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Title

SWEIS Yearbook — 2003

Comparison of 2003 Data Projections of the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory

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Contents

Tables

Figures

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).

The 2003 Yearbook will present the fifth year of data compiled since the ROD for the LANL SWEIS was issued in September 1999. The 2003 Yearbook 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

[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.

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 2003, and, together with the 2002 Yearbook, provides trend analysis of these data to assist DOE in its decision-making process. A similar summarization will be prepared every five years, as appropriate.

Previous editions of the Yearbook have incorporated photographs depicting important events that occurred during the calendar year under review. However, due to budgetary constraints this year, the 2003 Yearbook contains no photographs and a minimum of figures. In addition, this edition of the Yearbook will not be published as a stand-alone document, as has been done for all previous editions, but will be included as an appendix to the Supplement Analysis being prepared during 2004.

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Los Alamos National Laboratory, 2003. “SWEIS Yearbook – 2002” Los Alamos National Laboratory report LA-UR-03-5862, Los Alamos, NM. (http://lib-www.lanl.gov/cgi-bin/getfile?LA-UR-03-5862.htm)

Executive Summary

In 1999, the US Department of Energy (DOE) published a Site-Wide Environmental Impact Statement (SWEIS) for Continued Operation of Los Alamos National Laboratory (LANL or Laboratory)(DOE 1999a). DOE issued a Record of Decision (ROD) for this document in September 1999 (DOE 1999b).

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 calendar year (CY) 1998 through CY 2001 and CY 2003 focus on operations during one calendar year and specifically address the following:

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

The 2002 Yearbook is a special edition to assist DOE/National Nuclear Security Administration in evaluating the need for preparing a new SWEIS for LANL. This edition of the Yearbook summarizes the data routinely collected from CY 1998 through CY 2002 as described above. It also contains additional text and tabular summaries as well as a trend analysis. The 2002 Yearbook also indicates 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 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 levels.

The Yearbooks address 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. Chapter 2 discusses each of the 15 Key Facilities from three aspects—significant facility construction and modifications that have occurred during 2003, the types and levels of operations that occurred during 2003, and the 2003 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 2003, planned construction and/or modifications continued at 12 of the 15 Key Facilities. These activities were both modifications within existing structures and new or replacement facilities. New structures completed and occupied during 2003 included the Manufacturing Technical Support Facility (also known as the NMT FY 01 Office Building) at Technical Area (TA) 55, the Weapon Engineering Office Building at TA-16, a Carpenter Shop at TA-15, the X-Ray Calibration Facility at TA-15, a Warehouse at TA-15, the High Explosives Prep Facility at TA-36, and the Dual-Axis Radiographic Hydrodynamics Test Facility Vessel Prep Building at TA-15. Additionally, 13 major construction projects were either completed or continued for the Non-Key Facilities. These projects were as follows:

- Construction was completed on the Nonproliferation and International Security Center; the building was occupied in July 2003.
- Atlas was reassembled at the Nevada Test Site during 2003.
- The Emergency Operations Center was occupied in September 2003 and became fully operational in December 2003.
- Construction of the Safeguards and Security Group Security Systems Support Facility was completed in August 2003; the building was occupied in September 2003.
- Construction of the Decision Applications Division Office Building was completed in June 2003; the building was occupied in September 2003.
- Construction of the new Medical Facility continued in 2003.
- The Multi-Channel Communications Project was fully operational by October 2003.
- Construction of the National Security Sciences Building began in August 2003.
- Construction of the TA-72 Live Fire Shoot House was completed in January 2003; the building became fully operational in March 2003.
- Construction of the new Facility and Waste Operations Office Building began in 2003.
- Construction of the TA-03 Parking Structure began in July 2003.
- Demolition of the Omega West Reactor Facility was completed in September 2003.
- Construction Notice to Proceed was issued for the Pajarito Road Access Control Stations in October 2003.

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. None of these projects was completed in 2003.

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 (EPA) on December 29, 2000. This brings the total number of permitted outfalls up to 21. During 2003, only 16 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 2003 chemical usage amounts were extracted from the Laboratory's EX3 chemical inventory system 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 calendar year from 1999 through 2003. 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 (20 NMAC 2.73). The most recent report is "Emissions Inventory Report Summary, Reporting Requirements for the New Mexico Administrative Code, Title 20, Chapter 2, Part 73 (20 NMAC 2.73) for Calendar Year 2003" (LANL 2003).

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

- 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 in 2001, 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 2003, 88 capabilities were active. The eight inactive capabilities were Manufacturing Plutonium Components at the Plutonium Complex; both the Cryogenic Separation and the Diffusion and Membrane Purification capabilities at the Tritium Facilities; both the Destructive and Nondestructive Assay and the Fabrication and Metallography capabilities at CMR; both the Accelerator Transmutation of Wastes and the Medical Isotope Production capabilities at the Los Alamos Neutron Science Center; and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

As in the preceding calendar years from 1998 through 2002, only three of LANL's facilities operated during 2003 at levels approximating those projected by the ROD—the Materials Science Laboratory (MSL), the Bioscience Facilities (formerly Health Research Laboratory), and the Non-Key Facilities. The two Key Facilities (MSL and Bioscience) are more akin to the Non-Key Facilities and represent the dynamic nature of research and development at LANL. More importantly, neither of these facilities is a major contributor to the parameters that lead to significant potential environmental impacts.

The remaining 13 Key Facilities all conducted operations at or below projected activity levels.

Radioactive airborne emissions from point sources (i.e., stacks) during 2003 totaled approximately 2,060 curies, just under 10 percent of the 10-year average of 21,700 curies projected by the SWEIS ROD. The final dose is 0.65 millirem per year (compared to 5.44 projected), well under the EPA emissions limit of 10 millirem per year for DOE facilities. The final dose for 2003 was reported to the EPA by June 30, 2003. Calculated NPDES discharges totaled 209.8 million gallons per year compared to a projected volume of 278 million gallons per year. However, the apparent decrease in flows 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. Quantities of solid radioactive and chemical wastes generated in 2003 ranged from approximately 5.7 percent of the mixed low-level radioactive waste projection to 137 percent of the mixed transuranic (TRU) waste projection. The larger than projected quantity of mixed TRU waste was the result of the Decontamination and Volume Reduction System (DVRS) repackaging of legacