programs at TA-55 remain active today and accounted for 18.7 person-rem or about 12 percent of the LANL collective TEDE. Long-term plans are to

shift this mission to Idaho National Engineering Laboratory. Pit production at TA-55 is planned to increase to 10 pits per year in 2007 and 50 pits per year by 2012, which should result in higher collective doses in future years. The baseline pit production rate in the ROD was nominally 20 pits per year.

ALARA Program: Improvements in maintaining radiation exposures ALARA, such as improved dose tracking during work activities, additional shielding, and better radiological safety designs that are being implemented during the replacement of aged production lines in TA-55, should result in lower worker exposures and justify collective TEDE for LANL plutonium workers.

Comparison with the Projected TEDE in the ROD. The CY 2006 collective TEDE is less than the baseline collective TEDE levels in CYs 1993–1995, and significantly less than the 704 person-rem collective TEDE projected in the ROD. The implementation of war reserve pit manufacturing, which was approved in the ROD, has not become fully operational causing lower collective doses than projected. The collective dose will increase once the pit manufacturing production schedule is fully implemented.

Collective TEDEs for Key Facilities. In general, collective TEDEs by Key Facility or TA are difficult to determine because these data are collected at the group level, and members of many groups and/or organizations receive doses at several locations. The fraction of a group's collective TEDE coming from a specific Key Facility or TA can only be estimated. For example, personnel from the Health Physics Operations group and KSL are distributed over the entire Laboratory, and these two organizations account for a significant fraction of the total LANL collective TEDE. Approximately 95 percent of the collective TEDE that these groups incur is estimated to come from operations at TA-55. The total collective TEDE for Nuclear Materials Technology Division, Health Physics Operations, Actinide Analytical Chemistry group, and KSL groups in CY 2006 was approximately 81 person-rem or about 50 percent of the total LANL collective TEDE of 161.6 person-rem.

3.6 Socioeconomics

The LANL-affiliated workforce continues to include LANS employees and subcontractors. As shown in Table 3.6-1, the number of employees has exceeded SWEIS ROD projections. The 12,764 employees at the end of CY 2006 are 1,413 more employees than SWEIS ROD projections of 11,351. SWEIS ROD projections were based on 10,593 employees identified for the index year (employment as of March 1996). The 12,764 total employees at the end of CY 2006 reflect a decrease of 740 employees as compared to the 13,504 employees reported in the 2005 Yearbook (LANL 2006b).

Table 3.6-1. LANL-Affiliated Work Force

Category	LANS Employees	Technical Contractor	Non-Technical Contractor	KSL	PTLA	Total
SWEIS ROD [a]	8,740	795	Not projected [b]	1,362	454	11,351
Calendar Year 2006	10,321	330	206	1,224	683	12,764

a Total number of employees was presented in the SWEIS, the breakdown had to be calculated based on the percentage distribution shown in the SWEIS for the base year.
b Data were not presented for non-technical contractors or consultants.

These employees have had a positive economic impact on northern New Mexico. Through 1998, DOE published a report each FY regarding the economic impact of LANL on north-central New Mexico as well as the State of New Mexico (Lansford et al. 1997, 1998, and 1999). The findings of these reports indicate that LANL activities resulted in a total increase in economic activity in New Mexico of about $3.2 billion in 1996, $3.9 billion in 1997, and $3.8 billion in 1998. The publication of this report was discontinued after FY 1998 due to funding deficiencies. However, based on number of employees and payroll, it is expected that the LANL 2006 economic contribution was similar to the three years analyzed for DOE/NNSA.

The residential distribution of LANS employees reflects the housing market dynamics of three counties. As seen in Table 3.6-2, 82 percent of the LANS employees continued to reside in the three counties of Los Alamos, Rio Arriba, and Santa Fe.

Table 3.6-2. County of Residence for LANS Employees [a]

Calendar Year	Los Alamos	Rio Arriba	Santa Fe	Other NM	Total NM	Outside NM	Total
SWEIS ROD [b]	4,279	1,762	1,678	671	8,390	350	8,740
Calendar Year 2006	4,889	1,588	2,297	813	9,587	734	10,321

a Includes both Regular and Temporary employees, including students who may not be at LANL for much of the year.
b Total number of employees was presented in the SWEIS, the breakdown had to be calculated based on the percentage distribution shown in the SWEIS for the base year.

LANL records contain the TA and building number of each employee's office. This information does not necessarily indicate where the employee actually performs his or her work, but rather, indicates where this employee gets mail and officially reports to duty. However, for purposes of tracking the dynamics of changes in employment across Key Facilities, this information provides a useful index. Table 3.6-3 identifies LANS employees by Key Facility based on the facility definitions contained in the SWEIS. The employee numbers contained in the category "Rest of LANL," were calculated by subtracting the Key Facility numbers from the CY total.

Table 3.6-3. LANS Employee[a] Index for Key Facilities

Key Facility	Reference Year 1999 [b]	Calendar Year 2006
Plutonium Complex	589	704
Tritium Facilities	28	1
CMR	204	167
Pajarito Site	70	6
Sigma Complex	101	101
MSL	57	47
TFF	54	49
Machine Shops	81	120
High Explosive Testing	227	202
High Explosive Processing	96	103
LANSCE	560	370
HRL	98	98
Radiochemistry Laboratory	128	123
Waste Management–Radioactive Liquid Waste	62	82
Waste Management–Radioactive Solid and Chemical Waste	65	62
Rest of LANL	4,601	6,063
Total Employees	7,021	8,298

a Includes full-time and part-time regular employees; it does not include students who may be at LANL for much of the year nor does it include special programs personnel. A similar index does not exist in the SWEIS, which used a very time-intensive method to calculate this index.

b CY 1999 was selected as the reference year for this index because it represents the year the SWEIS ROD was published.

The numbers in Table 3.6-3 cannot be directly compared to numbers in the SWEIS. The employee numbers for Key Facilities in the SWEIS represent total workforce, and include PTLA, KSL, and other subcontractor personnel. The new index (shown in Table 3.6-3) is based on routinely collected information and only represents full-time and part-time regular LANS employees. It does not include employees on leave of absence, students (high school, cooperative, undergraduate, or graduate), or employees from special programs (i.e., limited-term or long-term visiting staff, post-doctorate, etc.). Because the two sets of numbers do not represent the same entity, a comparison to numbers in the SWEIS is not appropriate. This new index will be used throughout the lifetime of the Yearbook; hence, future comparisons and trending will be possible. CY 1999 was selected as the reference year for this index because it represents the year the SWEIS ROD was published.

3.7 Land Resources

Land resources were examined in 1996–1998 during the development of the SWEIS. From then until CY 2006, the land resources (i.e., undeveloped and developed lands) available for use at LANL remained constant. In CY 2002, approximately 2,209 acres of land were transferred to the Department of Interior in trust for the Pueblo of San Ildefonso and to Los Alamos County under Public Law 105-119[11] (42 USC 2391). No

[11] On November 26, 1997, Congress passed PL 105-119 (42 USC 2391). Section 632 of this Act directed the Secretary of Energy to convey to the Incorporated County of Los Alamos, New Mexico, or to the designee of the County, and transfer to the

lands were transferred during CY 2003 or CY 2004. In CY 2005, three tracts of land were transferred to Los Alamos County for a total of 45.7 acres. No lands were transferred in CY 2006.

Also during CY 2000, LANL's 2000/2001 Comprehensive Site Plan (LANL 1999) was completed. This site plan is LANL's guide for land development and its geographic information system identified approximately 18,500 acres or two-thirds of LANL's land resources as undesirable for development due to physical and operational constraints. Of the remaining 9,300 acres (about one-third of LANL) over 5,500 acres have been developed, leaving about 4,000 acres undeveloped. The majority of this undeveloped land is located in TA-58, TA-70, TA-71, and TA-74. Because of the remote locations and adjacent land uses of TA-70, TA-71, and TA-74, these lands are not considered prime developable lands for LANL activities.

Since CY 2000 the Comprehensive Site Plan has been expanded by the addition of several Area Development Plan and TA Master Plans, as support documents. Included in this list are the following Area Development Plans: Pajarito Corridor East Planning Area, West Pajarito Corridor, Core Planning Area Update, Anchor Ranch Planning Area and an Update, TA-21 Master Plan and an update, Water Canyon Planning Area, Sigma Mesa Planning Area, and LANSCE Planning Area.

The following TAs have had a Master Plan developed since the completion of the 2000/2001 Comprehensive Site Plan: TA-03, TA-59, TA-64, TA-48, TA-55, TA-50, TA-35, TA-63, TA-66, TA-52, TA-51, TA-46, TA-54, TA-53, TA-16, TA-22, TA-15, TA-33, and TA-21, including updates for TA-21, TA-63, and TA-03. During 2007 the following Master Plans are being updated: TA-54 and TA-49.

Other planning documents developed since the 2000/2001 Comprehensive Site Plan include the annual Ten Year Site Plan a laboratory capital improvement document, the 2005 site Transportation Plan, a LANL Sustainable Design Guide, Site and Architectural Design Principles and it's replacement the Site Development Standards.

Projects under construction in CY 2006 include the TA-55 CMRR RLUOB, the TA-50 South parking lot, the TA-03 northwest Utilities Corridor, TA-03 Health Clinic parking lot (old health clinic site), Security Perimeter Project, Relocation of Roads and Grounds to TA-60, CINT, Gas Co-Generation Plant, Hydrotest Design Facility, TA-33 Electrical Upgrades and Security Modular Office Facilities, TA-60 Radio Shop, TA-50 Caustic

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Secretary of the Interior, in trust for the Pueblo of San Ildefonso, parcels of land under the jurisdictional administrative control of DOE at or in the vicinity of LANL. Such parcels, or tracts, of land must meet suitability criteria established by the Act.

The Act sets forth the criteria, processes, and dates by which the tracts will be selected, titles to the tracts reviewed, environmental issues evaluated, and decisions made as to the allocation of the tracts between the two recipients. DOE's responsibilities under the Act included identifying potentially suitable tracts of land, identifying any environmental restoration and remediation that would be needed for those tracts of land, and conducting NEPA review of the proposed conveyance or transfer of the land tracts. Under this Act, those land parcels identified suitable for conveyance and transfer must have undergone any necessary environmental restoration or remediation.

Tank Facility, Power Grid Infrastructure Upgrades Project, and the D&D of TA-21 began. Most of these projects are on previously developed or disturbed land.

CY 2006 was similar to the previous CYs: the land acreage (Table 3.7-1) remained constant; the ongoing construction projects from CY 2003–CY 2006 continued. The developed projects occurred within land designated by the Comprehensive Site Plan for the land use developed.

Table 3.7-1. Site-wide Land Use

Land Use Category	Acreage in CY 2004, CY 2005, and CY 2006
Service/Support	184
Experimental Science	705
High Explosives Research and Development	1,297
High Explosives Testing	7,209
Nuclear Materials Research and Development	131
Physical/Technical Support	452
Public/Corporate Interface	31
Theoretical/Computational	7
Waste Management	196
Reserve	15,355
Total	25,590

The ERS Program is unique from a land use standpoint. Rather than using land for development, this program cleans up legacy wastes and makes land available for future use. Through these efforts, LANL, Los Alamos County, or other adjacent landowners will make several large tracts of land available for use. For example, under Public Law 105-119, the DOE/NNSA was directed to convey to Los Alamos County and transfer to the Department of Interior, in trust for the Pueblo of San Ildefonso, lands not required to meet the national security mission of DOE (42 USC 2391). Several tracts of land were identified for conveyance or transfer and, pending cleanup by the ERS Program, will be made available for future use.

CY 2002 marked the first land transfers under Public Law 105-119 (42 USC 2391). In CY 2004, no land was transferred to private ownership. In CY 2005 three tracts of land were transferred for a total of 45.7 acres. Parts of the airport tract (A-5-1, A-7) and TA-21 (A-15-1) were transferred. No land was transferred in CY 2006. Table 3.7-2 provides a summary of the potential land parcels remaining to be transferred.

Table 3.7.2. Potential Land Transfer Tracts

Land Tract	Acreage	Location
TA-21	244	On the eastern end of the same mesa on which the central business district of Los Alamos is located.
DP Road	27	Between the western boundary of TA-21 and the major commercial districts of the Los Alamos town site.
DOE LASO	8	Within the Los Alamos town site between Los Alamos Canyon and Trinity Drive.

Table 3.7.2. (cont.)

Land Tract	Acreage	Location
Airport	144	East of the Los Alamos town site, close to the East Gate Business Park.
Rendija Canyon	909	North of and below Los Alamos town site's Barranca Mesa residential subdivision.
TA-74 South	647	Southern reach of Pueblo Canyon between the White Rock Y and Airport.

Because of the land transfers, the distance to some site boundaries has decreased and a preliminary assessment of the impact of the boundary changes on the accident analyses in the SWEIS has been performed. The full assessment is in Appendix E of the SWEIS Yearbook 2003 (LANL 2004a).

The basic conclusion of the assessment is that the decrease in distances between assumed accident locations and previously analyzed receptor locations will have little or no impact on estimated doses in the SWEIS. On this basis there appears to be no need to revise accident analyses in the SWEIS because of land transfers from the DOE/NNSA to public entities. The conclusion is based on a review of several facilities and postulated accidents, especially risk-dominant accidents in the SWEIS. Very few or minimal changes in predicted effects are expected to occur. One exception, a hydrogen cyanide accident at the Sigma Facility, has been noted. The SWEIS still serves the purpose of characterizing LANL operations, differentiating among alternatives, and presenting a baseline that is suitable for tiering and bounding of potential accidents at LANL. A recommendation in the conclusion is that site boundary changes be considered in future NEPA reviews as appropriate.

3.8 Groundwater

Groundwater occurs in three settings beneath the Pajarito Plateau: alluvium, intermediate saturated zones, and the regional aquifer. The major source of recharge to the regional aquifer beneath the Pajarito Plateau is precipitation within the Sierra de los Valles. However, alluvial groundwater on the Pajarito Plateau is also a source of recharge to underlying intermediate saturated zones and to the regional aquifer.

Water levels have been measured in wells tapping the regional aquifer since the late 1940s when the first exploratory wells were drilled by the US Geological Survey (LANL 1998a). The annual production and use of water increased from 231 million gallons in 1947 to a peak of 1,732 million gallons in 1976. Water use has declined since 1976 to 1,506 million gallons in 2000. LANL used between 50 percent and 27 percent of the total water pumped from 1999 to 2001 (LANL 2003b). Trends in water levels in the wells reflect a plateau-wide decline in regional aquifer water levels in response to municipal water production. The decline is gradual and does not exceed one to two feet per year for most production wells. When pumping stops in the production wells, the static water level returns in about six to 12 months. Hence, the water level trends suggest no adverse

impacts on long-term water supply production from groundwater withdrawals (LANL 1998a, 2003b).

Sampling and analysis of water from water supply wells indicate that water in the regional aquifer beneath the Pajarito Plateau is generally of high quality and meets or exceeds all applicable water supply standards. There have been 35 hydrogeologic characterization wells installed that monitor the regional aquifer and 29 that monitor the intermediate saturated zones since 1998 and each of the wells has been sampled (Figure 3-1). The chemistry of regional aquifer water ranges from calcium-sodium bicarbonate composition (Sierra de los Valles) to sodium-calcium bicarbonate composition (White Rock Canyon springs) (LANL 1995, 2001b, 2002b, 2002c). Silica is the second most abundant solute found in surface water and groundwater because of reactions between soluble silica glass in the rock and water. Trace metals including barium, strontium, and uranium vary within the different saturated zones (alluvial, intermediate, and regional aquifer) depending on how long the water has been in contact with the host rock. Older groundwater within the regional aquifer tends to have higher concentrations of trace elements.

The conceptual model with regard to interconnection between alluvial groundwater, intermediate saturated zones, and the regional aquifer has been refined based on the data collected in the drilling, sampling, and testing of new wells. The conceptual model is that contaminants are transported in surface water or alluvial groundwater from source areas to areas where infiltration occurs. Infiltration is most likely to occur where the Bandelier Tuff thins or is not present (for example, Los Alamos Canyon near the low-head weir on State Route 4) or where a structure pools water (for example, in Mortandad Canyon at the sediment traps). Infiltration carries contaminants to intermediate saturated zones and to the regional aquifer.

Based on analysis of water samples, the source terms correlate reasonably well with chemical data for mobile solutes collected at downgradient characterization wells (LANL 2001b, 2002b). Non-adsorbing contaminants (perchlorate, nitrate, and tritium) are among the most mobile and travel the greatest distances along flow paths**.** Groundwater impacted by LANL-derived effluent is characterized by elevated concentrations of major ions (calcium, magnesium, potassium, sodium, chloride, bicarbonate, nitrate, and sulfate); trace solutes (for example, chromium, molybdenum, perchlorate, barium, boron, and uranium); high explosive compounds and other VOCs; and radionuclides (tritium, americium-241, cesium-137, plutonium isotopes, strontium-90, and uranium isotopes) (LANL 2001b, 2002b, 2002c, 2002d, 2002e, 2002f, 2002g, 2004c).

The work summarized herein was conducted in accordance with the "Interim Measures Work Plan for Chromium Contamination in Groundwater," (LANL 2006c), hereafter called the Work Plan, and the "Final Drilling Plan for Sandia Canyon Drilling Program," (Kleinfelder 2006), hereafter called the Drilling Plan. The U.S. Army Corps of Engineers contracted Kleinfelder, Inc., to conduct the drilling program for the DOE; LANL scientists provided technical assistance and oversight. Figure 3-1 shows the LANL site boundary and highlights the location of Sandia Canyon and the locations of the alluvial

wells (SCA designations), piezometers (SCP designations), and core holes (SCC designations) described in this report. One core hole, SCC-1, was converted to a well that is called SCI (Sandia Canyon Intermediate)-1.

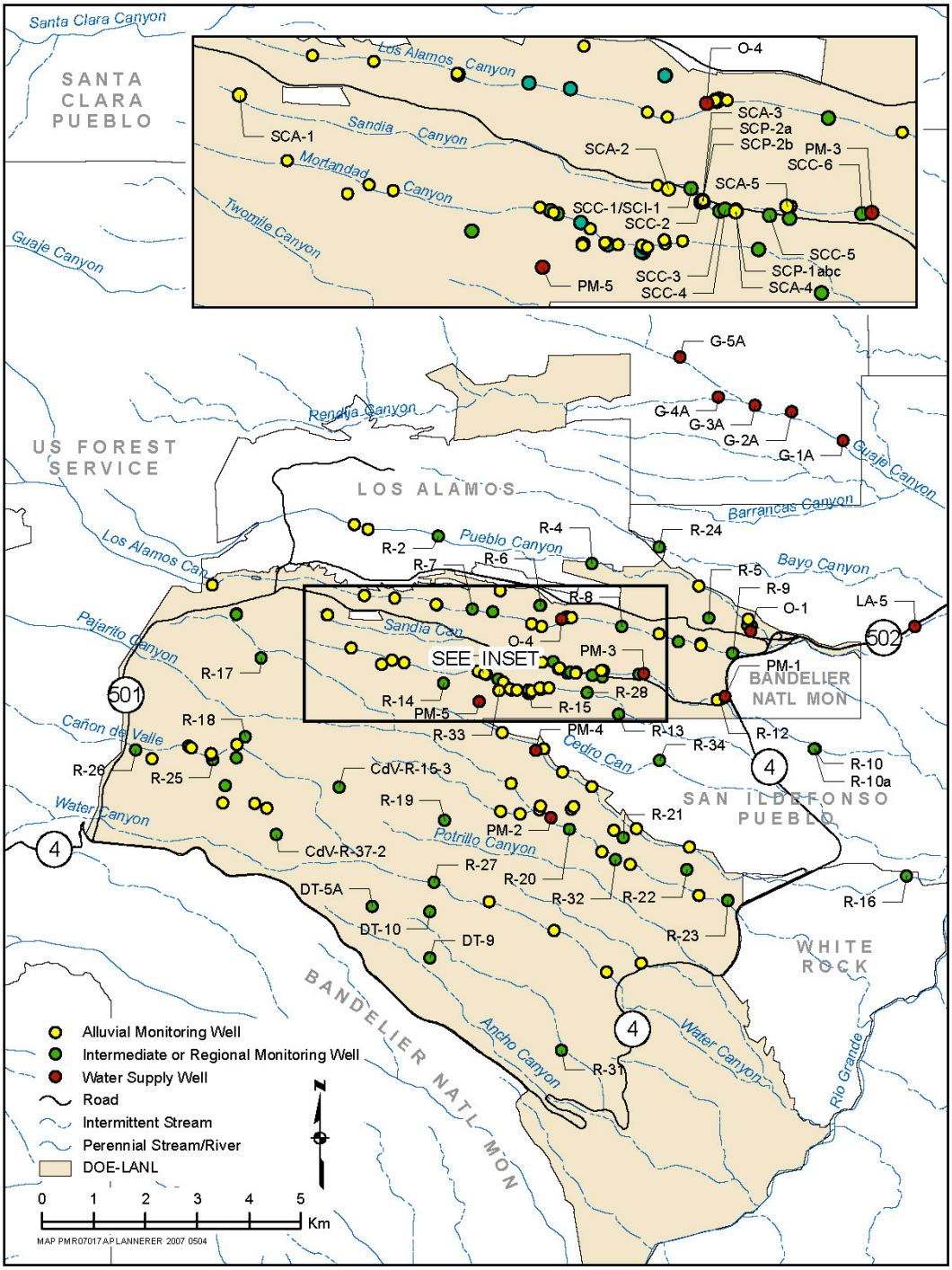

Figure 3-1. Alluvial, perched-intermediate, and regional aquifer characterization wells within LANL and vicinity.

By the end of 2006, five additional characterization wells were installed along with five piezometers and six exploratory core holes. The characterization wells were drilled using hollow stem auger in the alluvial and intermediate zones of Sandia Canyon. Geologic core was collected in some of the wells and geologic cuttings were collected at defined intervals during the drilling operations and described to record the stratigraphy encountered. Geophysical logging was conducted in some wells to enhance the understanding of the stratigraphy and rock characteristics. The wells, piezometers, and characterization boreholes include the following:

- SCA-1
- SCA-2
- SCA-3
- SCA-4
- SCA-5
- SCP-1 abc
- SCP-2a
- SCP-2b
- SCC-1/SCI-1
- SCC-2
- SCC-3
- SCC-4
- SCC-5
- SCC-6

The LANL Work Plan called for five alluvial wells to be installed in Sandia Canyon in order to

- constrain the extent of alluvial saturation,
- determine the nature and extent of chromium within alluvial groundwater, and
- obtain data to calculate chromium inventories.

General drilling goals were outlined in the LANL Work Plan and refined in the Kleinfelder Drilling Plan, with input from LANL scientists.

The five wells were successfully installed in Sandia Canyon; SCA-1 was installed in upper Sandia Canyon and the remaining four wells, SCA-2, SCA-3, SCA-4 and SCA-5, were installed in lower Sandia Canyon. Per the Drilling Plan, core and groundwater samples were not collected at the alluvial wells. Additionally, geophysical logging was not planned in the shallow alluvial wells. Two of the five alluvial wells, SCA-2 and SCA-3, contain low volumes of water.

SCA-1 was hand-augered on August 25, 2006, in a wetlands area in Reach S-2 of upper Sandia Canyon. The hole was augered to 2.2 feet below ground surface and was completed with a screened interval between 1.3 and 1.9 feet below ground surface. Per the Drilling Plan, the target depth for SCA-1 was 5 feet below ground surface; however, hand-augering became difficult at 2.2 feet below ground surface and project management decided to terminate the boring at that point. Water was present at ground surface during drilling and was measured at 0.02 feet below ground surface in the completed well on

September 1, 2006. Per the Drilling Plan, core and groundwater samples were not collected at SCA-1 during drilling.

SCA-2 was hand-drilled with a power auger on August 24, 2006, in lower Sandia Canyon. The hole was augered to 19 feet below ground surface and was completed with a screened interval between 10.3 and 15 feet below ground surface. Per the Drilling Plan, the target depth for SCA-2 was 20 feet below ground surface; however, at approximately 16 feet below ground surface the bottom of the hole began sloughing and project management decided to terminate the boring at 19 feet below ground surface. Alluvial groundwater was encountered during drilling at 11.9 feet below ground surface and was present to the total depth of the borehole. It was measured in the completed well at 14.36 feet below ground surface on October 1, 2006, which represents a standing water column of approximately 1.4 feet. The well was bailed dry after approximately 0.6 gallon of water was removed. Consequently, well development and slug testing could not be performed on this well. Per the Drilling Plan, core and groundwater samples were not collected at SCA-2 during drilling.

SCA-3 was drilled on September 9, 2006, in lower Sandia Canyon. During drilling, flowing silt and sand began entering the augers at approximately 30 feet below ground surface, and at approximately 43.5 feet below ground surface flowing sand locked the core barrel inside the auger flights. At the direction of project management, drilling was terminated at 53.5 feet below ground surface without reaching bedrock because of the drilling difficulties. SCA-3 was offset approximately 15 feet to the east and drilled to 58.5 feet below ground surface with a wooden plug at the tip of the augers. A well was then installed with a screened interval between 27.6 and 32 feet below ground surface. Water was encountered at 30.6 feet below ground surface during drilling and was present to the borehole total depth. It was measured in the completed well at 32.10 feet below ground surface on October 1, 2006. The well was developed by bailing for 8 hours with a final turbidity reading of 16.5 nephelometric turbidity units. Following development, a slug test could not be conducted because of the small amount of water in the well (0.5 feet); a transducer was installed on October 1, 2006, to monitor recharge.

SCA-4 was drilled on September 10, 2006, in lower Sandia Canyon. The hole was drilled to 43.8 feet below ground surface and was completed with a screened interval between 37 and 41.5 feet below ground surface. Bedrock was present at 41.8 feet below ground surface. Water was encountered from 36.96 to 41.8 feet below ground surface during drilling. It was measured in the completed well at 37.91 feet below ground surface on September 24, 2006.

SCA-5 was drilled on September 6 and 7, 2006, in lower Sandia Canyon. The hole was drilled to 78.5 feet below ground surface and was completed with a screened interval between 55 and 64.4 feet below ground surface. Bedrock was encountered at 72.5 feet below ground surface. Thin stringers of saturation were encountered from 39.5 to 65 feet below ground surface during drilling. Water was measured in the completed well at 57.80 feet below ground surface on September 20, 2006.

The LANL Work Plan called for two piezometers nests, with up to three piezometers each, to be installed near SC-2 and SC-3 in lower Sandia Canyon. The nested

piezometers were installed to provide data regarding infiltration rates and vertical hydraulic gradients. General drilling goals were outlined in the LANL Work Plan and refined in the Kleinfelder Drilling Plan, with input from LANL scientists.

Five piezometers were installed; three within one borehole (SCP-labc) and two in separate boreholes (SCP-2a and SCP-2b). SCP-labc was installed approximately 6 feet west of SCA-4; SCP-2a and 2b were installed approximately 5 and 10 feet east of SCA-3, respectively. Per the Drilling Plan, core and groundwater samples were not collected during drilling at the piezometers, and no geophysical logs were run.

Three nested piezometers, SCP-la, SCP-lb and SCP-lc, were drilled and installed on September 11 and 12, 2006, in lower Sandia Canyon approximately 6 feet west of SCA-4. The piezometers were installed in a single borehole called SCP-labc. The borehole was drilled to 43.8 feet below ground surface and alluvial groundwater may have been encountered as high as 15 feet below ground surface; however, a clearer indication of groundwater was at 37.0 to 41.8 feet below ground surface. Bedrock was encountered at 42.3 feet below ground surface.

SCP-la was screened from 37.8 to 38.3 feet below ground surface, SCP-lb was screened from 39.4 to 39.9 feet below ground surface, and SCP-lb was screened from 41.2 to 41.7 feet below ground surface. Following completion, water was measured on September 24, 2006, at 37.64 feet below ground surface (SCP-la), 37.76 feet below ground surface (SCP-lb), and 37.45 feet below ground surface (SCP-lc).

SCP-2a was drilled on September 13, 2006, in lower Sandia Canyon. The hole was drilled to 45.6 feet below ground surface and was completed as a piezometer with a screened interval between 44.5 and 45 feet below ground surface. SCP-2a was installed approximately 10 feet east of SCA-3, and SCP-2b installed between them. Due to the problems with flowing sands encountered at SCA-3, SCA-2a was drilled with a center plug in the auger bit; bedrock was not reached at this location. Water was encountered from 25 to 45.6 feet below ground surface during drilling. It was measured in the completed piezometer at 32.04 feet below ground surface on September 22, 2006.

SCP-2b was drilled on September 12, 2006, in lower Sandia Canyon. The hole was drilled to 51.5 feet below ground surface and was completed as a piezometer with a screened interval between 49.5 and 50 feet below ground surface. SCP-2b was installed approximately 5 feet east of SCA-3. Due to the problems with flowing sands encountered at SCA-3, SCA-2b was drilled with a center plug in the auger bit; bedrock was not reached at this location. Water was encountered at 25 feet below ground surface during drilling and was present to the total depth of the borehole. It was last measured in the completed piezometer at 34.45 feet below ground surface on September 21, 2006.

The LANL Work Plan called for six characterization core holes to be installed in Sandia Canyon to determine the nature and extent of chromium in the upper vadose zone and obtain data to calculate chromium inventories. Drilling objectives were outlined in the LANL Work Plan and refined in the Kleinfelder Drilling Plan, with input from LANL scientists.

Six core holes, SCC-1 through SCC-6, were successfully drilled with air rotary techniques in Sandia Canyon. Core samples were collected at 20-foot intervals and submitted for laboratory analysis; the core runs were typically 3 feet long, although some 1.5-foot split spoon samples were collected at 20- and 40-foot depth. Cuttings were collected at 5-foot intervals between the core runs for lithologic descriptions. Video and geophysical logs (induction and natural gamma) were run at each core hole. All core holes except SCC-1 were plugged and abandoned.

SCC-l/SCI-1 was drilled from September 30 to October 5, 2006, in lower Sandia Canyon. The hole was drilled to 400 feet below ground surface and core samples were collected at 20-foot intervals. Core recovery ranged from 47 percent to 100 percent and all core samples were submitted for the full suite of laboratory analyses as specified in the Work Plan. The core hole was advanced 9.5 feet into the Cerros del Rio basalt, near the range of 10 to 20 feet identified in the Drilling Plan. All other drilling objectives identified in the Work Plan were met. Alluvial groundwater was encountered from 33.5 to approximately 58 feet below ground surface at SCC-1. The bottom of the alluvial groundwater zone was difficult to identify precisely because continuous core was not collected and an induction log was not run on this interval due to the presence of casing. Intermediate perched water was present in the Puye Formation at approximately 366 feet below ground surface; the bottom of the zone is inferred to be within the uppermost Cerros del Rio basalt at approximately 392 feet below ground surface, based on the conductivity log. One water sample was collected at SCC-1 from this zone. A monitoring well, renamed SCI-1, was installed with a screened interval between 358.4 and 377.9 feet below ground surface in the Puye Formation gravels. After construction of SCI-1, filter pack sand was discovered within the sump portion of the well. The sump was apparently punctured during installation. WDC Exploration & Wells, Inc. placed a permanent cylindrical PVC plug inside the sump which effectively sealed the bottom of the well. Based on a video that was run after the plug was installed, the top of the plug is at 377.9 feet below ground surface.

SCC-2 was drilled from August 18 to 31, 2006, in lower Sandia Canyon. The hole was drilled to 388.6 feet below ground surface and core samples were collected at 20-foot intervals. Core recovery ranged between 50 percent and 100 percent and all samples were submitted for laboratory analysis as specified in the Work Plan. The core hole was advanced 11.6 feet into the Cerros del Rio basalt, within the range of 10 to 20 feet identified in the Drilling Plan. All other drilling objectives identified in the Work Plan were met. Shallow perched water was encountered from 54 to 60 feet below ground surface in the Tshirege Member of the Bandelier Tuff and the upper Cerro Toledo interval. Water was measured at 50.2 feet below ground surface, with a borehole depth of 60 feet. Intermediate perched water was present in the Puye Formation from approximately 356 to 377 feet below ground surface.

SCC-3 was drilled from September 8 to 13, 2006, in lower Sandia Canyon. The hole was drilled to 344 feet below ground surface and core samples were collected at 20-foot intervals. Core recovery ranged between 50 percent and 100 percent and all samples were submitted for laboratory analysis as specified in the Work Plan. The core hole was advanced 16 feet into the Cerros del Rio basalt, in the range of 10 to 20 feet identified in the Drilling Plan. All other drilling objectives identified in the Work Plan were met.

Alluvial groundwater was encountered from 35 to approximately 45 feet below ground surface, near the base of the alluvium. The bottom of the alluvial groundwater zone was difficult to identify precisely because continuous core was not collected, and an induction log was not run on this interval due to the presence of casing. It is possible the alluvial groundwater zone extends slightly deeper into the uppermost portion of Unit 1g of the Tshirege Member of the Bandelier Tuff. Two thin zones of intermediate perched water were present in the Puye Formation from approximately 325.4 to 328 feet below ground surface, just above the Cerros del Rio basalt. When the borehole total depth ranged from 323 to 332 feet below ground surface, water levels inside the casing rose to between 315.3 and 315.5 feet below ground surface.

SCC-4 was drilled in lower Sandia Canyon from September 14 to 21, 2006. The hole was drilled to 323 feet below ground surface and core samples were collected at 20-foot intervals. Core recovery ranged from 17 percent to 100 percent; the core run with 17 percent recovery (from 123 to 123.5 feet below ground surface) did not have enough sample volume to submit for tritium analyses. All other core samples were submitted for the full suite of laboratory analyses as specified in the Work Plan. The core hole was advanced one foot into the Cerros del Rio basalt when coring was halted by LANL project personnel due to mechanical problems with the coring device. All other drilling objectives identified in the Work Plan were met. Alluvial groundwater was encountered from 35.5 to approximately 45 feet below ground surface. The bottom of the alluvial zone was difficult to identify precisely because continuous core was not collected and potable water injection began at 45 feet below ground surface. A thin zone of intermediate perched water was present in the Puye Formation from approximately 320.7 to 321.8 feet below ground surface, just above the Cerros del Rio basalt. Water was measured at 322.4 feet below ground surface, at the core hole total depth of 323 feet below ground surface.

SCC-5 was drilled from September 23 to 29, 2006, in lower Sandia Canyon. The hole was drilled to 290 feet below ground surface and core samples were collected at 20-foot intervals. Core recovery ranged from 50 percent to 100 percent and all core samples were submitted for the full suite of laboratory analyses as specified in the Work Plan. Additionally, at the request of LANL scientists, a sample from a thin, moist silt/clay layer from 60.2 to 60.3 feet below ground surface (the uppermost Otowi Member of the Bandelier Tuff) was submitted for moisture and anion analyses, and a basalt sample from 287.3 to 287.5 feet below ground surface in the final core run was submitted for metal and total organic carbon analyses. The core hole was advanced 9.5 feet into the Cerros del Rio basalt, near the range of 10 to 20 feet proposed in the Drilling Plan. All other drilling objectives identified in the Work Plan were met. Alluvial and intermediate zone groundwater was not encountered at SCC-5.

SCC-6 was cored in lower Sandia Canyon from October 8 to 11, 2006. The hole was cored to 259.5 feet below ground surface and core samples were collected at 20-foot intervals. Core recovery ranged from 23 percent to 100 percent and all core samples were submitted for the full suite of laboratory analyses as specified in the Work Plan. The core hole was advanced 10.5 feet into the Cerros del Rio basalt, in the range of 10 to 20 feet proposed in the Drilling Plan. All other drilling objectives identified in the Work Plan were met. Alluvial and intermediate zone groundwater was not encountered at SCC-6.

3.9 Cultural Resources

LANL has a large and diverse number of historic properties. Approximately 86 percent of DOE-administered land in Los Alamos County has been surveyed for prehistoric and historic cultural resources. Over 1,700 prehistoric sites have been recorded (Table 3.9-1). During FY 2006, sites that have been excavated since the 1950s were removed from the overall site count numbers. Thus, the number of recorded sites is less than in reports from previous years. More than 85 percent of these archaeological sites date from the 14th and 15th centuries. Most of the sites are found in the piñon-juniper vegetation zone, with 80 percent lying between 5,800 and 7,100 feet in elevation. Almost three-quarters of all sites are found on mesa tops.

Table 3.9-1. Acreage Surveyed, Prehistoric Cultural Resource Sites Recorded, and Cultural Resource Sites Eligible for the National Register of Historic Places (NRHP) at LANL FY 2006[a]

Fiscal Year	Total acreage surveyed	Total acreage systematically surveyed to date	Total prehistoric cultural resource sites recorded to date[b] (cumulative)	Total number of eligible & potentially eligible NRHP sites	Number of notifications to Indian Tribes [c]
SWEIS ROD	Not reported	Not reported	1,295[d]	1,092	23
1998	1,920	17,937	1,369	1,304	10
1999	1,074	19,011	1,392	1,321	13
2000	119	19,428	1,459	1,386	6
2001	4,112	19,790	1,424[d]	1,297[d]	2
2002	2,686	22,476	1,835	1,699	6
2003	200	22,676	1,797 [d]	1,667 [d]	6
2004	50	22,726	1,785 [d]	1,650 [d]	3
2005	0	22,726	1,776[d]	1,640[d]	3
2006	31	23,267[e]	1,715	1,619	3

a Source: Information on LANL provided by DOE/NNSA and LANL Cultural Resources Team (CRT) to the Secretary of Interior for a Report to Congress on Federal Archaeological Activities.

b In the CYs 1999 and 2000 Yearbooks, this column, then titled 'Total Archaeological Sites Recorded to Date,' included Historic Period cultural resources (AD 1600 to present), including buildings. In order to conform to the way cultural properties were discussed in the SWEIS, Historic period properties were removed beginning with the 2001 SWEIS Yearbook. Historic sites are now documented in a separate table (Table 3.9-2).

c As part of the SWEIS preparation, 23 tribes were consulted in a single notification. Subsequent years, however, show the number of separate projects for which tribal notifications were issued; the number of tribes notified is not indicated.

d As part of ongoing work to field verify sites recorded 20 to 25 years ago, LANL's CRT has identified sites that have been recorded more than once and have multiple Laboratory of Anthropology site numbers. Therefore, the total number of recorded archaeological sites is less than indicated in FY 2000. This effort will continue over the next several years and more sites with duplicate records will probably be identified.

e The total acreage surveyed was recalculated and corrected due to changes in the new DOE/NNSA boundary. Therefore, the total acres surveyed utilizing the new DOE/NNSA boundary and the corrected archaeological area surveyed is a total of 23,267 acres.

LANL continues to evaluate buildings and structures from the Manhattan Project and the Early Cold War period (1943–1963) for eligibility to the National Register of Historic Places (NRHP). Within LANL's limited access boundaries, there are ancestral villages,

shrines, petroglyphs, sacred springs, trails, and traditional use areas that could be identified by Pueblo and Athabascan[12] communities as traditional cultural properties.

The SWEIS ROD lists 2,319 historic (AD 1600 to the present) cultural resource sites, including sites dating from the Historic Pueblo, US Territorial, Statehood, Homestead, Manhattan Project, and Cold War periods (Table 3.9-2).

To date, LANL has identified no sites associated with the Spanish Colonial or Mexican Periods. During FY 2004 it was decided to combine the historic periods (Historic Pueblo, US Territorial, Statehood, and Undetermined Athabaskan) into one site affiliation code "Early Historic Pajarito Plateau" (AD 1500 to 1943). Many of the 2,319 potential historic cultural resources are temporary and modular properties, sheds, and utility features associated with the Manhattan Project and Cold War periods. Since the SWEIS ROD was issued, these types of properties have been removed from the count of historic properties because they are exempt from review under the terms of the Programmatic Agreement (MOU DE-GM32-00AL77152) between the NNSA/LASO, the New Mexico State Historic Preservation Office (NMSHPO), and the Advisory Council on Historic Preservation. Additionally, the Cultural Resources Team (CRT) has evaluated many Manhattan Project and Early Cold War properties (AD 1942–1963) and those properties built after 1963 that potentially have historical significance, reducing the total number of potential historic cultural resource sites to 753. Most buildings built after 1963 are being evaluated on a case-by-case basis as projects arise that have the potential to impact the properties. Therefore, additional buildings may be added to the list of historic properties in the future.

Table 3.9-2. Historic Period Cultural Resource Properties at LANL[a]

Fiscal Year	Potential Properties[b]	Properties Recorded[c]	Eligible and Potentially Eligible Properties	Non-Eligible Properties	Evaluated Buildings Demolished[d]
LANL SWEIS ROD	2,319	164	98	Not Reported	Not Reported
1998	Not Reported	181	136	45	Not Reported
1999	Not Reported	240	170	70	Not Reported
2000	Not Reported	246	173	73	Not Reported
2001	733	259	186	73	32
2002	753	301	218	83	46
2003	757	404	254	150	68
2004	757	410	255	155	82
2005	760	431	266	165	111
2006	753	592	338	254	134

a Source: Information on LANL provided by DOE/NNSA and LANL CRT to the Secretary of Interior for a Report to Congress on Federal Archaeological Activities. Numbers given represent cumulative total properties identified, evaluated, or demolished by the end of the given FY.

b This number includes historic sites that have not been evaluated, and therefore, may be potentially NRHP-eligible. In addition, beginning with the CY 2002 Yearbook, historic properties that are exempt from review under the terms of the Programmatic Agreement were removed from these totals, substantially reducing the number of potential Historic period cultural resources.

[12] Athabascan refers to a linguistic group of North American Indians. Their range extends from Canada to the American Southwest, including the languages of the Navajo and Apache.

c This represents both eligible and non-eligible sites.
[d] This represents the total number of evaluated buildings demolished to date.

LANL has recorded 136 historic sites. As stated previously, during FY 2006, sites that have been excavated since the 1950s were removed from the overall site count numbers. Thus, the number of recorded sites is less than in reports from previous years. All have been given unique New Mexico Laboratory of Anthropology site numbers. Some of the 136 are experimental areas and artifact scatters dating from the Manhattan Project and Early Cold War periods. The majority, 122 sites, are structures or artifact scatters associated with the Early Historic Pajarito Plateau or Homestead periods. Of these 136 sites, 96 have been declared eligible for the NRHP. LANL's Manhattan Project and Early Cold War period buildings account for the remaining 617 of the 753 Historic period properties. At this time, the New Mexico State Historic Preservation Division (NMSHPD) does not assign Laboratory of Anthropology numbers to LANL buildings. Of these historic buildings, 456 have been evaluated for eligibility and inclusion on the NRHP. Two hundred fourteen of these evaluated buildings have been declared not eligible for the NRHP; the remaining 242 are NRHP-eligible.

The CRT has documented 79 of the NRHP-eligible buildings in accordance with the terms of official Memoranda of Agreement between the DOE/NNSA and the NMSHPD. These buildings have subsequently been decontaminated, decommissioned, and demolished through the D&D Program. Fifty-five of the 214 non-eligible buildings have also been demolished through this program.

3.9.1 Compliance Overview

Section 106 of the National Historic Preservation Act, Public Law 89-665, implemented by 36 Code of Federal Regulations Part 800 (36 CFR 800), requires Federal agencies to evaluate the impact of proposed actions on historic properties. Federal agencies must also consult with the State Historic Preservation Officer (SHPO) and/or the Advisory Council on Historic Preservation about possible adverse effects to NRHP-eligible resources.

During FY 2006 (October 2005 through September 2006), the CRT evaluated 842 LANL-proposed actions, no new field surveys to identify cultural resources were conducted. DOE/NNSA sent seven survey reports to the SHPO for concurrence in findings of effects and determinations of eligibility for the NRHP of cultural resources located during the survey. Additionally, one Memorandum of Agreement and two final reports for completion of data recovery plan terms were submitted to the SHPO.

The American Indian Religious Freedom Act of 1978 (Public Law 95-341) stipulates that it is Federal policy to protect and preserve the right of American Indians to practice their traditional religions (42 USC 1996). Tribal groups must receive notification of possible alteration of traditional and sacred places. The Governors of San Ildefonso, Santa Clara, Cochiti, Jemez, and Acoma Pueblos and the President of the Mescalero Apache Tribe received copies of three reports to identify any traditional cultural properties that a proposed action could affect.

The Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601) states that if burials or cultural objects are inadvertently disturbed by Federal activities, work must stop in that location for 30 days, and the closest lineal descendant must be consulted for disposition of the remains (25 USC 1996). No discoveries of burials or cultural objects occurred in FY 2006 from Federal undertakings.

The Archaeological Resources Protection Act of 1979 (Public Law 96-95) provides protection of cultural resources and sets penalties for their damage or removal from Federal land without a permit (16 USC 1996). No violations of this Act were recorded on DOE/NNSA land in FY 2006.

3.9.2 Compliance Activities

Nake'muu. During FY 2006, the long-term monitoring program to assess the impact of LANL mission activities on cultural resources at the ancestral pueblo of Nake'muu was completed as part of the *Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility Mitigation Action Plan* (DOE 1996). Nake'muu is the only pueblo at LANL that still contains its original standing walls. It dates from circa AD 1200 to 1325 and contains 55 rooms with walls standing up to six feet high. During the nine-year monitoring program, the site has witnessed a 0.9 percent displacement rate of chinking stones and 0.3 percent displacement of masonry blocks. Statistical analyses indicate that these displacement rates are significantly correlated with annual snowfall, but not with annual rainfall or explosive tests at the DARHT facility.

Traditional Cultural Properties Comprehensive Plan. During FY 2006, the CRT continued to assist DOE/NNSA in implementing the *Traditional Cultural Properties Comprehensive Plan* (LANL 2000b). This included formal and informal meetings with the Pueblos of San Ildefonso and Santa Clara. Discussions during the year centered around working with San Ildefonso regarding properties in TA-03, along with working with both San Ildefonso and Santa Clara regarding traditional cultural properties in Rendija Canyon. Access agreements were worked out with the two Pueblos for continued access to the traditional cultural properties in Rendija Canyon after the forthcoming completion of the land transfer process between DOE and the County of Los Alamos.

Land Conveyance and Transfer. The Laboratory began the fifth year of a multiyear program of archaeological excavation in support of the Land Conveyance and Transfer project. Thirty-nine archaeological sites were excavated during the four field seasons, with more than 200,000 artifacts and 2,000 samples being recovered. This work was conducted under a Programmatic Agreement among the DOE/NNSA, the Advisory Council on Historic Preservation, the New Mexico SHPO, and the Incorporated County of Los Alamos concerning the conveyance of certain parcels of land to the county for economic development.

Cerro Grande Fire Recovery. During 2006, the CRT monitored 33 Ancestral Pueblo and Archaic period archaeological sites rehabilitated by the Pueblo of San Ildefonso in CY 2004. The monitoring was in support of the *Mitigation Action Plan for the Special Environmental Assessment for the Cerro Grande Rehabilitation Project* (DOE 2000b,

2000c). The monitoring is part of a long-term program to evaluate the success of erosion control measures and other aspects of rehabilitation.

3.9.3 Cultural Resources Management Plan

The Cultural Resources Management Plan provides a set of guidelines for managing and protecting cultural resources, in accordance with requirements of the National Historic Preservation Act, the Archaeological Resources Protection Act, Native American Graves Protection and Repatriation Act, the American Indian Religious Freedom Act, and other laws, regulations, and policies in the context of LANS's mission.

The Cultural Resources Management Plan provides high-level guidance for implementation of the *Traditional Cultural Properties Comprehensive Plan* and all other aspects of cultural resources management at LANL. It presents a framework for collaborating with Native American Tribes and other ethnic groups and organizations in identifying traditional cultural properties and sacred sites.

Status
The Cultural Resources Management Plan was finalized and approved by LANL and DOE/NNSA in 2005 and was implemented, under limited funding, during 2006 through a Programmatic Agreement signed on June 15, 2006, by DOE/NNSA, the New Mexico SHPO, and the Advisory Council on Historic Preservation. The management plan will be updated every five years after issuance. During 2006, implementing activities included an assessment of individual properties within the proposed Project Y Manhattan Project National Historic Landmark, as part of data gathering for use in developing the forthcoming landmark nomination package for the National Park Service. The degree of implementation of the plan in future years will be contingent on the level of funding received.

Relationship to Other Plans
The Biological Resources Management Plan (particularly the Threatened and Endangered Species Habitat Management Plan [LANL 1998b]) may limit access to certain cultural resource sites. Erosion control under the SWPPPs may have a potential impact on cultural resource sites.

Demolished Buildings
Table 3.9.3-1 indicates the extent of historic building documentation and demolition to date. To date, not all buildings that have been documented have been demolished.

Table 3.9.3-1. Historic Building Documentation and Demolition Numbers

Fiscal Year	Number of Buildings for which Required Documentation was Completed	Number of Buildings Actually Demolished in Fiscal Year[a]
Pre 1995	1	Unknown
1995	21	Unknown
1998	5	Unknown
1999	5	Unknown
2000	2	Unknown
2001	8	Unknown
2002	37	14
2003	17	22
2004	14	14
2005	25	29
2006	5	23
TOTAL	140	102

a Although buildings were demolished in the years before 2002, the CRT did not monitor the dates when the building demolitions actually occurred.

2006 Land Transferred

No land tracts were transferred in CY 2006 (see Land Resources Section 4.7).

3.10 Ecological Resources

LANL is located in a region of diverse landforms, elevation, and climate—features that contribute to producing diverse plant and animal communities. Plant communities range from urban and suburban areas to grasslands, wetlands, shrublands, woodlands, and mountain forest. These plant communities provide habitat for a variety of animal life.

The SWEIS ROD projected no significant adverse impacts to biological resources, ecological processes, or biodiversity (including threatened and endangered species) resulting from LANL operations. Data collected for CY 2006 support this projection. These data are reported in the 2006 Environmental Surveillance Report issued (LANL 2007b).

3.10.1 Conditions of the Forests and Woodlands

The forests and woodlands in the LANL area have undergone significant changes that began with the 2000 Cerro Grande Fire that will have an impact on forest health for decades to come. The fire reduced tree densities in the area, particularly on Forest Service land west of LANL. Subsequent wildfire risk reduction thinning activities reduced tree density and cover on much of the LANL forest and woodland. At the same time, the recent bark beetle infestation killed many of the remaining mature conifer trees throughout the Pajarito Plateau. LANL forests and woodlands are now much more open and will continue to be dominated by understory species for many years.

The Cerro Grande Fire burned approximately 7,678 acres on LANL property (LANL 2004d). Most of this, 62 percent or 4,760 acres, was in ponderosa pine forests. An

additional 17 percent of the Cerro Grande Fire burned in piñon-juniper woodlands on LANL. In either case, a large percentage of this, 88 percent, was burned at low severity and with 10 percent to 40 percent overstory mortality. Only 12 percent of the area at LANL that was burned by the Cerro Grande Fire was at moderate- or high-burn severities. To minimize the potential for erosion and to facilitate recovery from the fire, a total of 1,800 acres was rehabilitated after the fire with seeded grass, straw mulch, and hydromulch (LANL 2002g). Four years after rehab treatment implementation, burned areas have maintained total ground cover but vegetation cover has declined, probably as a result of drought (LANL 2007b). Cover is sufficient to protect most areas from soil loss.

LANL is located in a fire-prone region and there will always be a high potential for wildfires. Recent modeling of wildfire risks indicates that the greatest potential for lightning to ignite fires occurs along the western and southwestern boundary of LANL and in the adjacent mountainous areas. Because of this risk, thinning has been a primary management activity to reduce fire hazards in forests and woodlands at LANL. The total amount of thinning conducted since 2000 is approximately 9,150 acres (LANL 2005d). Of this, approximately 40 percent or 3,900 acres were in ponderosa pine forests, with the remaining acreage consisting of piñon-juniper woodlands. In addition, 800 acres at LANL had been thinned between 1997 and 1999.

Bark beetle-induced tree mortality has leveled off over the past two years, as much through lack of live trees as an improvement in forest health. Tree mortality first became a prominent result of the drought during 2002 and continued in 2003 and 2004. By the end of 2004, 95 percent of the piñon trees had been killed. In addition, approximately 12 percent of ponderosa pine trees had been killed. In the lower elevations of the mixed conifer zone on north-facing slopes of the canyons, up to 100 percent of the Douglas fir trees were also killed by the drought and subsequent bark beetle activity.

The LANL area received approximately 16 inches of precipitation in water year 2004 (October – September), 25 inches in water year 2005, and 14 inches in 2006. The average for the TA-6 meteorological station is 17 inches. This cycle of alternating wet and dry years makes it difficult to identify any trend in vegetation recovery. We see rapid growth of understory plant species during wet years and neutral or negative response to dry years. Although we can reasonably expect to see regrowth of shrubby species, it is unlikely that there will be any appreciable increase in tree species until the current climate trends improve.

3.10.2 Threatened and Endangered Species Habitat Management Plan

LANL's Threatened and Endangered Species Habitat Management Plan (LANL 1998b) received US Fish and Wildlife Service concurrence on February 12, 1999. The plan is used in project reviews and to provide guidelines to project managers for assessing and reducing potential impacts to federally listed threatened and endangered species, including the Mexican spotted owl, southwestern willow flycatcher, and bald eagle. The Threatened and Endangered Species Habitat Management Plan was incorporated into the

NEPA, Cultural Resources, and Biological Resources Laboratory Implementation Requirement document (LANL 2000c) developed during 1999.

In CY 2006, LANL continued conducting annual surveys for Mexican spotted owls, southwestern willow flycatchers, and bald eagles. The Biological Resources Compliance and Monitoring Team provided guidance for avoiding human disturbance and habitat alteration impacts on federally-listed species to projects and operations through excavation permit reviews and the permits and requirements identification process. Kathryn Bennett completed a M.S. Thesis identifying the location of movement corridors of large ungulates at LANL, based on radiotelemetry data and geographic information system modeling.

3.10.3 Biological Assessments and Compliance Packages

LANL reviews proposed activities and projects for potential impact on biological resources including Federal- or State-listed threatened or endangered species. These reviews evaluate and record the amount of development or disturbance at proposed construction sites, the amount of disturbance within designated core and buffer habitat, the potential impact to wetlands or floodplains in the project area, and whether habitat evaluations or species-specific surveys are needed.

During 2006 the Biological Resources Compliance and Monitoring Team completed a biological assessment of all new operations and projects proposed in the 2006 Draft SWEIS for LANL. This involved assessing impacts of 16 individual projects as well as cumulative effects of the operation of LANL (LANL 2006d). Compliance packages were also written in support of modification of the effluent reduction ponds for the RLWTF (LANL 2006e), monitoring and maintenance of surface water monitoring stations and groundwater wells (LANL 2006f), and modifications to the CMR Replacement project (LANL 2006g). The US Fish and Wildlife Service concurred in determinations that projects may affect, but were not likely to adversely affect, federally listed species except for two projects in the SWEIS BA. For those two projects, US Fish and Wildlife Service concluded they could not make a determination until more specific information was available on the projects.

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4.0 Trend Analysis

Beginning in 1999 the Yearbook included a new chapter that examined trends by comparing actual LANL operating conditions to SWEIS ROD projections. Where the 1999 Yearbook was restricted to waste data, subsequent Yearbooks, including this edition, also included land use and utilities information. Additional information was added to the 2002 edition of the Yearbook so that SWEIS ROD projections could be applied to a wider range of data to assist in the preparation of the five-year review of the SWEIS. The purpose of these additional comparisons was to allow a more comprehensive review of the SWEIS projections compared to actual LANL operating parameters over the years in which data were available. Many of these comparisons are qualitative due to the nature of the data collected.

In preparing this chapter, it became obvious that not all data collected lend themselves to this type of analysis. First, some data consist mostly of estimates (i.e., historical NPDES outfall flows) where variations between years may be nothing more than an artifact of the methodology used to make estimates. These data did not depict environmental risk, and any evaluation between years would be meaningless. Second, some data were so far below SWEIS ROD projections (i.e., air quality and high explosive production), that even significant increases in measured quantities would not cause LANL to exceed the risks evaluated in the SWEIS, and such a comparison would have served no practical purpose for the development of a SWEIS in the future. Finally, some data did not represent site impacts, were inherently variable, and did not represent utilization of on-site natural resources (for example, ERS Program exhumed material shipped off-site). The data conducive to numerical analysis represent real numbers of two distinct types: first, data that demonstrate cumulative effects across years where summed quantities could approach or exceed SWEIS ROD projections or regulatory limits or create negative environmental impacts (e.g., waste disposed at LANL) and second, data that represent, on an annual basis, measured quantities that approach limits established by agreement and/or regulation (i.e., gas, electric, and water consumption).

4.1 Land Use

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. Therefore, loss of available lands through development or Congressionally mandated land transfer could have an impact on strategic planning for operations. Conversely, increases in available lands through cleanups performed by the ERS Program, and demolition of vacated buildings also affect strategic planning. To date, however, the ERS Program has not significantly added to available land.

In CY 2002, the first of the Congressionally mandated conveyance of land to the County of Los Alamos and transfer to the Pueblo of San Ildefonso were accomplished. These disbursals effectively removed 2,239 acres from LANL and made them unavailable for LANL operational uses, though these were acres previously identified as reserve properties with no identified land use. Three additional land transfers as part of the 1997

conveyance and transfer process occurred during CY 2005 for a total of 45.7 acres. In CY 2006, no land was transferred.

The SWEIS ROD did not anticipate any significant effects on land use. Land uses within LANL boundaries have not changed substantially since the SWEIS was issued (see Table 3.7-1) and are not expected to change in the next few years. Future development will be consistent with LANL's Comprehensive Site Plan 2000 (LANL 1999), Area Development Plans, and TA Master Plans, which guide LANL land development. Refer to Section 3.7, Land Resources, for detailed information on the available planning document developed since the Comprehensive Site Plan 2000.

Though construction and modification often result in substantial loss of greenfields (previously undeveloped areas), this has not been the case for the period 1998–2006. For this Yearbook, the amount of greenfield and brownfield (previously developed areas) development was estimated using geographic information system data relating to LANL's larger ground-disturbing projects. The estimates do not include small facility projects, such as installing short utility lines.

LANL's major projects between 1998 and 2006 have affected or will affect (in some cases, actual construction has not begun) about 338 acres. About 187 acres of greenfield (about 34 of the 2005 new acres attributable to the 12-inch gas transmission line easement) have been developed or proposed for development; the remaining 154 acres consist of brownfield areas. Greenfield development in CY 2006 did not occur.

Future construction at LANL is incorporated in various facility strategic plans. A common component of these plans is consolidation of dispersed activities into central areas and compliance with the new security Design Basis Threat requirements. As a result, future construction will frequently be concentrated in areas that are already developed or are adjacent to developed areas, thus reducing future greenfield loss.

Projects planned for FY 2007 and 2008 listed in the Ten-Year Site Plan include the following projects: the TA-55 RLOUB, CMRR, the Criticality Experimental Facility, TA-55 Radiography, Nuclear Material Safeguard & Security Upgrade Phase II, additional Super Vault Type Rooms, and the Computing and Communication Facility. New parking facilities in support of TA-55, upgrades to the Diamond/Eniwetok intersection, TA-54/Pajarito Road intersections improvements for safety, as well as a pedestrian underpass at TA-55, and TA-03 Utility Corridor are included, as well as a DOE/NNSA office building and the Science Complex to be located in a greenfield area west and northwest of the Wellness Center parking lot. In addition, the Ten-Year Site Plan notes in FY 2008 the TRU Waste Facility and the Radioactive Liquid Waste replacement may begin development, along with the Wellness Center Replacement, if funding occurs.

4.2 Waste Quantities

Wastes have been generated at levels below quantities projected by the SWEIS ROD with the exception of the ERS Program chemical wastes. For three of the last seven years

(1999–2001), ERS Program wastes (see Table 3.3-1) have been generated at levels at least seven times the SWEIS ROD projection. These wastes result from exhumation of materials placed into the environment during the early history of LANL and thus differ from the newly created wastes from routine operations. ERS Program wastes are typically shipped off-site for disposal at EPA-certified waste treatment, storage, and disposal facilities and do not impact local environs.

As a result of the uncertainty in ERS Program waste estimates, the Yearbook presents totals for LANL waste generation both with and without the ERS Program. As shown in tables in Section 3.3, total generated amounts fall within projections made by the SWEIS ROD. This Yearbook also presents total volumes of solid sanitary waste.

Sanitary Waste

LANL sanitary waste generation and transfer of waste to the Los Alamos County Landfill has varied considerably over the last decade, with a peak (more than 14,000 tons) transferred to the landfill in 2000 that is probably due to removal of Cerro Grande Fire debris. The SWEIS estimated that LANL disposed of approximately 4,843 tons of waste at the Los Alamos County Landfill between July 1995 and June 1996 (DOE 1999). This estimate may not have been representative of LANL's sanitary waste disposal over the long term.

The SWEIS projected that the Los Alamos County Landfill would not reach capacity until about 2014. In 2002, the DOE/NNSA renewed the special use permit for the County to operate waste disposal, transfer, and post-closure at the County landfill site. The Los Alamos County solid waste landfill is now scheduled to close by December 2007. In compliance with NMED regulations, a closure plan containing post-closure operations and maintenance manual with all the information needed to effectively monitor and maintain the facility for the entire post-closure period was submitted in September 2005. The County landfill will be replaced by a transfer station.

DOE/NNSA has implemented goals for WMin. LANL has instituted an aggressive WMin and recycling program that has reduced the amount of waste disposed in sanitary landfills. LANL's per capita generation of routine sanitary waste fell from 265 kilograms per person per year in 1993 to 163 kilograms per person per year in 2001 to 153 kilograms per person per year in 2006, equivalent to a 57 percent decrease in routine waste generation. This reduction is the result of aggressive WMin programs that include recycling of white paper, junk mail, colored office paper, catalogs, cardboard, plastic, pallets, scrap wood, and metal and source reduction efforts such as the Stop Mail program.

LANL's total waste generation can be classified as routine and nonroutine. The waste can also be categorized as recyclable and non-recyclable. Table 4.2-1 shows LANL sanitary waste generation for FY 2006. The recycle of total (routine + nonroutine) sanitary waste currently stands at 62 percent compared to 1993 when LANL recycled only about 10 percent of the sanitary waste.

Table 4.2-1. LANL Sanitary Waste Generation in 2006 (metric tons)

	Routine	Nonroutine	Total
Recycled	691	1,741	2,432
Landfill disposal	1,954	169	2,123
Total	2,645	1,910	4,555

Routine sanitary waste consists mostly of food and food-contaminated waste and cardboard, plastic, glass, styrofoam packing material, and similar items.

Nonroutine sanitary waste is typically derived from construction and demolition projects. Until May 1998, construction debris was used as fill to construct a land bridge between two areas of LANL; however, environmental and regulatory issues resulted in this activity being halted. Construction of new facilities and demolition of old facilities are expected to continue to produce substantial quantities of this type of waste. Recycling programs for concrete, asphalt, dirt, and brush were established in FY 2001 and are a major component of LANL's sanitary waste reduction efforts.

Chemical Waste

Waste projections for the ERS Program, by the SWEIS ROD, are uncertain at best. These projections were developed in the 1996–1997 time period. Estimates were based on the then current Installation Work Plan methodology. The ERS Program office kept a continuously updated database of waste projections by waste type for each PRS. Estimates were made for the amount of waste expected to be generated by that PRS for the life of the ERS Program. In 1996–1997, it was assumed that the life of the ERS Program would be 10 years, but the schedule now projects cleanup will extend to 2020. This demonstrates the legitimate uncertainty in waste estimates and schedules developed for the ERS Program caused by changing requirements and refined waste calculations as additional data were gathered.

One task of the ERS Program is to characterize sites about which little is known and to make adjustments in waste quantity estimates based on new information. In addition, even the most rigorous field investigations cannot truly determine waste quantities with a high degree of certainty until remediation has progressed considerably. Remediation can often create more or less waste, or waste that was not anticipated, based on field sampling. Moreover, the administrative authority may not approve a NFA recommendation or may require additional sampling or an alternative corrective action than the one planned. All of these factors lead to waste projections that are highly uncertain.

An example of the latter is MDA P. The first closure plan for MDA P was submitted to EPA, and later NMED, in the early 1980s. This plan proposed closure in place, but was never approved. During the mid- to late-1980s, all parties (LANL, DOE, EPA, and NMED) decided that clean-closure was a more appropriate standard and the plan was rewritten to reflect risk-based clean-closure. All information in the closure plan, including waste estimates, was based on best available information (a combination of operating group records and data from field investigations). However, when remediation

started, it quickly became apparent that early information was not reliable, and that there would be more waste generated than originally anticipated. The ERS Program clean-closure of MDA P began on November 17, 1997, and Phase I (i.e., waste management, handling, and disposal) and Phase II (i.e., confirmatory sampling) activities were completed by April 2002. A total of 20,812 cubic yards of hazardous waste and 21,354 cubic yards of other waste were excavated and shipped to a disposal facility. A total of 6,600 cubic yards were shipped and used as clean fill at MDA J.

Chemical waste quantities shown in Table 4.2-2 are higher than projections from 1999–2001 for two reasons: ERS Program cleanup activities during 1999, 2000, and 2001 and the Legacy Materials Cleanup Project during 1998. The variability in ERS Program waste projections is discussed in the previous paragraph. The Legacy Materials Cleanup Project, completed in September 1998, required facilities to locate and inventory all materials for which a use could no longer be identified. All such materials (more than 22,000 items) were characterized, collected, and managed. In 1999, the Non-Key Facilities also exceeded projections, and this was attributed to ERS Program cleanups of PRSs within the Non-Key Facilities. When comparing the subtotal of Key and Non-Key Facilities, only the Legacy Program in 1998 pushed the quantities over SWEIS ROD projections. Regardless, these wastes (both ERS and Legacy Program) were and are shipped off-site, do not impact the local environs, and do not hasten the need to expand the size of Area G. High amounts of chemical waste at Non-Key Facilities during 2001 were mostly due to new construction and some expanded operations.

Table 4.2-2. Chemical Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004	2005	2006
Key Facilities	10^3 kg/yr	600	120	49	1,121	513	267	64	189	23	61
Non-Key Facilities	10^3 kg/yr	650	1,506 [a]	765	368	1,255 [b]	334	594	929 [b]	623	1521
ERS Program	10^3 kg/yr	2,000	144	14,630 [c]	26,185 [d]	25,816 [e]	1,133	31	94	1,322	99
LANL	10^3 kg/yr	3,250	1,771	15,441	27,674	27,583	1,734	689	1,210	1,968	1,681[f]

a At the Non-Key Facilities in 1998, chemical waste quantities exceeded projections because of a LANL-wide campaign to identify and dispose of chemicals no longer used or needed.

b At the Non-Key Facilities in 2001 and 2004, the increased activity from new construction generated a higher quantity of chemical waste in the form of industrial solid waste.

c Cleanup efforts of the ERS Program accounted for the large waste volumes, almost 95 percent of the total. Most of the 14.5 million kilograms of chemical waste generated by the ERS Program resulted from remediation of PRSs at TA-16, particularly MDA P. MDA P was exhumed as part of a clean-closure under the RCRA.

d Cleanup efforts of the ERS Program accounted for the large waste volumes. The continuing cleanup of MDA P, remediation of PRS 3-056(c) at the upper end of Sandia Canyon in TA-03, and the accelerated cleanup of MDA R due to the Cerro Grande Fire were responsible for most of the chemical waste generation.

e The continuing cleanup efforts at MDA P and PRS 3-056(c) accounted for most of the ERS Program generated waste in 2001.

f Total slightly different than the total Chemical Waste generated in table 3.3-1 due to rounding issue.

Low Level Waste

LANL generation of LLW is generally below that projected in the SWEIS ROD (Table 4.2-3). Although data from 2006 show that SWEIS projections were exceeded at the Non-Key Facilities, total waste volumes remain within SWEIS projections.

Table 4.2-3. LLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004	2005	2006
Key Facilities	m^3/yr	7,450	1,045	1,017	1,172	2,776	1,202	1,843	875	1,349	896
Non-Key Facilities	m^3/yr	520	36	286	578 [a]	601 [a]	624 [a]	1,964 [a]	13,962 [a]	1,046	792[a]
ERS Program	m^3/yr	4,260	726	407	2,467	562	5,484	1,819	0.76	3,016	7,916[b]
LANL	m^3/yr	12,230	1,807	1,710	4,217	3,939	7,310	5,625	14,839	5,410	9,604

a LLW generation at the Non-Key Facilities exceeds the SWEIS ROD due to heightened activities and new construction.

b LLW generation at ERS Program resulted from heightened activities associated with the Consent Order (see section 2.17).

Mixed Low Level Waste

Table 4.2-4 shows a significant increase in MLLW in 2000. Total LANL MLLW volume for 2000 was 598 cubic meters; 575 of that came from the MDA P cleanup. Waste generation returned to more typical levels in successive years. Even with the noticeable increase in 2000, the generation of MLLW remains within SWEIS projections.

Table 4.2-4. MLLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004	2005	2006
Key Facilities	m^3/yr	54	8	17	11	20	11	16.55	22.90	17.9	4.7
Non-Key Facilities	m^3/yr	30	55 [a]	3	10	9	9	19.55	32.93	2.3	17.2
ERS Program	m^3/yr	548	9	1	577 [b]	29	0	0	0.02	50.6	7.7
LANL	m^3/yr	632	72	21	598	58	20	36.10	32.95	70.8	29.1

a MLLW for Non-Key Facilities was contaminated soil and asphalt generated by construction activities.

b Almost all of the MLLW generated in 2000 resulted from the remediation of MDA P.

TRU and Mixed TRU

Despite the expected slow, but increasing, levels of activity on pit production and related programs, generation of TRU (Table 4.2-5) and Mixed TRU waste (Table 4.2-6) remained within the projections of the SWEIS ROD. Increasing levels of effort in the pit production program and related programs are expected to result in increasing quantities of these waste types in the near future but are not expected to exceed SWEIS projections. LANL's OSR Project has generated TRU waste that is considered to be a waste from Non-Key Facilities. The SWEIS did not anticipate TRU waste generation from Non-Key

Facilities. A separate NEPA review was conducted for the OSR Program and the effects of implementing the program were determined to be bounded by the SWEIS impact analysis (DOE 2000).

Table 4.2-5. Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004	2005	2006
Key Facilities	m^3/yr	322	108	143	122	83	82	312.91	18.7	57.4	33.9
Non-Key Facilities	m^3/yr	0	0	0	3	25	37 [a]	90.46 [a]	21.4 [a]	17.5 [a]	42.4 [a]
ERS Program	m^3/yr	11	0	0	0	0	0	0	0	0	0
LANL	m^3/yr	333	108	143	125	108	119	403.37	40.1	74.9	76.3

a TRU waste generated at the Non-Key Facilities during CYs 2002, 2003, 2004, 2005, and 2006 was the result of the OSR Project. Because this waste comes through Shipping and Receiving, it is attributable to that location as the point of generation.

Table 4.2-6. Mixed Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003	2004	2005	2006
Key Facilities	m^3/yr	115	34	72	89	35	87	151.04 [a]	23.9 [a]	99.9	39.5
Non-Key Facilities	m^3/yr	0	0	0	0	0	0	5.91 [b]	0	0.2	0
ERS Program	m^3/yr	0	0	0	0	0	0	0	0	0	0
LANL	m^3/yr	115	34	72	89	35	87	156.95	23.9	100.1	39.5

a SWEIS ROD projection for mixed TRU waste generated by the Key Facilities was exceeded at the Solid Chemical and Radioactive Waste Facility due to DVRS repackaging of legacy TRU waste for shipment to WIPP.

b Generation of 5.91 cubic meters of mixed TRU waste at the Non-Key Facilities was the result of the OSR Project. Because this waste comes through Shipping and Receiving, it is attributed to that location as the point of generation.

4.3 Utility Consumption

Consumption of gas, water, and electricity is not additive in the same context as waste generation. Rather, consumption of these commodities is restricted by contract and should be compared to the SWEIS ROD projections for annual use. Section 3.4 presents these three sets of data (gas [see Table 3.4.1-1], electricity [see Tables 3.4.2-1 and 3.4.2-2], and water [see Table 3.4.3-1]) and demonstrates that none of these measured consumptions of utilities exceeded SWEIS ROD projections, except for natural gas in 1993, which is before the 10-year window evaluated by the SWEIS ROD. Based on these data, it appears that utility usage remains within the SWEIS ROD environmental envelope for operations.

Tables 4.3-1 and 4.3-2 show peak demand and consumption for FY 1991–2006.

Table 4.3-1. Electric Peak Coincident Demand/Fiscal Years 1991–2006

Category	LANL Base	LANSCE	LANL Total	County Total	Pool Total
SWEIS ROD	50,000[a]	63,000	113,000	Not projected	Not projected
FY 1991	43,452	32,325	75,777	11,471	84,248
FY 1992	39,637	33,707	73,344	12,426	85,770
FY1993	40,845	26,689	67,534	12,836	80,370
FY 1994	38,354	27,617	65,971	11,381	77,352
FY 1995	41,736	24,066	65,802	14,122	79,924
FY 1996	41,799	20,799	62,598	13,160	75,758
FY 1997	37,807	24,846[b]	62,653	13,661	76,314
FY 1998	39,064	24,773	63,837	13,268	77,105
FY 1999	43,976	24,510[b]	68,486	14,399	82,885
FY 2000	45,104	20,343[b]	65,447	15,176	80,623
FY 2001	50,146	20,732[b]	70,878	14,583	85,461
FY 2002	45,809	20,938	66,747	16,653	83,400
FY 2003	50,008	20,859	70,867[b]	16,910	87,777[b]
FY 2004	47,608	21,811	69,419	16,231	85,650
FY 2005	47,586	21,874	69,460	18,319	87,779
FY 2006	41,078	26,916	67,994	18,312	86,130

a All figures in kilowatts.
b Transcription and summation errors corrected from previous yearbooks.

Table 4.3-2. Electric Consumption/Fiscal Years 1991–2006

Category	LANL Base	LANSCE	LANL Total	County	Pool Total
SWEIS ROD	345,000[a]	437,000	782,000	Not projected	Not projected
FY 1991	282,994	89,219	372,213	86,873	459,086
FY 1992	279,208	102,579	381,787	87,709	469,496
FY 1993	277,005	89,889	366,894	89,826	456,720
FY 1994	272,518	79,950	352,468	92,065	444,533
FY 1995	276,292	95,853	372,145	93,546	465,691
FY 1996	277,829	90,956	368,785	93,985	462,770
FY 1997	258,841	138,844	397,685[b]	96,271	493,956[b]
FY 1998	262,570	64,735	327,305	97,600	424,905
FY 1999	255,562	113,759	369,321	106,547	475,868
FY 2000	263,970	117,183	381,153	112,216	493,369
FY 2001	294,169	80,974	375,143	116,043	491,186
FY 2002	299,422	94,966	394,398	121,013	515,401
FY 2003	294,993	87,856	382,849	109,822	492,671
FY 2004	327,117	86,275	413,392	127,429	540,821
FY 2005	328,371	93,042	421,413	129,457	550,870
FY 2006	322,566	122,354	444,920	125,117	570,036

a All figures in megawatt-hours
b Summation error corrected from previous yearbooks.

Table 4.3-3 shows water consumption in thousands of gallons for CY 1992 through CY 2006.

Table 4.3-3. Water Consumption (thousands of gallons) for Calendar Years 1992–2006

Category	LANL	Los Alamos County	Total
SWEIS ROD	759,000	Not Projected	Not Applicable
CY 1992	547,535	982,132	1,529,667
CY 1993	467,880	999,863	1,467,743
CY 1994	524,791	913,430	1,438,221
CY 1995	337,188	1,022,126	1,359,314
CY 1996	340,481	1,035,244	1,375,725
CY 1997	488,252	800,019	1,288,271
CY 1998	461,350	Not Available [a]	Not Available [a]
CY 1999	453,094	Not Available [a]	Not Applicable
CY 2000	441,000	Not Available [a]	Not Available [a]
CY 2001	393,123	Not Available [a]	Not Applicable
CY 2002	324,514	Not Available [a]	Not Available [a]
CY 2003	377,768	Not Available [a]	Not Available [a]
CY 2004	346,624	Not Available [a]	Not Available [a]
CY 2005	359,252	Not Available [a]	Not Available [a]
CY 2006	345,867	Not Available [a]	Not Available [a]

a In September 2001, Los Alamos County acquired the water supply system and LANL no longer collects this information.

Tables 4.3-4 and 4.3-5 illustrate gas consumption and steam production, respectively, from FY 1991 through FY 2006.

Table 4.3-4. Gas Consumption (decatherms[a]) at LANL/Fiscal Years 1991–2006

Fiscal Year	SWEIS ROD	Total LANL Consumption	Total Used For Electric Production	Total Used For Heat Production
1991	1,840,000	1,480,789	64,891	1,415,898
1992	1,840,000	1,833,318	447,427	1,385,891
1993	1,840,000	1,843,936	411,822	1,432,113
1994	1,840,000	1,682,180	242,792	1,439,388
1995	1,840,000	1,520,358	111,908	1,408,450
1996	1,840,000	1,358,505	11,405	1,347,100
1997	1,840,000	1,444,385	96,091	1,348,294
1998	1,840,000	1,362,070	128,480	1,233,590
1999	1,840,000	1,428,568	241,490	1,187,078
2000	1,840,000	1,427,914	352,126	1,075,788
2001	1,840,000	1,492,635	273,312	1,219,323
2002	1,840,000	1,325,639	212,976	1,112,663
2003	1,840,000	1,220,137	41,632	1,178,505
2004	1,840,000	1,149,936	25,680	1,124,256
2005	1,840,000	1,187,855	20,086	1,167,768
2006	1,840,000	1,145,433	26,912	1,118,521

a A decatherm is equivalent to 1,000 to 1,100 cubic feet of natural gas.

Table 4.3-5. Steam Production at LANL/Fiscal Years 1996–2006

Fiscal Year	TA-3 Steam Production (klb [a])	TA-21 Steam Production (klb)	Total Steam Production (klb)
1996	451,363	54,033	701,792
1997	413,684	50,382	464,066
1998	377,883	37,359	415,242
1999	576,548 [b]	29,468	606,016
2000	634,758 [b]	27,840	662,598
2001	531,763 [b]	29,195	560,958
2002	478,007 [b]	26,206	504,213
2003	351,905 [b]	26,147	378,052
2004	347,110 [b]	23,910	371,020
2005	333,042 [c]	24,299	357,341
2006	350,068 [c]	24,513	374,581

a klb: Thousands of pounds

b TA-03 steam production has two components: that used for electric production (16,571 klb for FY 2005) and that used for heat (316,471 klb in FY 2005).

4.4 Long-Term Effects

To date, LANL has continued to operate within the projections made by the SWEIS ROD. None of the measured parameters exceed SWEIS ROD projections or regulatory limits. Thus, long-term effects should remain within the projections made by the SWEIS ROD.

References

Department of Energy, 1999. "Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory," DOE/EIS-0238, Albuquerque, NM.

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Los Alamos National Laboratory, 1999. "Comprehensive Site Plan 2000, Technical Site Information Document," Los Alamos National Laboratory report LA-UR-99-6704, Los Alamos, NM.

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5.0 Summary and Conclusion

5.1 Summary

The 2006 SWEIS Yearbook reviews CY 2006 operations for the 15 Key Facilities (as defined by the SWEIS) and Non-Key Facilities at LANL and compares those operations to levels projected by the ROD. The Yearbook also reviews the environmental parameters associated with operations at the same 15 Key Facilities and the Non-Key Facilities and compares these data with ROD projections. In addition, the Yearbook presents a number of site-wide effects of those operations and environmental parameters. The more significant results presented in the Yearbook are as follows:

Facility Construction and Modifications. The ROD projected a total of 38 facility construction and modification projects for LANL facilities. Ten of these projects were listed only in the Expanded Operations Alternative, such as expansion of the LLW disposal area at TA-54, Area G, and the LPSS at TA-53. These 10 projects could not proceed until DOE issued the ROD in September 1999. However, the remaining 28 construction projects were projected in the No Action Alternative. These included facility upgrades (e.g., safety upgrades at the CMR Building and process upgrades at the RLWTF), facility renovation (e.g., conversion of the former Rolling Mill, Building 03-141, to the Beryllium Technology Facility), and the erection of new storage domes at TA-54 for TRU wastes. Since these projects had independent NEPA documentation, they could proceed while the SWEIS was still in process.

During 2006, construction of new facilities continued at one of the 15 Key Facilities. One major construction project, CINT, was completed and occupied during 2006. At the Non-Key Facilities, two major construction projects, the Security Perimeter Project and the NSSB, were completed in 2006.

Facility Operations. The SWEIS grouped LANL into 15 Key Facilities, identified the operations at each, and then projected the level of activity for each operation. These operations were grouped in the SWEIS under 96 different capabilities for the Key Facilities. Capabilities across LANL changed during 2001. Following the events of September 11, 2001, the Laboratory supports homeland security.

During CY 2006, 80 capabilities were active. The 16 inactive capabilities were the Cryogenic Separation at the Tritium Facilities; both the Destructive and Nondestructive Assay and the Fabrication and Metallography capabilities at CMR; Characterization of Materials at the TFF; the Accelerator Transmutation of Wastes at LANSCE; Waste Retrieval, Size Reduction, and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities; and eight of the nine TA-18 capabilities (Dosimeter Assessment and Calibration, Detector Development, Materials Testing, Fast-Neutron Spectrum, Dynamic Measurements, Skyshine Measurements, Vaporization, and Irradiation).

While there was activity under nearly all capabilities, the levels of these activities were mostly below levels projected by the ROD. For example, the LANSCE linac generated an H^- beam to the Lujan Center for 3,892 hours in 2006, at an average current of 190 microamps, compared to 6,400 hours at 200 microamps projected by the ROD. Similarly, no criticality experiments were conducted at Pajarito Site, compared to the 1,050 projected experiments.

Only two of LANL's facilities operated during 2005 at levels approximating those projected by the ROD—the MSL and the Non-Key Facilities. The Key Facility MSL is more akin to the Non-Key Facilities and represents 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 14 Key Facilities all conducted operations at or below projected activity levels.

Operations Data and Environmental Parameters. This 2006 Yearbook evaluates the effects of LANL operations in three general areas—effluents to the environment, workforce and regional consequences, and changes to environmental areas for which the DOE has stewardship responsibility as the administrator of LANL.

Radioactive airborne emissions from point sources (i.e., stacks) during 2006 totaled approximately 1,450 curies, approximately 7 percent of the 10-year average of 21,700 curies projected by the ROD. Radioactive emissions decreased by 83 percent from 2005 due to the repair of the emission control system at LANSCE.

Calculated NPDES discharges totaled 221.70 million gallons for CY 2006 compared to a projected volume of 278 million gallons per year. This is approximately 23.24 million gallons more than the CY 2005 total of 198.26 million gallons, due largely to resumption of normal Laboratory operations after the LANL stand down that occurred in July 2004. The 2006 total volume of discharge is well below the maximum flow of 278.0 million gallons that was projected in the SWEIS ROD. In addition, the apparent decrease in flows compared to the SWEIS ROD is primarily due to the methodology by which flow was measured and reported in the past. Historically, instantaneous flow was measured during field visits as required in the NPDES permit. These measurements were then extrapolated over a 24-hour day/seven-day week. With implementation of the new NPDES permit on February 1, 2001, data are collected and reported using actual flows recorded by flow meters at most outfalls. At those outfalls that do not have meters, the flow is calculated as before, based on instantaneous flow. Waste quantities from 2006 LANL operations were below SWEIS ROD projections for all waste types, reflecting the levels of operations at both the Key and Non-Key Facilities. Quantities of wastes generated in 2006 ranged from approximately 5 percent of the MLLW projection to about 79 percent of the LLW projection.

The workforce has been above ROD projections since 1997. The 12,764 employees at the end of CY 2006 represent 1,413 more employees than projected and reflect a decrease of 740 employees from CY 2005. Since 1998, the highest peak electricity consumption was 444 gigawatt-hours during 2006 and the maximum peak demand was 85 megawatts

during 2001 compared to projections of 782 gigawatt-hours with a peak demand of 113 megawatts. The peak water usage was 461 million gallons during 1998 (compared to 759 million gallons projected), and the peak natural gas consumption was 1.49 million decatherms during 2001 (compared to 1.84 million decatherms projected). Between 1998 and 2006, the highest collective TEDE for the LANL workforce was 163 person-rem during 2006, which is considerably lower than the workforce dose of 704 person-rem projected by the ROD.

Measured parameters for ecological resources and groundwater were similar to ROD projections, and measured parameters for cultural resources and land resources were below ROD projections. For land use, the ROD projected the disturbance of 41 acres of new land at TA-54 because of the need for additional disposal cells for LLW. As of 2006, this expansion had not become necessary.

Cultural resources remained protected, and no excavation of sites at TA-54 has occurred. (The ROD projected that 15 prehistoric sites would be affected by the expansion of Area G into Zones 4 and 6 at TA-54.)

As projected by the ROD, 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 in the 1995–2006 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977. Five additional characterization wells were complete by the end of 2006.

In addition, ecological resources are being sustained as a result of protection afforded by DOE/NNSA administration 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 have included a wildfire fuels reduction program, burned area rehabilitation and monitoring efforts, and enhanced vegetation and wildlife monitoring.

5.2 Conclusions

In conclusion, LANL operations data mostly fell within projections. Operations data that exceeded projections, such as number of employees, produced a positive impact on the economy of northern New Mexico. Overall, the 2006 operations data indicate that LANL was operating within the SWEIS envelope and still ramping up operations towards the preferred Expanded Operations Alternative in the ROD.

One purpose of the 2006 Yearbook is to compare LANL operations and resultant 2006 data to the SWEIS ROD to determine if LANL was still operating within the environmental envelope established by the SWEIS and the ROD. Data for 2006 indicate that positive impacts (such as socioeconomics) were greater than SWEIS ROD projections, while negative impacts, such as radioactive air emissions and land disturbance, were within the SWEIS operating envelope.

5.3 To the Future

The Yearbook will continue to be prepared on an annual basis, with operations and relevant parameters in a given year compared to SWEIS projections for activity levels chosen by the ROD. The presentation proposed for the 2006 Yearbook will follow that developed for the previous Yearbooks—comparison to the SWEIS ROD.

The 2006 Yearbook is an important step forward in fulfilling a commitment to make the SWEIS for LANL a living document. Future Yearbooks are planned to continue that role.

Appendix A: Chemical Usage and Estimated Emissions Data

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Key Facility	Chemical Name	Chemical Abstract Survey Number	Units	2006 Est. Air Emissions	2006 Usage
CMR Building	Acetic Acid	64-19-7	kg/yr	0.37	1.05
CMR Building	Acetone	67-64-1	kg/yr	2.49	7.11
CMR Building	Acetylene	74-86-2	kg/yr	0.00	4.27
CMR Building	Aluminum numerous forms	7429-90-5	kg/yr	0.01	0.91
CMR Building	Bromine	7726-95-6	kg/yr	1.09	3.12
CMR Building	Diethylene Triamine	111-40-0	kg/yr	0.17	0.48
CMR Building	Divinyl Benzene	1321-74-0	kg/yr	0.08	0.23
CMR Building	Ethanol	64-17-5	kg/yr	4.24	12.12
CMR Building	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	0.23	0.66
CMR Building	Hydrogen Bromide	10035-10-6	kg/yr	1.58	4.50
CMR Building	Hydrogen Chloride	7647-01-0	kg/yr	12.88	36.80
CMR Building	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.09	0.25
CMR Building	Mercury numerous forms	7439-97-6	kg/yr	0.01	1.36
CMR Building	Methyl Alcohol	67-56-1	kg/yr	0.28	0.79
CMR Building	Nitric Acid	7697-37-2	kg/yr	43.26	123.61
CMR Building	Propane	74-98-6	kg/yr	0.00	4.46
CMR Building	Sulfuric Acid	7664-93-9	kg/yr	6.44	18.40
CMR Building	Tantalum Metal	7440-25-7	kg/yr	5.18	14.81
CMR Building	Tin numerous forms	7440-31-5	kg/yr	0.01	0.50
CMR Building	Tributyl Phosphate	126-73-8	kg/yr	0.09	0.24
HRL	2-Butoxyethanol	111-76-2	kg/yr	0.16	0.45
HRL	Acetic Acid	64-19-7	kg/yr	5.51	15.74
HRL	Acrylamide	79-06-1	kg/yr	1.18	3.37
HRL	Chloroform	67-66-3	kg/yr	2.13	6.08
HRL	Ethanol	64-17-5	kg/yr	64.72	184.91
HRL	Ethanolamine	141-43-5	kg/yr	0.25	0.71
HRL	Hydrogen Chloride	7647-01-0	kg/yr	0.52	1.48
HRL	Hydrogen Peroxide	7722-84-1	kg/yr	10.14	28.98
HRL	Iso-Amyl Alcohol	123-51-3	kg/yr	0.28	0.80
HRL	Isopropyl Alcohol	67-63-0	kg/yr	5.22	14.92
HRL	Mercury numerous forms	7439-97-6	kg/yr	0.02	1.70
HRL	Methyl Alcohol	67-56-1	kg/yr	15.44	44.12
HRL	n,n-Dimethylformamide	68-12-2	kg/yr	0.08	0.24
HRL	Nitric Acid	7697-37-2	kg/yr	1.34	3.82
HRL	Phenol	108-95-2	kg/yr	0.21	0.61
HRL	Phosphorus	7723-14-0	kg/yr	0.08	0.23
HRL	Pyridine	110-86-1	kg/yr	0.16	0.47
HRL	Trichloroacetic Acid	76-03-9	kg/yr	0.18	0.50
High Explosive Processing	1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	kg/yr	10.94	31.27
High Explosive Processing	Acetone	67-64-1	kg/yr	25.68	73.38
High Explosive Processing	Acetonitrile	75-05-8	kg/yr	16.22	46.36
High Explosive Processing	Acetylene	74-86-2	kg/yr	0.00	41.28

Key Facility	Chemical Name	Chemical Abstract Survey Number	Units	2006 Est. Air Emissions	2006 Usage
High Explosive Processing	Aluminum numerous forms	7429-90-5	kg/yr	1.03	102.72
High Explosive Processing	Ammonium Chloride (Fume)	12125-02-9	kg/yr	5.20	14.87
High Explosive Processing	Boron Trifluoride	7637-07-2	kg/yr	0.11	0.30
High Explosive Processing	Carbon Black	1333-86-4	kg/yr	0.09	0.25
High Explosive Processing	Chlorodifluoromethane	75-45-6	kg/yr	7.06	20.16
High Explosive Processing	Diethylene Triamine	111-40-0	kg/yr	0.34	0.96
High Explosive Processing	Ethanol	64-17-5	kg/yr	0.52	1.49
High Explosive Processing	Ethyl Acetate	141-78-6	kg/yr	2.52	7.20
High Explosive Processing	Ethylene Dichloride	107-06-2	kg/yr	1.73	4.94
High Explosive Processing	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	3.70	10.56
High Explosive Processing	Hydrogen Chloride	7647-01-0	kg/yr	3.12	8.90
High Explosive Processing	Hydrogen Fluoride, as F	7664-39-3	kg/yr	68.74	196.41
High Explosive Processing	Hydrogen Peroxide	7722-84-1	kg/yr	0.49	1.41
High Explosive Processing	Isopropyl Alcohol	67-63-0	kg/yr	8.56	24.46
High Explosive Processing	Methyl Alcohol	67-56-1	kg/yr	19.94	56.98
High Explosive Processing	Methyl Ethyl Ketone (MEK)	78-93-3	kg/yr	80.06	228.74
High Explosive Processing	Methyl Iodide	74-88-4	kg/yr	0.11	0.31
High Explosive Processing	Methyl Isobutyl Ketone	108-10-1	kg/yr	1.12	3.19
High Explosive Processing	Methylene Chloride	75-09-2	kg/yr	9.29	26.53
High Explosive Processing	Nitric Acid	7697-37-2	kg/yr	24.30	69.43
High Explosive Processing	Nitromethane	75-52-5	kg/yr	82.86	236.74
High Explosive Processing	Propane	74-98-6	kg/yr	0.00	25.03
High Explosive Processing	Silica, Quartz	14808-60-7	kg/yr	0.18	0.50
High Explosive Processing	Sulfur Hexafluoride	2551-62-4	kg/yr	14.21	40.60
High Explosive Processing	Tetrahydrofuran	109-99-9	kg/yr	11.20	32.01

Key Facility	Chemical Name	Chemical Abstract Survey Number	Units	2006 Est. Air Emissions	2006 Usage
High Explosive Processing	Turpentine	8006-64-2	kg/yr	1.68	4.79
High Explosive Processing	VM & P Naphtha	8032-32-4	kg/yr	1.31	3.75
High Explosive Processing	Xylene (o-,m-,p-Isomers)	1330-20-7	kg/yr	0.30	0.86
High Explosive Processing	Zinc Oxide Fume	1314-13-2	kg/yr	0.01	0.50
High Explosive Testing	1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	kg/yr	6.57	18.76
High Explosive Testing	Acetone	67-64-1	kg/yr	6.64	18.96
High Explosive Testing	Copper	7440-50-8	kg/yr	0.00	0.26
High Explosive Testing	Ethanol	64-17-5	kg/yr	83.43	238.37
High Explosive Testing	Ethylene Dichloride	107-06-2	kg/yr	0.43	1.24
High Explosive Testing	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.14	0.39
High Explosive Testing	Hydrogen Peroxide	7722-84-1	kg/yr	0.70	2.00
High Explosive Testing	Isopropyl Alcohol	67-63-0	kg/yr	2.20	6.28
High Explosive Testing	Kerosene	8008-20-6	kg/yr	1.12	3.20
High Explosive Testing	Methyl Alcohol	67-56-1	kg/yr	4.57	13.06
High Explosive Testing	Methyl Ethyl Ketone (MEK)	78-93-3	kg/yr	3.38	9.66
High Explosive Testing	n-Butyl Acetate	123-86-4	kg/yr	0.15	0.44
High Explosive Testing	Nitric Acid	7697-37-2	kg/yr	1.34	3.82
High Explosive Testing	Platinum Metal	7440-06-4	kg/yr	0.22	0.63
High Explosive Testing	Potassium Hydroxide	1310-58-3	kg/yr	0.09	0.25
High Explosive Testing	Sulfur Hexafluoride	2551-62-4	kg/yr	42.63	121.79
High Explosive Testing	Tungsten as W insoluble Compounds	7440-33-7	kg/yr	0.01	0.57
LANSCE	1,4-Dioxane	123-91-1	kg/yr	1.09	3.10
LANSCE	Acetic Anhydride	108-24-7	kg/yr	0.38	1.08
LANSCE	Acetone	67-64-1	kg/yr	18.09	51.68
LANSCE	Acetylene	74-86-2	kg/yr	0.00	24.98
LANSCE	Carbon Tetrachloride	56-23-5	kg/yr	0.56	1.59
LANSCE	Chloroform	67-66-3	kg/yr	3.11	8.90
LANSCE	Chromium, Metal &Cr III Compounds, as Cr	7440-47-3	kg/yr	0.18	0.50
LANSCE	Cyclohexane	110-82-7	kg/yr	1.09	3.12

Key Facility	Chemical Name	Chemical Abstract Survey Number	Units	2006 Est. Air Emissions	2006 Usage
LANSCE	Cyclohexanone	108-94-1	kg/yr	0.17	0.47
LANSCE	Ethanol	64-17-5	kg/yr	91.25	260.70
LANSCE	Ethyl Ether	60-29-7	kg/yr	2.21	6.30
LANSCE	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	1.85	5.28
LANSCE	Hydrogen Chloride	7647-01-0	kg/yr	2.08	5.94
LANSCE	Hydrogen Fluoride, as F	7664-39-3	kg/yr	1.73	4.94
LANSCE	Hydrogen Peroxide	7722-84-1	kg/yr	0.74	2.11
LANSCE	Indium & compounds, as In	7440-74-6	kg/yr	6.51	18.61
LANSCE	Iso-Amyl Alcohol	123-51-3	kg/yr	0.56	1.60
LANSCE	Isobutane	75-28-5	kg/yr	74.85	213.86
LANSCE	Isopropyl Alcohol	67-63-0	kg/yr	18.96	54.18
LANSCE	Isopropylamine	75-31-0	kg/yr	1.99	5.69
LANSCE	Lithium Hydride	7580-67-8	kg/yr	0.18	0.50
LANSCE	Methyl Alcohol	67-56-1	kg/yr	12.33	35.22
LANSCE	n,n-Dimethylformamide	68-12-2	kg/yr	0.33	0.95
LANSCE	n-Butyl Acetate	123-86-4	kg/yr	0.15	0.44
LANSCE	Nitric Acid	7697-37-2	kg/yr	16.02	45.78
LANSCE	Oxalic Acid	144-62-7	kg/yr	1.75	5.00
LANSCE	Pentane (all isomers)	109-66-0	kg/yr	1.32	3.76
LANSCE	Propane	74-98-6	kg/yr	0.00	55.27
LANSCE	Sulfur Hexafluoride	2551-62-4	kg/yr	28.42	81.19
LANSCE	Sulfuric Acid	7664-93-9	kg/yr	0.32	0.92
LANSCE	Tetrahydrofuran	109-99-9	kg/yr	4.50	12.87
LANSCE	Tin numerous forms	7440-31-5	kg/yr	0.01	0.50
LANSCE	Toluene	108-88-3	kg/yr	3.06	8.76
LANSCE	Tungsten as W insoluble Compounds	7440-33-7	kg/yr	0.01	0.50
LANSCE	Zinc Chloride Fume	7646-85-7	kg/yr	0.12	0.34
Machine Shops	Ethanol	64-17-5	kg/yr	15.03	42.95
Machine Shops	Methyl 2-Cyanoacrylate	137-05-3	kg/yr	0.09	0.26
Machine Shops	Propane	74-98-6	kg/yr	0.00	25.68
MSL	Acetic Acid	64-19-7	kg/yr	0.92	2.62
MSL	Acetone	67-64-1	kg/yr	27.37	78.20
MSL	Acetonitrile	75-05-8	kg/yr	3.30	9.43
MSL	Copper	7440-50-8	kg/yr	0.02	1.58
MSL	Ethanol	64-17-5	kg/yr	6.05	17.29
MSL	Ethyl Ether	60-29-7	kg/yr	2.94	8.40
MSL	Hydrogen Chloride	7647-01-0	kg/yr	0.21	0.59
MSL	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.35	0.99
MSL	Hydrogen Peroxide	7722-84-1	kg/yr	0.25	0.70
MSL	Indium & compounds, as In	7440-74-6	kg/yr	3.02	8.64
MSL	Isopropyl Alcohol	67-63-0	kg/yr	11.68	33.38
MSL	Methyl Alcohol	67-56-1	kg/yr	5.78	16.52
MSL	Methylene Chloride	75-09-2	kg/yr	3.71	10.61
MSL	n,n-Dimethylformamide	68-12-2	kg/yr	1.66	4.74
MSL	Phosphoric Acid	7664-38-2	kg/yr	1.28	3.67
MSL	Tetrahydrofuran	109-99-9	kg/yr	0.31	0.89

Key Facility	Chemical Name	Chemical Abstract Survey Number	Units	2006 Est. Air Emissions	2006 Usage
Pajarito Site	Propane	74-98-6	kg/yr	0.00	89.00
Plutonium Facility	Acetic Acid	64-19-7	kg/yr	0.37	1.05
Plutonium Facility	Acetylene	74-86-2	kg/yr	0.00	18.41
Plutonium Facility	Ammonium Chloride (Fume)	12125-02-9	kg/yr	0.35	1.00
Plutonium Facility	Chlorine	7782-50-5	kg/yr	2.51	7.17
Plutonium Facility	Ethanol	64-17-5	kg/yr	6.63	18.94
Plutonium Facility	Hydrogen Chloride	7647-01-0	kg/yr	24.93	71.22
Plutonium Facility	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.81	2.31
Plutonium Facility	Hydrogen Peroxide	7722-84-1	kg/yr	65.24	186.39
Plutonium Facility	Methyl 2-Cyanoacrylate	137-05-3	kg/yr	0.13	0.36
Plutonium Facility	Methyl Alcohol	67-56-1	kg/yr	0.55	1.58
Plutonium Facility	n,n-Dimethylformamide	68-12-2	kg/yr	0.83	2.37
Plutonium Facility	Nitric Acid	7697-37-2	kg/yr	13.35	38.15
Plutonium Facility	Oxalic Acid	144-62-7	kg/yr	27.30	78.00
Plutonium Facility	Phosphoric Acid	7664-38-2	kg/yr	0.64	1.83
Plutonium Facility	Sulfuric Acid	7664-93-9	kg/yr	0.64	1.84
Radiochemistry Site	Acetic Acid	64-19-7	kg/yr	1.47	4.20
Radiochemistry Site	Acetone	67-64-1	kg/yr	43.43	124.10
Radiochemistry Site	Acetonitrile	75-05-8	kg/yr	4.70	13.44
Radiochemistry Site	Acetylene	74-86-2	kg/yr	0.00	7.89
Radiochemistry Site	Ammonium Chloride (Fume)	12125-02-9	kg/yr	0.18	0.50
Radiochemistry Site	Beryllium	7440-41-7	kg/yr	0.19	0.55
Radiochemistry Site	Chloroform	67-66-3	kg/yr	4.15	11.87
Radiochemistry Site	Dibutyl Phosphate	107-66-4	kg/yr	0.10	0.27
Radiochemistry Site	Ethanol	64-17-5	kg/yr	13.05	37.29
Radiochemistry Site	Ethyl Acetate	141-78-6	kg/yr	5.20	14.86
Radiochemistry Site	Ethyl Ether	60-29-7	kg/yr	3.21	9.17
Radiochemistry Site	Ethylene Diamine	107-15-3	kg/yr	0.16	0.45
Radiochemistry Site	Formic Acid	64-18-6	kg/yr	0.18	0.50
Radiochemistry Site	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	6.70	19.15
Radiochemistry Site	Hydrogen Bromide	10035-10-6	kg/yr	6.30	18.00
Radiochemistry Site	Hydrogen Chloride	7647-01-0	kg/yr	50.93	145.52
Radiochemistry Site	Hydrogen Fluoride, as F	7664-39-3	kg/yr	1.21	3.45
Radiochemistry Site	Hydrogen Peroxide	7722-84-1	kg/yr	7.63	21.80
Radiochemistry Site	Hydrogen Sulfide	7783-06-4	kg/yr	2.57	7.35
Radiochemistry Site	Isopropyl Alcohol	67-63-0	kg/yr	3.33	9.50
Radiochemistry Site	Lead, el.&inorg.compounds, as Pb	7439-92-1	kg/yr	0.01	0.50
Radiochemistry Site	Manganese Dust & Compounds or Fume	7439-96-5	kg/yr	0.09	0.25
Radiochemistry Site	Methyl Alcohol	67-56-1	kg/yr	8.74	24.98
Radiochemistry Site	Methylene Chloride	75-09-2	kg/yr	42.36	121.04
Radiochemistry Site	Molybdenum	7439-98-7	kg/yr	0.71	2.04
Radiochemistry Site	Nitric Acid	7697-37-2	kg/yr	359.24	1026.40
Radiochemistry Site	Oxalic Acid	144-62-7	kg/yr	0.35	1.00
Radiochemistry Site	Pentane (all isomers)	109-66-0	kg/yr	1.10	3.13
Radiochemistry Site	Phosphoric Acid	7664-38-2	kg/yr	2.57	7.34

Key Facility	Chemical Name	Chemical Abstract Survey Number	Units	2006 Est. Air Emissions	2006 Usage
Radiochemistry Site	Potassium Hydroxide	1310-58-3	kg/yr	1.00	2.86
Radiochemistry Site	Propane	74-98-6	kg/yr	0.00	4.49
Radiochemistry Site	Pyridine	110-86-1	kg/yr	0.33	0.93
Radiochemistry Site	Styrene	100-42-5	kg/yr	0.32	0.91
Radiochemistry Site	Sulfur Hexafluoride	2551-62-4	kg/yr	2.58	7.38
Radiochemistry Site	Sulfuric Acid	7664-93-9	kg/yr	1.29	3.68
Radiochemistry Site	Tellurium & Compounds, as Te	13494-80-9	kg/yr	0.22	0.63
Radiochemistry Site	Tetrahydrofuran	109-99-9	kg/yr	1.62	4.62
Radiochemistry Site	Toluene	108-88-3	kg/yr	1.52	4.33
Radiochemistry Site	Tungsten as W insoluble Compounds	7440-33-7	kg/yr	0.06	6.00
Radiochemistry Site	Uranium (natural) Sol.&Unsol.Comp. as U	7440-61-1	kg/yr	1.33	3.80
Radiochemistry Site	VM & P Naphtha	8032-32-4	kg/yr	3.15	9.00
Sigma Complex	Acetone	67-64-1	kg/yr	4.42	12.64
Sigma Complex	Beryllium	7440-41-7	kg/yr	3.18	9.07
Sigma Complex	Diethylene Triamine	111-40-0	kg/yr	0.34	0.96
Sigma Complex	Ethanol	64-17-5	kg/yr	4.44	12.70
Sigma Complex	Furfuryl Alcohol	98-00-0	kg/yr	0.37	1.07
Sigma Complex	Hydrogen Chloride	7647-01-0	kg/yr	6.65	18.99
Sigma Complex	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.16	0.45
Sigma Complex	Isopropyl Alcohol	67-63-0	kg/yr	5.44	15.54
Sigma Complex	Nitric Acid	7697-37-2	kg/yr	10.95	31.28
Sigma Complex	Sulfuric Acid	7664-93-9	kg/yr	10.30	29.44
Sigma Complex	Tetrahydrofuran	109-99-9	kg/yr	0.31	0.89
Sigma Complex	Zinc Oxide Fume	1314-13-2	kg/yr	0.01	0.50
TFF	Acetone	67-64-1	kg/yr	3.04	8.69
TFF	Aniline & Homologues	62-53-3	kg/yr	0.18	0.50
TFF	Chloroform	67-66-3	kg/yr	2.08	5.93
TFF	Ethanol	64-17-5	kg/yr	6.55	18.70
TFF	Ethyl Ether	60-29-7	kg/yr	1.96	5.60
TFF	Isopropyl Alcohol	67-63-0	kg/yr	6.05	17.28
TFF	Lithium Hydride	7580-67-8	kg/yr	0.14	0.40
TFF	Methyl Alcohol	67-56-1	kg/yr	15.37	43.92
TFF	Methyl Silicate	681-84-5	kg/yr	0.42	1.20
TFF	Methylene Chloride	75-09-2	kg/yr	4.64	13.27
TFF	n,n-Dimethylformamide	68-12-2	kg/yr	2.66	7.59
TFF	Nickel, metal (dust) or Soluble & Inorganic Comp.	7440-02-0	kg/yr	0.61	1.75
TFF	Nitric Acid	7697-37-2	kg/yr	1.07	3.05
TFF	Potassium Hydroxide	1310-58-3	kg/yr	1.23	3.50
TFF	Tetrahydrofuran	109-99-9	kg/yr	9.96	28.45
TFF	Tin numerous forms	7440-31-5	kg/yr	0.01	0.50
Tritium Operations	Propane	74-98-6	kg/yr	0.00	23.01
Waste Management Operations	Acetylene	74-86-2	kg/yr	0.00	4.27
Waste Management Operations	Ethanol	64-17-5	kg/yr	42.13	120.37

Key Facility	Chemical Name	Chemical Abstract Survey Number	Units	2006 Est. Air Emissions	2006 Usage
Waste Management Operations	Hydrogen Chloride	7647-01-0	kg/yr	367.47	1049.91
Waste Management Operations	Nitric Acid	7697-37-2	kg/yr	9.61	27.47
Waste Management Operations	Phosphorus	7723-14-0	kg/yr	0.08	0.23
Waste Management Operations	Potassium Hydroxide	1310-58-3	kg/yr	3.17	9.06
Waste Management Operations	Propane	74-98-6	kg/yr	0.00	1139.73
Waste Management Operations	Sulfuric Acid	7664-93-9	kg/yr	214.33	612.36

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Appendix B: Nuclear Facilities List

Safety Basis Division	Documentation and Records	SB 401 Rev. 8 January 2007

DOE/LANL LIST OF LOS ALAMOS NATIONAL LABORATORY NUCLEAR FACILITIES

U.S. Department of Energy
National Nuclear Security Administration
Los Alamos Site Office

Los Alamos National Laboratory
Safety Basis Division

APPROVED FOR USE

LANL Safety Basis Division	1/29/07 Date
LASO Safety Basis Team Leader	3/15/07 Date
LASO Manager	3/21/07 Date

Record of Document Revisions

Revision Record		
Revision	**Date**	**Summary**
0	April 2000	Original Issue.
1	June 2001	Updated nuclear facility list and modified format.
2	December 2001	Corrected CSOs, referenced DOE approval memo for 10 CFR 830 compliant facilities, new acronym list, and safety basis documentation update since last revision.
3	July 2002	Semi-annual update.
4	February 2004	Update safety basis documentation for Transportation, TA-18 LACEF, TA-8-23 Radiography, TA-21 TSTA, and TA-50 RLWTF. Added 11 Environmental Sites that were categorized as Hazard Category 2 and Hazard Category 3 Nuclear Facilities. TA-21 TSTA, TA-48-1 Radiochemistry, and TA-50 RAMROD were downgraded to Radiological Facilities and removed from this list. The facility contacts were changed from the Facility Manager and Facility Operations to Responsible Division Leader and Facility Management Unit.
5	August 2004	Updated TA-50 RLWTF as Hazard Category 2 Nuclear Facility, Added DVRS as a temporary Hazard Category 2 Nuclear Facility. Downgraded TSFF to a Hazard Category 3 Nuclear Facility from a Hazard Category 2. The organization of the Nuclear Facility List was modified to identify only the document that categorizes the facility. Other safety basis documents related to a facility would be identified in the Authorization Agreements. The purpose of this was to reduce redundancy and conflicts between the Nuclear Facility List and Authorization Agreements.
6	June 2005	Removed TA-8-23 from Nuclear Facility per SABM/STEELE 040805, "Approval of request to Recategorize the TA-8-23 Nuclear Facility to a less than High Hazard Radiological Facility" dated 4/8/2005. Updated TA55 PF-185 as a Hazard Category 2 Nuclear Facility per SABM:STEEL, "TA-55-PF185 OSRP SB Approval" dated 5/17/2005. Updated TA55 PF-355 as a Hazard Category 2 Nuclear Facility per SER for SST Facility, dated 5/25/2005. Updated various RDLs, editorial changes, etc. Tables columns listing the DOE CSO, and the LANL FMU were deleted upon consultation between SBO and SABT. Table rows re-ordered for easier reading.
7	October 2005	Removed TSFF per the successful OFO V&V per SABM: Steele: Approval of 2nd LANL Submittal Request for TSFF Downgrade; dated 8/1/2005
8	January 2007	Removed LANSCE 1L Target, Lujan Center, and component storage facilities due to PCM-06-016; Removed TA-55, PF-185 per

		SBT:5485.3:5SS-06-003; Removed TWISP per SABT:5485.3:CMK:103105; Updated RDL to be the current FODs relative to 5485.1 SABT:8JF-001; Updated general editorial elements (e.g., PS-SBO to SB, summary of Table 5-1, deletion of "Performance Surety", et.c)

Changes in Nuclear Facility Status

Date	Description
3/97	Omega West Reactor (OWR), TA-2-1, downgraded from hazard category 2 reactor facility to a radiological facility. OWR removed from the nuclear facilities list.
9/98	Safety Analysis Report (SAR) approved accepting the Radioactive Materials, Research, Operations, and Demonstration Facility (RAMROD), TA-50-37, as a hazard category 2 nuclear facility. RAMROD added to the nuclear facilities list.
9/98	TA-35 Buildings 2 and 27 downgraded from a hazard category 2 nuclear facility to a hazard category 3 nuclear facility.
9/98	Basis of Interim Operations (BIO) approved accepting the Los Alamos Neutron Science Center (LANSCE) A-6 Isotope Production and Materials Irradiation and 1L Manuel Lujan Neutron Scattering Center (MLNSC) Target Facilities as hazard category 3 nuclear facilities.
10/98	TA-8 Radiography Facility Buildings 24 and 70 downgraded from hazard category 2 nuclear facilities to radiological facilities.
11/98	Health Physics Calibration Facility (TA-3 SM-40, SM-65 and SM-130) downgraded from a hazard category 2 nuclear facility to a radiological facility. SM-40 and SM-65 had been hazard category 2 nuclear facilities while SM-130 had been a hazard category 3 nuclear facility. Health Physics Calibration Facility removed from the nuclear facilities list.
12/98	Radioactive Liquid Waste Treatment Facility (RLWTF) downgraded from a hazard category 2 nuclear facility to a hazard category 3 nuclear facility.
1/99	Pion Scattering Experiment of the TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE) removed from the nuclear facilities list.
2/00	Building TA-50-190, Liquid Waste Tank, of the Waste Characterization Reduction and Repackaging Facility (WCRRF) removed from the nuclear facilities list.
3/00	DOE SER clarifies segmentation of the Waste Characterization Reduction and Repackaging Facility (WCRRF) as: 1) Building TA-50-69 designated as a hazard category 3 nuclear facility, 2) an outside operational area designated as a hazard category 2 nuclear facility, and 3) the Non-Destructive Assay (NDA) Mobile Facilities located outside TA-50-69 and designated as a hazard category 2 nuclear facility.
4/00	Building TA-3-159 of the TA-3 SIGMA Complex downgraded from hazard category 3 nuclear facility to a radiological facility and removed from the nuclear facilities list.
4/00	TA-35 Nonproliferation and International Security Facility Buildings 2 and 27 downgraded from hazard category 3 nuclear facilities to radiological facilities and removed from the nuclear facilities list.
3/01	TA-3-66, Sigma Facility, downgraded and removed from this nuclear list.
5/01	TA-16-411, Assembly Facility, downgraded and removed from this nuclear list.
5/01	TA-8-22, Radiography Facility, downgraded and removed from this nuclear list.
6/01	Site Wide Transportation added as a nuclear activity (included in 10 CFR 830 plan).
9/01	TA-53 LANSCE, WNR Target 4 JCO approved as hazard category 3 nuclear activity.
10/01	TA-53 LANSCE IL JCO in relation to changes in operational parameters of the coolant system with an expiration date of 1/31/02.
10/01	TA-53 LANSCE Actinide BIO approved as hazard category 3 nuclear activity.
3/02	TA-33-86, High Pressure Tritium Facility (HPTF) removed from nuclear facilities list.
4/02	TA-53 LANSCE, DOE NNSA approves BIO for Storing Activated Components (A6, etc.) in Bldg 53-3 Sector M "Area A East" and added as hazard category 3 nuclear activity.
7/02	TA-53 LANSCE, WNR Facility Target 4 downgraded to below hazard category 3 and removed

Changes in Nuclear Facility Status

Date	Description
	from the nuclear facilities list.
1/03	TA-50 Radioactive Materials, Research, Operations, and Demonstration (RAMROD) facility was downgraded to below hazard category 3 and removed from the nuclear facilities list.
6/03	TA-48-1, Radiochemistry and Hot Cell Facility was downgraded to below hazard category 3 and removed from the nuclear facilities list.
7/03	TA-21 Tritium System Test Assembly (TSTA) facility was downgraded to below hazard category 3 and removed from the nuclear facilities list.
11/03	TA-10 PRS 10-002(a)-00 (Former liquid disposal complex) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-21 PRS 21-014 (Material Disposal Area A) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-21 PRS 21-015 (Material Disposal Area B) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-21 PRS 21-016(a)-99 (Material Disposal Area T) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-35 PRS 35-001 (Material Disposal Area W, Sodium Storage Tanks) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-35 PRS 35-003(a)-99 (Wastewater treatment plant (WWTP)) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-35 PRS 35-003(d)-00 (Wastewater treatment plant – Pratt Canyon) environmental site was categorized as a hazard category 3 nuclear facility
11/03	TA-49 PRS 49-001(a)-00 (Material Disposal Area AB) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-50 PRS 50-009 (Material Disposal Area C) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-53 PRS 53-006(b)-99 (Underground tank with spent resins) environmental site was categorized as a hazard category 2 nuclear facility
11/03	TA-54 PRS 54-004 (Material Disposal Area H) environmental site was categorized as a hazard category 3 nuclear facility
3/04	TA-54-38, Radioassay and Nondestructive Testing (RANT) Facility, is re-categorized as a Hazard Category 2 nuclear facility from Hazard Category 3.
6/04	TA-54-412 Decontamination and Volume Reduction Glovebox (DVRS) added to Nuclear Facility List. The facility will operate as a Hazard Category 2 not exceeding 5 months from the date LASO formally releases the facility for operations following readiness verification.
6/04	DOE Safety Evaluation Report for the TSFF BIO establishes that TSFF is re-categorized as a Hazard Category 3 from Hazard Category 2.
7/04	TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) was re-categorized as a Hazard Category 2 Nuclear Facility based on a DOE Memo dated March 20, 2002.

Changes in Nuclear Facility Status

Date	Description
4/05	Removed TA-8-23 from Nuclear Facility List per SABM/STEELE 040805, "Approval of request to Recategorize the TA-8-23 Nuclear Facility to a less than High Hazard Radiological Facility" dated 4/8/2005.
5/05	Updated TA55 PF-185 as a Hazard Category 2 Nuclear Facility per SABM:STEEL, "TA-55-PF185 OSRP SB Approval" dated 5/17/2005.
5/05	Updated TA55 PF-355 as a Hazard Category 2 Nuclear Facility per SER for SST Facility dated 5/25/2005.
10/05	Removed TSFF from the Nuclear Facility List per SABM: Steele: Approval of 2nd LANL Submittal Request for TSFF Downgrade; dated 8/1/2005
1/07	Removed TWISP from the Nuclear Facility List per "Authorization for Removal of TWISP Mission from the LANL Nuclear Facility List as a hazard Category 2 Activity; SABT:5485.3:CMK:103105; Removed TA-55 PF-185 from the List per "Authorization for Removal of TA-55-PF-185 from the Nuclear Facility List; SBT:5485.3:5SS-06-003; Remove LANSCE 1L Target, Lujan Center, and component storage facilities due to PCM-06-016 Titles of positions updated to reflect current operations model (RDL to FODs, SABM to SBT Leader)

FORWORD

1. This joint U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA), Los Alamos Site Office (LASO) and Los Alamos National Laboratory (LANL), document has been prepared by the LASO Safety Basis Team (SBT) and Safety Basis personnel at LANL. This document provides a tabulation and summary information concerning hazard category 1, 2 and 3 nuclear facilities at LANL. Currently, there are no hazard category 1 facilities at LANL.

2. This nuclear facility list will be updated to reflect changes in facility status caused by inventory reductions, final hazard classifications, exemptions, facility consolidations, and other factors.

3. DOE-STD-1027-92 methodologies are the bases used for identifying nuclear facilities to be included in this standard. Differences between this document and other documents that identify nuclear facilities may exist as this list only covers nuclear hazard category 2 and 3 facilities that must comply with the requirements stipulated in 10 CFR 830, Subpart B. Other documents might include facilities that have inventories below the nuclear hazard category 3 thresholds, such as radiological facilities.

LIST OF ACRONYMS AND ABBREVIATIONS

Term	Meaning
ARIES	Advanced Recovery and Integration Extraction System
BIO	Basis for Interim Operations
BUS	Business Operations (Division)
C	Chemistry (Division)
CFR	Code of Federal Regulations
CMR	Chemistry and Metallurgy Research (Facility)
CSO	cognizant secretarial officer
DD	Division Director
DOE	U.S. Department of Energy
DOE/AL	DOE Albuquerque Operations
DP	Defense Programs (DOE)
DSA	Documented Safety Analysis
DVRS	decontamination and volume reduction glovebox
EM	Environmental Management (DOE)
ESA	Engineering Sciences and Applications (Division)
ESH	Environment, Safety and Health (Division)
F&IB	Feedback and Improvement Board
FSAR	final safety analysis report
FM	facility management
FMU	facility management unit
FWO	Facility and Waste Operations (Division)
HA	hazard analysis
HC	hazard category
HPTF	High Pressure Tritium Facility
HSR	Health, Safety and Radiation
IAW	in accordance with
IFIT	Isotopic Fuel Impact Test
ITSR	interim technical safety requirements
JCO	justification for continued operations
LACEF	Los Alamos Criticality Experiment Facility
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LASO	Los Alamos Site Office
LLW	low-level waste
MER	management evaluation report
MDA	material disposal area
MLNSC	Manuel Lujan Neutron Scattering Center
N	Nuclear Nonproliferation (Division)
NIS	Nonproliferation and International Security (Division) (name changed to Nuclear Nonproliferation Division)
NDA	non-destructive assay
NNSA	National Nuclear Security Administration

NSM Rule .....Nuclear Safety Management Rule, 10 CFR 830
NTTL .....neutron tube target loading
NWIS.....Nuclear Waste Infrastructure Services
OAB .....Office of Authorization Basis
OLASO .....Office of Los Alamos Site Operation
OSR.....operational safety requirement
OWR .....Omega West Reactor
PRS .....Potential Release Site
Pu .....plutonium
RAMROD.....Radioactive Material, Research, Operations, and Demonstration (Facility)
RANT.....Radioactive Assay Nondestructive Testing (Facility)
RDL.....Responsible Division Leader
Rev. .....revision
RLWTF .....Radioactive Liquid Waste Treatment Facility
SA .....safety assessment
SAR.....safety analysis report
SBD.....Safety Basis Division
SER .....safety evaluation report
SM.....South Mesa
STD .....standard
SST.....Safe-Secure Trailer
SUP .....Supply Chain Management (Division) (formerly known as BUS)
TA .....technical area
TBD.....to be determined
TRU.....transuranic
TSD .....transportation safety document
TSE .....Tritium Science Engineering (Group)
TSR .....technical safety requirement
USQ.....unreviewed safety question
WCRRF.....Waste Characterization, Reduction and Repackaging Facility
WETF.....Weapons Engineering Tritium Facility

1 SCOPE

Standard DOE-STD-1027-92, Change 1, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, provides methodologies for the hazard categorization of DOE facilities based on facility material inventories and material at risk. This document lists hazard category 2 and 3 nuclear facilities because they must comply with requirements in Title10, *Code of Federal Regulations*, Part 830, Nuclear Safety Management, Subpart B, "Safety Basis Requirements." The Los Alamos National Laboratory (LANL) nuclear facilities that are below hazard category 3 (radiological facilities) have not been included on this list because they are exempt from the requirements in 10 CFR 830, Subpart B.

2 PURPOSE

This standard provides a list of hazard category 2 (HC2) and 3 (HC3) nuclear facilities at LANL. The list will be revised, as appropriate, to reflect changes in facility status resulting from final hazard categorization or movement, relocation, or final disposal of radioactive inventories. The list shall be used as the basis for determining initial applicability of DOE nuclear facility requirements. The list now identifies the categorization of site wide transportation and environmental sites per the requirements of 10 CFR 830, Subpart B.

3 APPLICABILITY

This standard is intended for use by NNSA and contractors with responsibilities for facility operation and/or oversight at LANL.

4 REFERENCES

4.1 49 CFR 173.469, Title 49, *Code of Federal Regulations,* Part 173 "Shippers - General Requirements for Shipments and Packagings."

4.2 DOE O 420.2, Change 1, *Safety of Accelerator Facilities*, USDOE, 5/26/99.

4.3 DOE-STD-1027-92, Change 1, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, USDOE, 9/97.

4.4 10 CFR 830, Title 10, *Code of Federal Regulations*, Part 830, "Nuclear Safety Management."

4.5 ANSI N43.6, American National Standards Institute (ANSI) N43.6, "American National Standard for General Radiation Safety—Sealed Radioactive Sources, Classification".

5 NUCLEAR FACILITIES LIST

Table 5-1 identifies all HC2 and HC3 nuclear facilities at LANL. Facilities have been categorized based on criteria in DOE-STD-1027-92, Change 1. Site, zone or area, building number, name, and dominant hazard category identifies each facility. The dominant hazard category is determined by identifying the highest hazard category for multi-process facilities. Buildings, structures, and processes addressed by a common documented safety analysis have

been designated as a single facility. DOE-STD-1027-92, Change 1, permits exclusion of sealed radioactive sources from a radioactive inventory of the facility if the sources were fabricated and tested in accordance with 49 CFR 173.469 or ANSI N43.6. In addition, material contained in U.S. Department of Transportation (DOT) Type B shipping containers may also be excluded from radioactive inventory. Facilities containing only material tested or stored in accordance with these standards do not appear in the list and tables that follow.

TABLE 5-1. Summary of LANL Nuclear Facilities

HAZ CAT	FACILITY NAME
2	Site Wide Transportation
2	TA-16 Weapons Engineering Tritium Facility (WETF)
2	TA-3 Chemistry and Metallurgy Research Facility (CMR)
2	TA-18 Los Alamos Critical Experiment Facility (LACEF) and Hillside Vault
2	TA-55 Plutonium Facility
2	TA-55 SST Facility
2	TA-50 Radioactive Liquid Waste Treatment Facility (RLWT)
2	TA-50 Waste Characterization Reduction and Repackaging Facility (WCRR)
2	TA-54 Waste Storage and Disposal Facility (Area G)
2	TA-54 Radioactive Assay Nondestructive Testing (RANT) Facility
2	TA-54 Decontamination and Volume Reduction (DVRS) Glovebox
2	TA-21 PRS 21-014 (MDA A)
3	TA-21 PRS 21-015 (MDA B)
2	TA-21 PRS-21-016(a)-99 (MDA T)
3	TA-10 PRS 10-002(a)-00 (Former liquid disposal complex)
3	TA-35 PRS 35-001 (MDA W – Sodium Storage Tanks)
3	TA-35 PRS 35-003(a)-99 (Wastewater Treatment Plant (WWTP))
3	TA-35 PRS 35-003(d)-00 (Wastewater Treatment Plant (Pratt Canyon))
2	TA-49 PRS 49-001(a)-00 (MDA AB)
2	TA-50 PRS 50-009 (MDA C)
2	TA-53 PRS 53-006(b)-99 (Underground tank with spent resin)
3	TA-54 PRS 54-004 (MDA H)

6 LANL NUCLEAR FACILITIES SUMMARY TABLES

The Table 5-2 lists the categorization basis information and a brief description for each nuclear facility identified in Table 5-1.

TABLE 5-2. Nuclear Facility Categorization Information

TA	Bldg/ PRS	Haz Cat	Facility Name	Description	Categorization Basis	FOD
Site Wide		2	Site Wide Transportation	Laboratory nuclear materials transportation	Safety Evaluation Report, Los Alamos National Laboratory Transportation Safety Document (TSD) Technical Safety Requirements (TSRs), September 2002, LANL BUS4-SA-002, R0. US DOE NNSA LASO November 8, 2002.	OSD
16	0205	2	Weapons Engineering and Tritium Facility (WETF)	Tritium Research	Safety Evaluation Report (SER) for WETF, SER-Rev.0, March 27, 2002.	Engr. Fac. Ops
3	0029	2	Chemistry and Metallurgy Research Facility CMR	Actinide chemistry research and analysis	*CMR Basis for Interim Operations*, dated August 26, 1998	CMR
18		2	Los Alamos Critical Experiment Facility (LACEF)	Critical experiment site	LANL Technical Area 18 Basis for Interim Operations, TA-18-AB-SAD-0102. March 2002.	TA-55
55	4	2	TA-55 Plutonium Facility	Pu glovebox lines; processing of isotopes of Pu	*Safety Evaluation Report of the Los Alamos National Laboratory Technical Area 55 Plutonium Building-4, Safety Analysis Report and Technical Safety Requirements*, December 1996.	TA-55
55	355	2	TA-55 SST Facility	Interim storage for nuclear material until June 2010.	*Safety Evaluation Report (SER) for the SST Facility at TA-55, Rev. 0, May 25, 2005.*	TA-55
50	0001	2	TA-50 Radioactive Liquid Waste Treatment Facility (RLWT)	Main treatment plant, pretreatment plant, decontamination operation	DOE Memorandum: Hazard Categorization of the Radioactive Liquid Waste Treatment Facility (RLWTF), SABT/RCJ.0202, March 20, 2002.	EMO
	0002	2		Low level liquid influence tanks, treatment effluent tanks, low level sludge tanks		
	0066	2		Acid and Caustic waste holding tanks		
	0090	2		Holding tank		
50	0069	3	TA-50 Waste Characterization	Waste characterization, reduction, and repackaging facility	*Safety Evaluation Report (SER) for Waste Characterization, Reduction, and*	EMO

TA	Bldg/ PRS	Haz Cat	Facility Name	Description	Categorization Basis	FOD
	External	2	Reduction and Repackaging Facility (WCRR)	NDA mobile activities outside TA-50-69	*Repackaging Facility (WCRRF) Interim Technical Safety Requirements (ITSRs), TA-50-69*, Rev. 0, February 15, 2000, March 13, 2000. (ITSRs/ HA approved as a BIO)	
	External	2		Drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69		
54	Area G	2	TA-54 Waste Storage and Disposal Facility (Area G)	Low level waste (LLW) (including mixed waste) storage and disposal in domes, pits, shafts, and trenches. TRU waste storage in domes and shafts (does not include TWISP). TRU legacy waste in pits and shafts. Low level disposal of asbestos in pits and shafts. Operations building; TRU waste storage.	U.S. Department of Energy, National Nuclear Security Administration SER for TA-55 Area G DSA 11/28/03; Final Documented Safety Analysis (DSA) Technical Area 54, Area g, ABD-WFM-001, Rev.0 April 9, 2003, ADB-WFM-002, Rev. 0, November 10, 2003.	EMO
54	0038	2	TA-54 Radioactive Assay Nondestructive Testing (RANT) Facility	Nondestructive assay and examination of waste drums, WIPP certification of TRU waste drums, TRUPACT loading of drums	Safety Evaluation Report, Basis for Interim Operation (BIO) and Technical Safety Requirements for the Radioassay and Nondestructive Testing (RANT) Facility, Technical Area 54-38, ABD-WFM-007, Rev. 0, May 30, 2003; LASO December 23, 2003	EMO
54	412	2	TA-54 Decontamination and Volume Reduction Glovebox	Recovery of buried TRU waste Note: The facility will operate as a Hazard Category 2 not exceeding 5 months from the date LASO formally releases the facility for operations following readiness verification.	Safety Evaluation Report: Basis for Interim Operation (BIO) and Technical Safety Requirements (TSRs) for the Decontamination and Volume Reduction Glovebox in support of the Quick-to-WIPP Project. ABD-WFM, Rev. 0 April 8, 2004. SER Effective Date: June 8, 2004.	EMO

TA	Bldg/ PRS	Haz Cat	Facility Name	Description	Categorization Basis	FOD
21	21-014	2	PRS 21-014 (MDA A)	MDA A is a 1.25 acre site that was used intermittently from 1945 to 1949 and 1969 to 1977 to dispose of radioactively contaminated solid wastes, debris from D&D activities, and radioactive liquids generated at TA-21. The area contains two buried 50,000 gal. storage tanks (the "General's Tanks") on the west side of MDA A, two rectangular disposal pits (each 18 ft long x 12.5 ft wide x 12.5 deep) on the east side of MDA A, and a large central pit (172 ft long x 134 ft wide x 22 ft deep).	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO
21	21-015	3	PRS 21-015 (MDA B)	MDA B is an inactive 6.03 acre disposal site. It was the first common disposal area for radioactive waste generated at LANL and operated from 1945 to 1952. The site runs along the fence line on DP Road and is located about 1600 ft east of the intersection of DB Road and Trinity Drive. The site comprises four major pits (each 300 ft x 15 ft x 12 ft deep), a small trench (40 ft x 2 ft x 3 ft deep), and miscellaneous small disposal sites.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO

TA	Bldg/ PRS	Haz Cat	Facility Name	Description	Categorization Basis	FOD
21	21-016(a)-99	2	PRS 21-016(a)-99 (MDA T)	MDA T, an area of about 2.2 acres, consists of four inactive absorption beds, a distribution box, a subsurface retrievable waste storage area disposal shafts, a former waste treatment plant, and cement paste spills on the surface and within the retrievable waste storage area.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO
10	10-0029(a)-99	3	PRS 10-002(a)-99 (Former liquid disposal complex)	PRS 10-002(a)-99 is associated with the former liquid disposal complex serving the radiochemistry laboratory at TA-10. The complex discharged to leach fields and pits. The entire complex underwent D&D in 1963. All above ground and below ground structures were removed. The remaining materials were placed in a pit that remains in place.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO

TA	Bldg/ PRS	Haz Cat	Facility Name	Description	Categorization Basis	FOD
35	35-001	3	PRS 31-001 (MDA W Sodium Storage Tanks)	MDA W consists of two vertical shafts or "tanks" that were used for the disposal of sodium coolant used in LAMPRE-1 sodium cooled research reactor. The two tanks are 125 ft long stainless steel tubes that were half filled and inserted into carbon steel casings separated by approximately 3 ft. Until 1980, a metal control shed was located above the tanks, but this feature was removed and replaced with a concrete cover. The predominant radionuclide of concern in the Sodium is Pu-239 that may have been introduced from a breach of one or two fuel elements during the operational life of LAMPRE-1.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO
35	35-003(a)-99	3	PRS 35-003(a)-99 (Wastewater treatment plant (WWTP))	The WWTP was located at the east end of Ten Site Mesa and operated from 1951 until 1963. It consisted of an array of underground waste lines, storage tanks, and chemical treatment precipitation tanks. The plant treated liquid waste that originated from the radiochemistry laboratories and operation of the radioactive lanthanum-140 hot cells in Bldg 35-2. The liquid wastes from the laboratories were acidic, and the radioactivity in the waste came from barium-140, lanthanum-140, strontium-89, strontium-90, and yttrium-90.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO

TA	Bldg/ PRS	Haz Cat	Facility Name	Description	Categorization Basis	FOD
35	35-003(d)-00	3	PRS 35-003(d)-00 (Wastewater treatment plant – Pratt Canyon)	The former structures associated with the Pratt Canyon component of the WWTP. All buildings, foundations, and structures were removed during D&D activities in 1981 and 1985, then backfilled with 20 ft of clean fill material.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO
49	49-001(a)-00	2	PRS 49-001(a)-00 (MDA AB)	This underground, former explosive test site comprises four distinct areas, each with a series of deep shafts used for subcritical testing. Radioactively contaminated surface soil exists at one of the test areas [SWMU 49-001(g)].	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO
50	50-009	2	PRS 50-009 (MDA C)	MDA C was established in 1948 to replace MDA B. MDA C covers 11.8 acres and consists of 7 pits (four are 610 ft x 40 ft x 25 ft, one is 110 ft x 705 ft x 18 ft, one is 100 ft x 505 ft x 25 ft, and one 25 ft x 180 ft x 12 ft), 107 shafts (each typically 2 ft dia. x 10-25 deep), and one unnumbered shaft used for a single strontium-90 source disposal. Pits and shafts were used for burial of hazardous chemicals, uncontaminated classified materials, and radioactive materials. TRU waste also was buried in unknown quantities in the pits. The landfill was used until 1974. COCPCs included inorganic chemicals, VOCs, SVOCs, and radionuclides.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO

TA	Bldg/ PRS	Haz Cat	Facility Name	Description	Categorization Basis	FOD
53	53-006(b)-99	2	PRS 53-006(b)-99 (Underground tank with spent resins)	Three inactive underground tanks associated with the former radioactive liquid waste system at TA-53. One tank (Structure 53-59) is 28 in dia x 65 ft long and contains spent ion exchange resin. Two empty tanks are 6 ft dia x 12 ft long and are not included here.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO
54	54-004	3	PRS 54-004 (MDA H)	MDA H is a 0.3 acre site on Mesita del Buey that contains nine inactive shafts that were used for disposal of LANL waste. Each shaft is 6 ft dia x 60 ft deep.	DOE Memo: *New Categorization of Existing Nuclear Facilities at LANL, November 26, 2003* LANL Memo: *Initial Categorization of Environmental Sites, November 21, 2003, RRES-DO:03-138*	EMO

Appendix C: Radiological Facilities List

LOS ALAMOS NATIONAL LABORATORY

RADIOLOGICAL FACILITY LIST

PS-OAB-403, Revision 1

Prepared by: George F. Nolan	Signature: [illegible] for George Nolan	Date: 1/13/03
Approved by: David G.Satterwhite, Office Leader	Signature: [illegible]	Date: 1/13/03

HISTORY OF REVISIONS

Revision Record		
Revision	**Date**	**Summary**
0	09/18/01	Original Issue
1	11/14/02	Annual update based upon input from facility managers

Los Alamos
NATIONAL LABORATORY

James L. Holt
Associate Director for Operations
Los Alamos National Laboratory
Mail Stop A104
Los Alamos, New Mexico 87545
505-667-0079/Fax 505-665-1812

Date: September 26, 2002
Refer to: AD-Ops:02-120

Christopher M. Steele
National Nuclear Security Administration
Office of Los Alamos Support Operations
P.O. Box 1663, Mail Stop A316
Los Alamos, NM 87545

Dear Mr. Steele:

Subject: Radiological Facilities Inventory of Radioactive Material

Attached for your information are the results of LANL's annual radioactive material inventory, conducted in accordance with the requirement of LIR 300-00-05, *Facility Hazard Categorization*. Attachment 1 is the radioactive material inventory report for radiological facilities. The methodology used in developing this report is detailed in Attachment 2. Attachment 3 is the updated listing of radiological facilities. Attachment 4 is a summary of the changes to the radiological facilities list over the past year

If you have questions please contact George Nolan, 7-3477.

Sincerely,

James L. Holt
Associate Director for Operations

JLH:DGS:mv

Attachments:
1. RAM Inventory
2. RAM Inventory Methodology
3. LANL Radiological Facility List
4. Summary of Radiological Facility List Changes.

Action to Jim Lovd and
Dave Sattiewhite
Due to Scott COB Nov. 7th.

BJB
11/1

United States Government

Department of Energy

memorandum

National Nuclear Security Administration
Albuquerque Operations Office
Office of Los Alamos Site Operations
Los Alamos, New Mexico 87544

DATE: October 25, 2002

REPLY TO ATTN OF: SABT/RCJ.02.012: SABM Steele

SUBJECT: Radiological Facilities Inventory of Radioactive Material

TO: James L. Holt, Associate Director for Operations, MS-A104

The Los Alamos National Laboratory (LANL) submitted, via a letter from J. Holt to C. Steele, dated September 26, 2002, the "Radiological Facilities Inventory of Radioactive Material" to National Nuclear Security Administration (NNSA) for information (Attachment 1). NNSA has reviewed the subject document and has identified issues in a number of the hazard categorization tables included in the document. These tables provide the calculations of the Hazard Category (HC3) Ratio used to determine that the radioactive material inventory in the facility is less than HC3 in accordance with the standard and Laboratory Implementing Requirements (LIR 300-00-05, Facility Hazard Categorization).

The calculations provided in these tables are used by LANL to finalize the current list of Radiological Facilities (RF) at LANL. NNSA performed independent verification of a small number of the hazard categorization results using the Mass Inventory values provided with the correct threshold values obtained from DOE-STD-1027-92 CN1. The results of the NNSA review indicates that the inventory / HC3 ratios for the NIS facilities could be greater than one (Attachment 2).

NNSA comments on the above referenced submittal are included as Attachment 2. NNSA requires LANL to review all of the Radioactive Material Inventory tables submitted in the referenced document and revise those tables as appropriate.

If you have any questions regarding this matter please contact Randy Janke of my staff at 665-4205 or myself at 667-3418.

Christopher M. Steele
Senior Authorization Basis Manager

U02

Los Alamos
NATIONAL LABORATORY

James L. Holt
Associate Director for Operations
Los Alamos National Laboratory
Mail Stop A104
Los Alamos, New Mexico 87545
505-667-0079/Fax 505-665-1812

Date: November 14, 2002
Refer to: AD-Ops:02-152

Christopher M. Steele
National Nuclear Security Administration
Office of Los Alamos Support Operations
P.O. Box 1663, Mail Stop A316
Los Alamos, NM 87545

Dear ~~Mr. Steele~~ Chris:

Subject: Radiological Facilities Inventory of Radioactive Material

Reference: SABT/RCJ.02.012:SABM Steele (October 25, 2002)

The subject document has been revised and attached (Attachment 1) according to your comments/ observations transmitted in the Reference stated above. Response/resolution to each comment has been also documented and attached (Attachment 2).

If you have questions, please contact David Satterwhite 5-8034 or Kyo Kim 5-8902 of my staff.

Sincerely,

Jim

James L. Holt
Associate Director for Operations

JLH:DGS:mv

Attachments:

1. List of LANL Radiological Facilities
2. NNSA Comment Resolution

Based upon input from facility managers (FM), the facilities listed in the table below are identified as radiological facilities. The definition for radiological facility per in the DOE-approved LIR 300-00-05, *Facility Hazard Categorization,* is:

> *A radioactive material using area/activity that contains less than 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 in 10 CFR 835. Radioactive material that is either in a DOT Type B shipping container or is a sealed source may be excluded from consideration per the conditions defined by DOE-STD-1027-92.*

Based on the LIR definition, the following instructions were provided to the facility mangers to identify radiological facilities:

a. Contains less than hazard category 3 (<HC3) amounts of RAM (see DOE-STD-1027-92, Change 1).
b. Contains area posted as a radiological area (per 10 CFR 835)
c. Exclude RAM in sealed radioactive sources meeting requirements of ANSI N43.6.
d. Exclude RAM in U.S. Department of Transportation (DOT) Type B container.
e. Exclude structures included in the safety bases of HC2 and HC3 nuclear facility (see *DOE/LANL List of Los Alamos National Laboratory Nuclear Facilities*, FWO-OAB 401, Rev. 1), and
f. Exclude structures whose only source of radiation is machine produced X rays.
g. RAM used in exempted, commercially available products, should not be considered part of a facility's inventory.

Radiological facilities (<HC3) are nuclear facilities but are not required to comply with 10 CFR 830, Subpart B. The attached table provides a list of these radiological facilities identified in September 2002. Several facilities are listed as potentially radiological facilities. These facilities normally have no RAM, but could receive RAM on an interim basis. Per DOE-STD-1027-92, a facility is involved with an inventory of radioactive materials that varies with time must be categorized on the basis of its maximum inventory of radioactive materials.

LANL RADIOLOGICAL FACILITY SUMMARY TABLE

TA-BLDG	Descriptor	FM/FMU	Disposition Note
TA-2-1	Omega Reactor	D. McLain/64	D&D residual radiation
TA-3-16	Ion Exchange	D. McLain/64	D&D, tritium
TA-3-34	Cryogenics Bldg B	L. Woodrow/73	Multiple isotope samples
TA-3-35	Σ Press Building	L. Woodrow/73	DU plus residual in ducts
TA-3-40	Physics Bldg (HP)	S. Archuleta/77	To relocate TA-36-1/214
TA-3-66	Sigma Building	L. Woodrow/73	DU
TA-3-102	Tech Shop Add	B. Grace/70	DU
TA-3-159	Σ Thorium Storage	L. Woodrow/73	Th-232
TA-3-169	Warehouse	L. Woodrow/73	DU
TA-3-1698	Material Science Lab	L. Woodrow/73	Multiple isotope samples
TA-3-1819	Experiment Mat'l Lab	L. Woodrow/73	Multiple isotope samples
TA-8-22	X ray Facility	B. Grace/70	Potential DU
TA-8-70	Non Destructive Testing	B. Grace/70	DU/Th-232
TA-8-120	Radiography	B. Grace/70	Potential DU
TA-11-30	Vibration Test	B. Grace/70	Potential DU
TA-15-R183	Vault	T. Alexander/67	DU
TA-16-88	RAM Machine Shop	B. Grace/70	DU/Th-232
TA-16-202	Laboratory	B. Grace/70	DU/tritium
TA-16-207	Component Testing	B. Grace/70	Potential DU/Th-232, Rm 113
TA-16-300	Component Storage	B. Grace/70	DU/Th-232
TA-16-301	Component Storage	B. Grace/70	DU
TA-16-302	Component Storage Training	B. Grace/70	DU/Th-232
TA-16-332	Component Storage	B. Grace/70	DU/Th-232
TA-16-410	Assembly Building	B. Grace/70	DU/Th-232
TA-16-411	Assembly Building	B. Grace/70	DU/Th-232
TA-21-5	Lab Bldg	D. McLain/64	D&D
TA-33-86	High pressure tritium	D. McLain/64	D&D
TA-35-2	Nuclear Safeguards Research	P. Bussolini/75	NIS-5 sources
TA-35-27	Nuclear Safeguards Lab	P. Bussolini/75	NIS-5 sources
TA-36-1	Laboratory and offices	S. Helmick/71	Sources
TA-36-214	Central HP Calibration Facility	S. Helmick/71	Sources
TA-37-10	Storage Magazine	B. Grace/70	DU
TA-37-14	Storage Magazine	B. Grace/70	DU
TA-37-16	Storage Magazine	B. Grace/70	DU
TA-37-24	Storage Magazine	B. Grace/70	DU
TA-37-25	Storage Magazine	B. Grace/70	DU
TA-41-1	Underground Vault	B. Grace/70	DU/Th-232
TA-43-1	Bio Lab	R. Crook/72	Sources
TA-53-945	RLW Treatment Facility	D. Seely/61	Waste products
TA-53-954	RLW Basins	D. Seely/61	Waste products
TA-54-412	DVRS	D. McLain/64	Waste products

LIST OF LANL RADIOLOGICAL FACILITIES

Table	TA-BLDG	Descriptor	FM/FMU	Disposition/Note
1.	TA-2-1	Omega Reactor	D. McLain/64	D&D residual radiation
2.	TA-3-16	Ion exchange	D. McLain/64	D&D tritium
3.	TA-3-34	Condensed Matter & Thermal Physics	L. Woodrow/73	Multiple isotope samples
4.	TA-3-35	Sigma Press Building	L. Woodrow/73	DU
5.	TA-3-40	Physics Bldg (Health Physics)	S. Archuleta/77	Multiple isotope samples
6.	TA-3-66	Sigma Building	L. Woodrow/73	DU
7.	TA-3-102	RAM Machine Shop	B. Grace/70	DU
8.	TA-3-159	Sigma Thorium Building	L. Woodrow/73	Th-232
9.	TA-3-169	Sigma Thorium Building	L. Woodrow/73	DU
10.	TA-3-1698	Material Science Lab	L. Woodrow/73	Multiple isotope samples
11.	TA-3-1819	Material Science Lab	L. Woodrow/73	Multiple isotope samples
12.	TA-8-22	Radiography	B. Grace/70	DU
13.	TA-8-70	NDT&E	B. Grace/70	DU/Th-232
14.	TA-8-120	Radiography	B. Grace/70	Potential DU
15.	TA-11-30	Vibration Testing	B. Grace/70	Potential DU
16.	TA-15-R183	Vault	T. Alexander/67	DU
17.	TA-16-88	Component Storage	B. Grace/70	DU/Th-232
18.	TA-16-202	Laboratory	B. Grace/70	DU/tritium
19.	TA-16-207	Component Testing	B. Grace/70	DU/Th-232, Rm 113
20.	TA-16-300	Component Storage	B. Grace/70	DU/Th-232
21.	TA-16-301	Component Storage	B. Grace/70	DU
22.	TA-16-302	Component Storage/Training	B. Grace/70	DU/Th-232
23.	TA-16-332	Component Storage	B. Grace/70	DU/Th-232
24.	TA-16-410	Assembly Building	B. Grace/70	DU/Th-232
25.	TA-16-411	Assembly Building	B. Grace/70	DU/Th-232
26.	TA-21-5	Lab Bldg	D. McLain/64	D&D
27.	TA-33-86	High pressure tritium facility	D. McLain/64	D&D, tritium
28.	TA-35-2	Nuclear Safeguards Research	P. Bussolini/75	Sources
29.	TA-35-27	Nuclear Safeguards Research	P. Bussolini/75	Sources
30.	TA-36-1	Calibration Lab and offices	S. Helmick/71	Sources
31.	TA-36-214	Calibration Lab and offices	S. Helmick/71	Sources
32.	TA-37-10	Storage Magazine	B. Grace/70	DU
33.	TA-37-14	Storage Magazine	B. Grace/70	DU
34.	TA-37-16	Storage Magazine	B. Grace/70	DU
35.	TA-37-24	Storage Magazine	B. Grace/70	DU
36.	TA-37-25	Storage Magazine	B. Grace/70	DU
37.	TA-41-1	Underground Vault	B. Grace/70	DU/Th-232
38.	TA-43-1	Bio/Chem Laboratory	Crook/72	Lab sources
39.	TA-53-945	RLW Treatment	D. Seely/61	RLW products
40.	TA-53-954	RLW Basins	D. Seely/61	RLW products
41.	TA-54-412	Radioactive waste compactor (DVRS)	D. McLain/64	Residual

Table 1 Isotopic Inventory for BLDG TA-2-1

Descriptor: Omega Reactor

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: SO-WFM-001, *Inventory Control for Radiological Facilities*

Disposition D&D

Date of Inventory: Not applicable

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Fixed low level residual radiation. No new RAM allowed.			
		HC3 Ratio Sum	**NA**

Table 2 Isotopic Inventory for BLDG TA-3-16

Descriptor: Ion exchange

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: FM Standing Order

Disposition D&D

Date of Inventory: Not applicable

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Entrained tritium. No new RAM allowed.			
		HC3 Ratio Sum	**NA**

Table 3 Isotopic Inventory for TA-3-34

Descriptor: Condensed Matter and Thermal Physics

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FSP-PAC-5304, *Facility Safety Plan for the Material Science Complex*

Date of Inventory: August 8, 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Pu-239	0.15	8.4	0.020
		HC3 Ratio Sum	**0.020**

Table 4 Isotopic Inventory for TA-3-35

Descriptor: Sigma Press Building

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FOM-AP-0310, *MST Field Operations Manual for Radionuclide Inventory Management*

Date of Inventory: August 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Empty			
		HC3 Ratio Sum	**0.000**

Table 5 Isotopic Inventory for TA-3-40

Descriptor: Physics Building (Health Physics)

Division: P

Responsible FM/FMU: D. Riker/77

RAM Accountability Procedure: FSP-FMU77-2002-02

Date of Inventory: September 12, 2002

Isotope	Activity(Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Cl-36	4.7E-7	3.4E+2	0.000
Co-60	2.00E-6	2.8E+2	0.000
Sr-90	1.70E-5	1.6E+1	0.000
I-129	1.03E-6	6.0E-2	0.000
Cs-137	5.50E-3	6.0E+1	0.000
Pu-238	7.41E-8	6.2E-1	0.000
Pu-239	4.00E-8	5.2E-1	0.000
H-3	1.00E+1	1.6E+4	0.001
		HC3 Ratio Sum	**0.001**

Table 6 Isotopic Inventory for TA-3-66

Descriptor: Sigma Building

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FOM-AP-0310, *MST Field Operations Manual for Radionuclide Inventory Management*

Date of Inventory: August 15, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	9.55E+3	1.3E+4	0.735
		HC3 Ratio Sum	**0.735**

Table 7 Isotopic Inventory for TA-3-102

Descriptor: RAM machine shop

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	3E+3	1.3E+4	0.231
		HC3 Ratio Sum	**0.231**

Table 8 Isotopic Inventory for TA-3-159

Descriptor: Sigma Thorium Building

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FOM-AP-0310, *MST Field Operations Manual for Radionuclide Inventory Management*

Date of Inventory: August 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Th-232	2.43E+5	9.1E+5	0.267
		HC3 Ratio Sum	**0.267**

Table 9 Isotopic Inventory for TA-3-169

Descriptor: Sigma Thorium Building

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FOM-AP-0310, *MST Field Operations Manual for Radionuclide Inventory Management*

Date of Inventory: August 15, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	1.18E+3	1.3E+4	0.091
		HC3 Ratio Sum	**0.091**

Table 10 Isotopic Inventory for TA-3-1698

Descriptor: Material Science Lab

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FSP-PAC-5304, *Facility Safety Plan for the Material Science Complex*

Date of Inventory: August 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Empty			0.000
		HC3 Ratio Sum	**0.000**

Table 11. Isotopic Inventory for TA-3-1819

Descriptor: Material Science Lab

Division: MST

Responsible FM/FMU: L. Woodrow/73

RAM Accountability Procedure: MST-FSP-PAC-5304, *Facility Safety Plan for the Material Science Complex*

Date of Inventory: August 15, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Empty			0.00
		HC3 Ratio Sum	**0.00**

Table 12. Isotopic Inventory for TA-8-22

Descriptor: Radiography

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	4.8E+1	1.3E+4	0.004
		HC3 Ratio Sum	**0.004**

Table 13. Isotopic Inventory for TA-8-70

Descriptor: NDT&E

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	4.70E+1	1.3E+4	0.004
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.004**

Table 14. Isotopic Inventory for TA-8-120

Descriptor: Radiography

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
Empty			
		HC3 Ratio Sum	**0.000**

Table 15. Isotopic Inventory for TA-11-30

Descriptor: Vibration testing

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Empty			
		HC3 Ratio Sum	**0.000**

Table 16. Isotopic Inventory for TA-15-R183

Descriptor: Vault

Division: DX

Responsible FM/FMU: T. Alexander/67

RAM Accountability Procedure: PRO-DX-001 and PRO-DX-009

Date of Inventory: August 26, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
U-238 (DU)	7.38E+5	1.3E+7	0.057
		HC3 Ratio Sum	**0.057**

Table 17. Isotopic Inventory for TA-16-88

Descriptor: Component storage

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	6.26E+2	1.3E+4	0.048
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.048**

Table 18. Isotopic Inventory for TA-16-202

Descriptor: Laboratory

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
U-238 (DU)	0.0E+0	1.3E+7	0.000
H-3	0.0E+0	1.6E+0	0.000
		HC3 Ratio Sum	**0.000**

Table 19. Isotopic Inventory for TA-16-207

Descriptor: Component testing

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	5.4E+1	1.3E+4	0.004
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.004**

Table 20. Isotopic Inventory for TA-16-300

Descriptor: Component storage

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	0	1.3E+4	0.000
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.000**

Table 21. Isotopic Inventory for TA-16-301

Descriptor: Component storage

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	2.3E+1	1.3E+4	0.002
		HC3 Ratio Sum	**0.002**

Table 22. Isotopic Inventory for TA-16-302

Descriptor: Component storage/training

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	3.91E+2	1.3E+4	0.030
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.030**

Table 23. Isotopic Inventory for TA-16-332

Descriptor: Component storage

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	5.113E+3	1.3E+4	0.393
Th-232	1.50E+2	9.1E+2	0.165
		HC3 Ratio Sum	**0.558**

Table 24. Isotopic Inventory for TA-16-410

Descriptor: Assembly building

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	1.94E+2	1.3E+4	0.015
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.015**

Table 25. Isotopic Inventory for TA-16-411

Descriptor: Assembly building

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Materials*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	4.0E+0	1.3E+4	0.000
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.000**

Table 26. Isotopic Inventory for TA-21-5

Descriptor: Laboratory building

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: FM Standing Order

Disposition: D&D

Date of Inventory: Not applicable

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Fixed low level residual radiation. No new RAM allowed per FM standing order.			
		HC3 Ratio Sum	**NA**

Table 27. Isotopic Inventory for TA-33-86

Descriptor: High-pressure tritium facility

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: FM Standing Order

Disposition: D&D

Date of Inventory: Not applicable

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
Entrained tritium in confinement system piping that is open to the atmosphere. No new RAM allowed per FM standing order.			
		HC3 Ratio Sum	**NA**

Table 28. Isotopic Inventory for TA-35-2

Descriptor: Nuclear safeguards research

Division: NIS

Responsible FM/FMU: P. Bussolini/75

RAM Accountability Procedure: NIS-5-99-01, *Radioactive Sealed Source Control and Accountability*

Date of Inventory: August 8, 2002

Isotope	Inventory (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Am-241	1.32E-1	5.20E-1	0.254
Ba-133	3.42E-3	1.10E+3	0.000
Cd-109	1.65E-4	1.80E+2	0.000
Cm-244	3.80E-5	1.04E+0	0.000
Cs-137	5.24E-4	6.00E+1	0.000
Np-237	4.00E-6	4.20E-1	0.000
Pu-238*	5.55E-3	3.60E-2	0.154
Pu-239*	1.49E+0	8.40E+0	0.177
Pu-240*	2.83E-1	2.28E+0	0.124
Pu-241*	1.97E-2	3.10E-1	0.064
Pu-242*	2.20E-2	1.58E+2	0.000
Sr-90	2.28E-2	1.60E+1	0.001
Tc-99	8.50E-2	1.70E+3	0.000
Th-228	6.31E-6	1.00E+0	0.000
Th-232	5.62E-4	1.00E-1	0.006
U-235*	1.81E+3	1.90E+6	0.001
U-238*	2.42E+4	1.30E+7	0.002
		HC3 Ratio Sum	**0.783**

Note *: U and Pu isotopes are in gram unit

Table 29. Isotopic Inventory for TA-35-27

Descriptor: Nuclear safeguards research

Division: NIS

Responsible FM/FMU: P. Bussolini/75

RAM Accountability Procedure: NIS-5-99-01, *Radioactive Sealed Source Control and Accountability*

Date of Inventory: August 8, 2002

Isotope	Inventory (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
H-3	2.91E+0	1.60E+4	0.000
Cf-252	2.09E-2	3.20E+0	0.007
Am-241	3.88E-2	5.20E-1	0.074
Cs-137	2.84E-3	6.00E+1	0.000
Pu-238*	5.18E-4	3.60E-2	0.014
Pu-239*	4.58E-1	8.40E+0	0.054
Pu-240*	5.27E-2	2.28E+0	0.023
Pu-241*	3.31E-3	3.10E-1	0.010
Pu-242*	1.50E-2	1.58E+2	0.000
Ra-226	4.43E+0	1.20E+1	0.369
U-235*	9.96E+3	1.90E+6	0.005
U-238*	1.39E+6	1.30E+7	0.106
		HC3 Ratio Sum	**0.662**

Note *: Pu and U isotopes are in gram units

Table 30. Isotopic Inventory for TA-36-1

Descriptor: Calibration lab and offices

Division: Responsible FM/FMU: S. Helmick/71

RAM Accountability Procedure: HSR-4-SOP-07, *Safe Operating Procedure for the Central Health Physics Calibration Facility*

Date of Inventory: September 3, 2002

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Am-241	1.13E-5	5.2E-1	0.000
Gd-148	4.2E-8	8.2E-2	0.000
Ba-133	2.08E-6	1.1E+3	0.000
C-14	1.6E-7	4.2E+2	0.000
Cl-36	4.79E-7	3.4E+2	0.000
Cs-137	7.76E-5	6.0E+1	0.000
I-129	1.03E-7	6.0E-2	0.000
Na-22	1.36E-6	2.4E+2	0.000
Pm-147	1.14E-7	1.00E+3	0.000

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Pu-238	7.00E-8	6.2E-1	0.000
Pu-239	3.97E-6	5.2E-1	0.000
Ra-226	9.00E-10	1.20E+1	0.000
Sr-90	4.54E-5	1.6E+1	0.000
Tc-99	2.92E-7	1.7E+3	0.000
Tl-204	4.00E-8	1.20E+3	0.000
H-3	2.00E+1	1.6E+4	0.001
U-235	6.00E-9	4.2E+0	0.000
		HC3 Ratio Sum	**0.001**

Table 31. Isotopic Inventory for TA-36-214

Descriptor: Calibration lab and offices

Division: Responsible FM/FMU: S. Helmick/71

RAM Accountability Procedure: HSR-4-RIC-SOP-06, *Central Health Physics Calibration Facility Safe Operating Procedure, (Sec. 8)*

Date of Inventory: September 3, 2002

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Pm-147	1.58E-3	1.00E+3	0.000
Tl-204	1.20E-4	1.20E+3	0.000
Sr-90	4.65E-3	1.6E+1	0.000
Cs-137	1.28E-4	6.0E+1	0.000
		HC3 Ratio Sum	**0.000**

Table 32. Isotopic Inventory for TA-37-10

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.60E+3	1.3E+4	0.662
		HC3 Ratio Sum	**0.662**

Table 33. Isotopic Inventory for TA-37-14

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.79E+3	1.3E+4	0.676
		HC3 Ratio Sum	**0.676**

Table 34. Isotopic Inventory for TA-37-16

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.28E+3	1.3E+4	0.637
		HC3 Ratio Sum	**0.637**

Table 35. Isotopic Inventory for TA-37-24

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.80E+3	1.3E+4	0.677
		HC3 Ratio Sum	**0.677**

Table 36. Isotopic Inventory for TA-37-25

Descriptor: Storage magazine

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	8.77E+3	1.3E+4	0.675
		HC3 Ratio Sum	**0.675**

Table 37. Isotopic Inventory for TA-41-1

Descriptor: Underground vault

Division: ESA

Responsible FM/FMU: B. Grace/70

RAM Accountability Procedure: ESA-WMM-AP-04, *Material Control and Physical Inventory of Nuclear Material*

Date of Inventory: September 24, 2002

Isotope	Mass (kg)	1027 HC3 TQ (kg)	HC3 Ratio
U-238 (DU)	0	1.3E+4	0.000
Th-232	0	9.1E+2	0.000
		HC3 Ratio Sum	**0.000**

Table 38. Isotopic Inventory for TA-43-1

Descriptor: Bio/Chem Lab

Division: B

Responsible FM/FMU: R. Crook/72

RAM Accountability Procedure: B-PRO-001, *Procedure for Receipt of Radioactive Material at HRL*

Date of Inventory: September 16, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
C-14	2.24E-3	9.40E+1	0.000
		HC3 Ratio Sum	**0.000**

Table 39. Isotopic Inventory for TA-53-945

Descriptor: RLW treatment

Division: LANSCE

Responsible FM/FMU: D. Seely/61

RAM Accountability Procedure: SOP-RLW-002, Rev. 3, *Procedures for TA-53 Radioactive Liquid Waste System: Emergency, Operations, Maintenance, and Sampling*

Date of Inventory: September 24, 2002

Isotope	Activity(Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
H-3	5.8E-2	1.6E+4	0.000
P-32	9.9E-4	1.2E+1	0.000
Co-58	4.5E-8	9.0E+2	0.000
Gd-148	1.2E-4	8.2E-2	0.001
Yb-166	1.4E-2	8.4E+2	0.000
Lu-170	3.1E-2	5.0E+2	0.000
Lu-171	2.3E-3	1.4E+3	0.000
Hf-172	2.2E-2	9.4E+1	0.000
Lu-172	4.8E-3	4.8E+2	0.000
Hf-175	1.4E-2	2.0E+3	0.000
W-181	1.5E-1	1.3E+4	0.000
Ta-182	4.9E-2	6.2E+2	0.000
W-185	9.0E-2	1.4E+3	0.000
U-234	8.3E-6	4.2E+0	0.000
U-235	1.9E-7	4.2E+0	0.000
U-238	1.6E-7	4.2E+0	0.000
Pu-238	4.6E-6	6.2E-1	0.000
Pu-239	2.2E-6	5.2E-1	0.000
Am-241	8.0E-6	5.2E-1	0.000
		HC3 Ratio Sum	**0.001**

Table 40. Isotopic Inventory for TA-53-954

Descriptor: Radioactive liquid waste basins

Division: LANSCE

Responsible FM/FMU: D. Seely/61

RAM Accountability Procedure: SOP-RLW-002, Rev. 3, *Procedures for TA-53 Radioactive Liquid Waste System: Emergency, Operations, Maintenance, and Sampling*

Date of Inventory: September 24, 2002

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
H-3	5.8E-2	1.6E+4	0.000
Co-58	4.5E-8	9.0E+2	0.000
Lu-170	3.1E-2	5.0E+2	0.000
Hf-172	2.2E-2	9.4E+1	0.000

Isotope	Activity (Ci)	1027 HC3 TQ (Ci)	HC3 Ratio
Hf-175	1.4E-2	2.0E+3	0.000
W-181	1.5E-2	1.3E+4	0.000
		HC3 Ratio Sum	**0.000**

Table 41. Isotopic Inventory for TA-54-412

Descriptor: Radioactive waste compactor (DVRS)

Division: FWO

Responsible FM/FMU: D. McLain/64

RAM Accountability Procedure: DOP-WFM-001, *DVRS Process Operation*

Date of Inventory: September 24, 2002

Isotope	Mass (g)	1027 HC3 TQ (g)	HC3 Ratio
None			
		HC3 Ratio Sum	**NA**

Attachment 2

Response/Resolution of NNSAComments on LANL's Radiological Facilities Inventory of Radioactive Material

No.	Page	Section/Para/Line	Reviewer Comment	Response/Resolution
1	1	List of LANL RF's	Observation: The table descriptors are inconsistent with the descriptor provided by the Facility Manager (FM). Example; table 3 states 'Cryogenics Bldg. B' and the FM's ' Condensed matter and Thermal Physics'. This inconsistency can be found for table 3,7,9,11,12,17,and 41. Action; use consistent terminology.	Revised descriptors to be consistent with each other.
2	1	List of LANL RF's	Observation: the tables' Disposition/Note are not consistent with that provided by the FM. Example; table 9 states 'Multiple isotope samples' and the FM's is 'Empty' This inconsistency can be found for table 3,4,10,11,14,and 15. Action; correct the difference.	The subject buildings will be used for the purpose Noted when needed. No RAM was stored at the time of inventory.
3	1	List of LANL RF's	Observation: the observation items No.1 and No. 2, listed above, have been incorporated into the LANL List of Radiological Facility (RF) attached to LOS ALAMOS NATIONAL LABORATORY RADIOLOGICAL FACILITY LIST, PS-OAB-403, Rev. 1 Action: correct the RF's list using the information obtained from the completion of observation items No. 1 and 2.	See 1 & 2 above
4	8	Table 20	Observation: the header states 1027 HC3 TQ (g) while the threshold values listed are in (kg). No impact on the HC3 ratio Action; list the required 1027 TQ values in (g)	Corrected, changed "g" to read "kg".
5	9	Table 23	Observation; the header states 1027 HC3 TQ (g) while the threshold values for U-238 and Th-232 listed are in (kg). Using the inventory mass values listed (g) and the correct 1027 values in (g) shown in Bold then;	All numbers are in Kg units. Table heading has been corrected. HC3 ratios as reported is still correct.

Attachment 2

Response/Resolution of NNSAComments on LANL's Radiological Facilities Inventory of Radioactive Material

No.	Page	Section/Para/Line	Reviewer Comment	Response/Resolution
			Isotope, Inventory Mass(g), 1027 HC3 TQ (g), HC3 Ratio U-238, 5.113E+3, **1.3 E+7,** **0.000393** Th-232, 1.5E+2 , **9.1E+5** **0.000165** HC# RATIO **SUM** **0.000558** Because of the obvious errors with the TQ values from 1027 there is no confidence that the Mass values listed under Inventory column are correct, therefore revise the whole table.	
6	11	Table 28	Observation; the header states 1027 HC3 TQ (Ci) while the TQ values listed are not correct for Pu-238, 239,240,241, Pu-242, U-235 and U-238, they appear to be stated in grams. Using the inventory mass values listed (Ci) and the correct 1027 values in (Ci) shown in Bold below then; Isotope , Inventory (Ci), 1027 HC3TQ(Ci), HC3 Ratio Am –241 1.32E-1 5.2E-1 0.254 Ba-133 3.42E-3 1.1E+3 0.000 Cd-109 1.65E-4 1.8E+2 0.000 Cm-244 3.8E-5 1.04E+1 0.000 Cs-137 5.24E-4 6.00E+1 0.000 Np-237 4.00E-6 4.2E-1 0.000 Pu-238 5.55E-3 **6.2E-1** **0.0089** Pu-239 1.49E+0 **5.2E-1** **2.865** Pu-240 2.83E-1 **5.2E-1** **0.5442** Pu-241 1.97E-2 **3.2E+1** **0.0006** Pu-242 2.20E-2 **6.2E-2** **0.0354** Sr-90 2.28E-2 1.6E+1 0.000 Tc-99 8.5E-2 1.7E+3 0.000 Th-228 6.31E-6 **1.0E+00** 0.000 U-235 1.81E+3 **4.2E+00** **4.30E+2** U-238 2.42E+4 **4.2E+00** **5.762E+3** **HC3 Ratio Sum** **6.2E+3**	All Pu and U isotopes are reported in grams and a footnote has been added to note this fact at the bottom of the table. HC3 Ratio as reported is correct and no "unidentified HC3 facility" exists.

Attachment 2

Response/Resolution of NNSAComments on LANL's Radiological Facilities Inventory of Radioactive Material

No.	Page	Section/Para/Line	Reviewer Comment	Response/Resolution
			The errors in the Table raise a concern that TA-35-2 may be an **unidentified HC3** facility. Because of the obvious errors with the TQ values from 1027 there is no confidence that the Mass values listed under Inventory column are correct, therefore revise the whole table.	
7	12	Table 29	Observation; the header states the 1027 HC3 TQ (Ci), while the TQ values listed are not correct for Pu-238, 239, 240, 241, Pu-242, U-235 and U-238, they are in (g). Using the inventory mass values listed (Ci) and the correct 1027 values in (Ci) shown in Bold below then; Isotope , Inventory (Ci), 1027 HC3 TQ (Ci), HC3 Ration H-3 2.91E+0 **1.6E+4** **0.000** Cf-252 2.09E-2 3.2E+0 0.007 Am-241 3.88E-2 5.2E-1 0.074 Cs-137 2.84E-3 6.00E+1 0.000 Pu-238 5.18E-4 **6.2E-1** **0.000** Pu-239 4.58E-1 **5.2E-1** **0.881** Pu-240 5.27E-2 **5.2E-1** **0.101** Pu-241 3.31E-3 **3.2E+1** **0.000** Pu-242 1.5E-2 **6.2E-1** **0.024** Ra-226 4.43E+0 1.20E+1 0.369 U-235 9.96E+3 **4.2E+00** **2.37E+3** U-238 1.39E+6 **4.2E+00** **3.31E+5** HC3 Ratio Sum **3.312E+5** The errors in the Table raise a concern that TA-35-27 may be an **unidentified HC3** facility. Because of the obvious errors with the TQ values from 1027	The H-3 TQ has been corrected. All Pu and U isotopes are reported in grams. The HC3 ratio has been changed from 0.665 to 0.662 due to H-3 isotope. A footnote has been added at the bottom of the table.

Attachment 2

Response/Resolution of NNSAComments on LANL's Radiological Facilities Inventory of Radioactive Material

No.	Page	Section/Para/Line	Reviewer Comment	Response/Resolution
			there is no confidence that the Mass values listed under Inventory column are correct, therefore revise the whole table.	
8	14-15	Table 35 and 36	The Inventory/Hazard Category 3 (HC3) ratios for separate facilities within close proximity approach unity. The proximity of storage magazines within TA-37, with radioactive material inventories approaching unity, may be as close as a few hundred feet. For example, storage magazines 24 and 25 are within approximately 200 feet of one another and have HC3 ratios of 0.677 and 0.675, respectively. DOE-STD-1027-92 states: "...the standard permits the concept of facility segmentation provided the hazardous material in one segment could not interact with hazardous materials in other segments..." Common cause evaluation basis accidents need to be carefully evaluated to ensure that the hazard categorization was appropriately applied for this facility as well as others. The use of segmentation per DOE-STD-1027-92 should be evaluated carefully to ensure that the hazard categorization can be supported.	In accordance with ESA practices, bulk DU and bulk HE are not stored together in these magazines. Hence, segmentation for these facilities is believed to be defensible under the worst case situation due to facility design and form of DU (solid non-dispersible). However, the segmentation issue will be re-visited as a part of resolving non-nuclear hazard categorization issues raised in the NNSA memorandum, SABT:3DN-008 (April 25, 2002)."

S = Suggested comment.
R = Required comment (comment must be addressed).

Appendix D: DOE 2006 Pollution Prevention Awards for LANL

Los Alamos National Laboratory Pollution Prevention Awards – 2006

In 2006, LANL won two NNSA Best-in-Class Pollution Prevention Awards and five NNSA Environmental Stewardship Awards. LANL received more awards than any other site in the complex. These efforts saved the Laboratory $5.2M in avoided costs.

NNSA Best in Class

Slip Top Can Reduction Project
The existing stainless steel slip top cans used to store transuranic waste did not meet new standards. If these 11,000 containers had become useless, about 55 m^3 of transuranic waste would have resulted. This team replaced just the container lids, resulting in significant cost savings and waste avoidance. Time was also saved because the materials in these containers did not require repackaging. The estimated cost avoidance for this project is $3.5M.
Michael Gallegos Ronnie Chavez Louis Ferran Aaron Martinez
Kenneth Salazar Michael Trujillo Robert Vigil Sheryl Willis Dennis Wulff

Green Primaries – Environmentally Friendly Primary Explosives
Existing primary explosives for demolition, mining, construction, ammunition, and fireworks are lead or mercury-based. The Laboratory invented a new set of primary explosives that do not contain any toxic materials or create any hazardous waste. The new primaries are very effective, but they are much safer to manufacture and handle because they cannot be accidentally detonated.
My Hang Huynh Michael Hiskey Michael Coburn Ernie Hartline Gordon Jio
Dennis Montoya Jose Archuleta Edward Roemer Herbert Harry Lorelei Johnson

NNSA Environmental Stewardship Awards

Institutional Improvement Projects Developed from the Environmental Management System
The Laboratory used its Environmental Management System to develop environmental improvement projects. Two of the most beneficial projects to the Laboratory were the materials disposition project and the chemical life cycle project. These projects help the Laboratory minimize the accumulation and disposal of unneeded materials. For example, over 100 m^3 of materials were salvaged or recycled during the cleanout at TA-59 instead of becoming trash. Cost savings: $36,500.

Debbie Bryan Bryan Carlson Sonja Salzman Robyn Petersen Kirk Hollis Dennis Hjeresen Jonathan Tapia Tim Sloan Joy McCullough Stephanie Anast
Feliz Vigil Ben Poff Peggy Reneau Marjorie Stockton Cathy Juarez
Janice Taylor Luce Salas Marc Gallegos Mike Shepherd Bret Chandler
Charles Davis Clare Bena Priscilla Davis Paul Hoover Rick Valerio
Luciana Vigil-Holterman Lance Kloefkorn Deba Daymon Connie Gerth
Dennis Martinez Kapil Goyal Pat Gallagher Kenny Ault

Power Grid Infrastructure Upgrades Transmission Line
Log and rock berms were installed instead of silt fence for sediment control around disturbed areas for a new power transmission line. The logs and rocks came from the surrounding areas, and the use of 15 cubic meters of silt fence was avoided. 90 cubic yards of wood mulch from the county landfill was reused for temporary stabilization. Estimated savings from this project were $72,000.
Tim Zimmerly Terrill Lemke Tom Lopez Shannon Smith Jake Lovato
Richard Dold Jeff Schroeder Liz English Annie Lovato

Removal & Asset Recovery of Copper-lined Faraday Cage
A Faraday Cage from TA-39-89 containing 1400 pounds of copper needed to be removed, and this removal was authorized as deactivation and decommissioning project rather than a remodeling project through the usual site support contractor. The value of recycling the copper offset the majority of the project cost, resulting in savings of over $21,000.
Connie Gerth Darrik Stafford Bill Anderson Michael Dennis Neal Chesnut

Improvements to the Plutonium Electrorefining Process
The cathode used in the plutonium electrorefining process was redesigned to eliminate the potential of failure. Eliminating cathode failure dramatically reduces the need to reprocess material, decreasing the resulting waste by a factor of three. The new process saves about 15 days worth of labor and avoids the generation of 2700 Liters/year of liquid transuranic waste and 0.1 m^3/year of solid transuranic waste. The estimated savings for this project were $18,450.
Ed Joyce Kevin Martinez Walter Griego Danny Martinez
Vonda Dole David Felix Al Vargas

Low-Level Waste Minimization at DARHT
The Dual-Axis Radiographic Hydrotest facility implemented several innovations to reduce the volume of beryllium-contaminated low-level waste. The staff minimized the amount of material entering the test area, reused equipment such as blast mats, tarps, pallets, and plastic drums, and used collapsible water bladders instead of sandbags. These measures avoid an estimated 80 cubic meters of low-level waste annually and save over $1.6M in waste disposal costs.
Shad Glidewell Ken Huff Gary McMath Paul Ortega Dennis Royer
Gary Salazar Jerry Seitz Richard Trujillo Larry Vaughn
Kelkenny Bileen Steven Dimarino

LANL is pleased to recognize the best projects submitted for the 2006 LANL Pollution Prevention Award program.

Best-in-Class Awards

Interior Furnishings Team
The Space Management and Facilities Planning Interior Furnishings Team develops LANL furniture standards and evaluates furnishings based on safety, ergonomics, aesthetics, and recycled material content. Last year the team developed a new program for the reuse of existing furniture. The program saved approximately $530,000 in FY05, and so far in FY06, the program has saved LANL over $300,000. If the furniture from the old administration building can be effectively reused as expected, LANL should save approximately $5 million.
Paul Trujillo Pat Nelson Debra Lowe Deborah Bater Geraldine Sanchez
Diana Blumberg Shawnette Prueitt John R. Smith

ESA Construction Waste Recycling and Reuse
A significant amount of recycling took place during the Weapons Engineering Campus Infrastructure project. 1300 linear feet of fencing was removed and donated to Habitat for Humanity. Approximately 25,000 cubic yards of soil were stockpiled at LANL for future fill projects. The team sent 103 tons of concrete and asphalt for recycling at the landfill. Trees that had to be removed during the demolition were sent to a sawmill to become lumber. Leftover mulch was used to stabilize a detention pond, drainage channels, and disturbed areas. Over 35 tons of scrap metal were recycled, and about 63 cubic yards of equipment and furniture were sent to salvage.
David Carr Darrik Stafford Scott Marriott Owen Clark Chris Romero
George Garduno Scott Christensen Jeff Tedder Raul Salazar LeRoy Givens

Low-Level Radioactive Waste Box Elimination Project
The NMT-7 low-level waste team implemented a procedure change that eliminated the use of cardboard boxes for packaging compactable low-level waste. Boxes were previously used as an additional liner between a strong plastic bag and a metal bin. By getting rid of the unnecessary boxes, more waste can be packaged in each bag. Overall the volume of low-level waste generated from these labs is reduced by approximately 20%, and about 40 hours per month are saved for more productive work since less handling is necessary without the boxes.
Joseph A. Gonzales Filiberto Dominguez Leroy Martinez
A. Chris Martinez Dino Martinez

The following projects are winners of Pollution Prevention Environmental Stewardship Awards from the Los Alamos National Laboratory. Many thanks to everyone who came up with ideas to avoid waste and participated in these projects.

Environmental Stewardship Awards

Slip Top Can Reduction Project
The existing stainless steel slip top cans used to store transuranic waste did not meet new standards for pressure relief. If all of these approximately 11,000 containers at LANL had become useless, about 55 cubic meters of transuranic waste would have resulted. This team determined that just the lids could be replaced, resulting in significant cost savings and waste avoidance. In addition, time was saved because the materials in these containers did not need to be moved to new containers.

Michael Gallegos	Ronnie Chavez	Louis Ferran	Dennis Wulff	Sheryl Willis
Ken Salazar	Michael Trujillo	Robert Vigil	Aaron Martinez	

PGIU 115 kV Transmission Line Construction Project
New posts were installed to support a power transmission line, and this process disturbed the ground surrounding the posts. Instead of using silt fence to restore the disturbed areas, logs and rocks from the areas were used to prevent potential migration of soil from the site. Using this natural method of soil stabilization avoided the use of about three linear miles of fence. The silt fence would have needed to be removed later, so the natural soil stabilization method saved that time as well.

Tim Zimmerly	Terrill Lemke	Tom Lopez
Shannon Smith	Jake Lovato	Richard Dold

Low-Level Waste Minimization at DARHT
The DX Firing Site Team at DARHT implemented several measures to reduce the generation of low-level waste by 40-50%. The team allows only necessary material to come onto the firing point; they reuse items such as tarps and pallets for multiple experiments; and the team switched from using sand bags to water bladders. Undamaged bladders can be reused, and broken bladders compact easily and occupy less volume than sand bags.

Shad Glidewell	Ken Huff	Gary McMath	Paul Ortega	Dennis Royer
Gary Salazar	Jerry Seitz	Richard Trujillo	Larry Vaughan	Kelkenny Bileen

Improvements to Plutonium Electrorefining Process
This team made design improvements to a support rod that had been prone to failure during the plutonium refining process in the past. When that rod failed, the entire run would be lost. Losing a run means generating transuranic waste and losing approximately 15 days worth of time. The new rod design was very inexpensive to implement, and it decreases the amount of transuranic waste generated through this process by a factor of three.

Ed Joyce	Walter Griego	Vonda Dole	Al Vargas
Kevin Martinez	Danny Martinez	David Felix	

Closeout of Non-Operational Mineral Oil Storage Tanks at DX Division
A team from DX Division shut down six non-operational mineral oil aboveground storage tanks. The oil was recycled, and the chance of oil leaks was eliminated. The New Mexico Department of Environment levies large fines for leaking tanks, and building the necessary secondary containment system to meet new codes would have cost an estimated $1.5 million. These construction costs were avoided, and now there is less chance of experiencing regulatory problems.
Mark Haagenstad Deba Daymon Owen Clark Randy A. Archuleta
Perfecto J. Martinez Kelkenny Bileen Steven Dimarino Randal Johnson

TA-8 Material Substitution
A team from ESA-AET had previously used a cleaner for their photographic machine racks that contained hexavalent chromium, and this process generated approximately 300 gallons of hazardous liquid waste annually. By switching to a new, non-hazardous cleaner, the team is avoiding about $1500 in waste disposal costs each year.
Ringo Beaumont Richard Boudrie Troy Childers Juan Fernandez
James Lucero John Stearns Al Stadelmaier Casey Von Bargen

Non-Hazardous Gun Cleaner
Members of the DX Shock Physics Team substituted a non-hazardous cleaner for cleaning guns after experiments. By switching to a non-hazardous cleaner, there were many resultant benefits. Worker health is improved due to the lack of volatile organic carbon compounds, one satellite storage accumulation area was no longer necessary, and the personal protective equipment used in this cleaning procedure no longer needs to be handled as hazardous waste.
Dennis Shampine James Esparza Mark Byers Frank Abeyta
Charles Owens Paulo Rigg Connie Gerth

Waste Evaluation for High Explosives Tools
Large pieces of equipment that could possibly be contaminated with high explosives are burned at the TA-16 Burn Ground, even if no high explosives are actually present. This team decided to dismantle some equipment to check for the presence of high explosives. In the cases where no high explosives are present, the metal equipment can be recycled instead of burned. Although the dismantling process is a little more time consuming, about 8000 pounds of hazardous waste and $20,000 in disposal costs were avoided during 2005. In 2006, the team is expecting to burn much less and save about 1600 gallons of propane.
Leonard Archuleta Mike Bailey Doug Hof Jake Olivas Steve Ortiz Billy Terrazas
Ann Sherrard Luciana Vigil-Holterman Reece Wilson Orbry Wright

Reuse of Excess Salvage Drums from TWISP
At its conclusion, the TWISP project had thousands of excess unused drums. Although they were clean, these drums could not be free released for recycling since they came from a radiological control area. DX Division was able to use these drums for packaging waste. He project avoided about $11,000 in procurement costs of new drums and an estimated 170 cubic meters of industrial waste generation.
Julie Minton-Hughes Will Gonzales Jennifer Griffin Robert Griffs Paul Newberry
Pat O'Grady Henry Nunes Connie Gerth Kelkenny Bileen Steve Dimarino

Recycling of Chemical Oxygen Demand Test Vials and Solution
This team discovered that a company called Hach could accept spent COD vials and solutions for recycling. Instead of sending the COD vials away as hazardous waste, the material can be recycled to recover metals. Recycling the COD vials involves less paperwork than disposal of hazardous waste, so C Division expects to save approximately 10 hours of labor.
Jose-Maria Sanisnena Geri Martinez

Alternatives to Open Burning
ESA treats explosives waste at the TA-16 Open Burn Ground that has no alternative treatment path. In 2006, ESA began an effort to better segregate explosives waste from non-hazardous waste so that less material would need to be burned and the non-hazardous waste could be handled more appropriately and cost effectively. ESA expects to eliminate about 15 burns annually and avoid the use of about 300 gallons of propane. The total cost avoidance for LANL is estimated at $30,750 annually, and the chance of incurring a permit violation is diminished.
Pat O'Grady James Heraghty Richard Keyser Arsenio Montano
Paul Newberry Ann Sherrard Elmer Velasquez

Alternate Users
KSL donated over 1000 gallons of new products that could not be returned to the vendor for a refund to end users such as the City of Santa Fe, Los Alamos Public Schools, and the Coyote District Ranger Station. The donated materials included latex paint, aerosol paint, and electric motor varnish. If these materials had not been donated, they might have been disposed of as hazardous waste. Approximately $30,000 in disposal costs were avoided.
Robert Castillo Steve Carrillo Mark Madrid Gabe Romero
Earl Holmsten Kelly Gee Justin H. Smith

Reuse of Lead and Copper for Radioactive Assay Shielding
NMT-7 personnel salvaged approximately 200 pounds of copper and 1500 pounds of lead shielding from TA-54 for use in the construction of a shielded assay environment at CMR. This shielded environment will be used to characterize radionuclide content of material in small containers with better accuracy. This project saves approximately 400 hours annually of time formerly spent redoing assays and avoided the purchase of a $5000 commercial shielding unit. In addition, the copper and lead did not become low-level or mixed low-level waste.
Georgiana M. Vigil Fred Lopez Philip John Martinez
Richard C. Staroski Bryan M. Vigil

Removal of Scrap Metal from DX Division
DX Division recycled approximately 300 cubic yards of scrap metal from multiple areas. Recycling the material allowed more vegetation to be removed from the areas around firing sites and reduced the risk of fire. The removal of the material increased safety and decreased potential environmental liability.
Willie E. Haynes Jr. Thomas C. Robinson Nancy L. Anderson Charles M. Wilson
Jake J. Olivas Kelkenny Bileen Steven Dimarino Randal Johnson

LEED at CMRR
The Leadership in Energy and Environmental Design (LEED) Green Building rating system is being used by the Chemistry and Metallurgy Research Replacement facility project. The team expects the Radiological Laboratory Utility Office Building to achieve LEED silver certification based on sustainable site selection, water efficiency, use of recycled materials, and indoor environmental quality.
Timothy Neal Craig Bachmeier Terrill Lemke Timothy Zimmerly
Judd Luchenbill Austin Commercial Contractors, LP led by David Weatherbie

Closeout of a Non-Operational HE Wastewater Sump at DX Division
A team from DX Division sealed a non-operational sump at TA-14 that had originally been used to collect wastewater contaminated with high explosives. Closing this sump means that about 1500 gallons of rainwater and snowmelt will no longer enter this sump and need to be pumped out and analyzed several times per year. The estimated annual savings are about 40 hours of labor and tens of thousands of dollars in pumping and analytical costs.
Percy Trujillo Doug Hof Dennis Montoya Bert Harry Connie Gerth Randal Johnson

Treatment and Disposition of Peroxide Formers
A team from NMT, ENV, and NWIS developed a treatment method to deactivate reactive peroxides. The team characterized and treated over 50 chemicals stored in an inert glovebox to eliminate the hazard posed by peroxides. Some of the chemical were transuranic waste, and without deactivating the peroxides, these wastes had no disposal path.
Doris Ford Greg Kaczar Leonardo Trujillo David Yeamans
Jeff Carmichael Egan McCormick Randy Martinez Kenny Salazar
Michael Gallegos Robert Vigil Karen Styers Kristy Long Michael Cournoyer

Salvaging Lead Acid Batteries
Michael Le Scouarnec changed the procedure for disposition of lead acid batteries generated by FWO/NWIS. He contacted LANL Salvage and had the lead batteries picked up for recycling through their contract.
Michael Le Scouarnec

Reuse of an ICPAES
A team from C Division donated a fully functional Inductively Coupled Plasma Atomic Emission Spectrometer to New Mexico Tech in Socorro. This gift was worth over $130,000 to New Mexico Tech, and donating the equipment instead of having it disposed of as waste resulted in a net savings to LANL of about $6000.
Joe Rodriguez Bryan Vigil Fred Lopez

RCRA Closure Waste Reduction
ESA Division closed two RCRA permitted sand filter facilities in 2005. The sand, gravel, and firebrick lining of these sand filter facilities were removed, and about 5000 pounds of this material was reused onsite. Careful analysis of the remaining material determined that it could be disposed of as non-hazardous waste instead of hazardous waste, avoiding approximately $25,000 in disposal costs.
Steven Ortiz Peggy Reneau Ann Sherrard Elmer Velasquez

Due Diligence in Support of Waste Classification
A team from Duratek and ENV and EES Divisions conducted an extensive review of all available environmental data involving a particular drilling project when some unexpected volatile organic carbons were detected in some of the samples. The due diligence efforts proved that the 46 cubic meters of material should appropriately be handled as low-level waste instead of mixed low-level waste for a disposal cost avoidance of approximately $1.5 million.
Danny Katzman Alice Barr Kelly VanDerpoel Leonard Trujillo
Nita Patel Luciana Vigil-Holterman

Continued Excellence at Minimizing Low-Level Waste at LANSCE
The LANSCE Waste Management Team has aggressively pursued LLW waste minimization through repackaging projects. This team has consistently achieved about a 50% reduction in the volume of LLW generated at LANSCE by using waste segregation and improved packing efficiency. These projects reduced LLW by approximately 89 cubic meters and avoided over $118,000 in waste disposal expenses.
Ronnie Garcia Lance Kloefkorn Sandra West Adrian Romero

CMRR Project Review System
The CMRR Document Review Service is used by the CMRR project team to review large numbers of documents quickly and efficiently online. Project team members and remote DOE reviewers can annotate these documents simultaneously and see the comments of others in real time. Now that none of the thousands of documents need to be printed by each reviewer, the project team estimates that the use of hundreds of millions of sheets of paper will be avoided during the review. The associated costs of ink, electricity, and time spent printing will also be avoided through this project.
Timothy Nelson Juan Corpion Bill Erickson
Steve Imgarten Julian Paquin Leanne Prokop

Reliable Replacement Warhead Design
A team from the Los Alamos National Lab is competing to design a reliable replacement warhead that will be easier and less expensive to fabricate. The new design will require less floor space for production, about 40% fewer steps will be involved in the construction, and no beryllium will be necessary. The team estimates that savings may be $10 billion over 30 years.
Joe Martz Jake Perea Steve Renfro John Hopson Mike Haertling David J. Heyden
Jon Nielson John Pedicini John Scott Ed Hoover Dennis Helmich

Paper Reduction at ENV-ECR
The Environmental Characterization and Remediation group is responsible for reviewing all Laboratory Excavation Permit Review Requests and PR-IDs for Solid Waste Management Unit compliance and management. In the past, ECR received faxed copies of these documents even though the appropriate people already received electronic copies. Patrick Valerio requested that these documents no longer be faxed, and this project now saves approximately 1500 pounds of paper annually.
Patrick Valerio

New Asphalt Plant
The new asphalt plant that was installed at LANL in 2005 has over 95% lower emissions than the old plant that was built in 1960. The new plant was designed with Best Available Control Technology to control particulate air emissions.
Charles McReynolds Dan McReynolds Dennis Martinez Don Finley

Treatment of Dimethyl Formamide
NMT-15 uses dimethyl formamide in several processes, and over time NMT-15 had stored about 8 gallons of this solution in a satellite accumulation area. The WIPP facility does not accept liquids, so NMT-15 worked with NMT-7, ENV-SWRC, and NWIS-OS to develop a disposal plan so that this waste could be neutralized and solidified so that the material met the Waste Acceptance Criteria for disposal at WIPP.
Larry Roybal Manuel Pacheco Jr. Matthew Ruggiero Randy Sandoval Jeff Carmichael
Egan McCormick Randy Martinez Michael Trujillo Nestor Trujillo

Recycle at LANSCE
Through continued clean-up efforts, the LANSCE Waste Management Team successfully completed shipments of approximately 1,000,000 pounds of metal for recycling. In addition to the avoided disposal costs of about $77,000, getting rid of the scrap metal improves work environment safety and reduces maintenance and inventory time.
Ronnie Garcia Lance Kloefkorn Sandra West Adrian Romero

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To obtain a copy of the SWEIS Yearbook – 2006, contact Marjorie Wright
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This 2006 Yearbook is available on the web at:
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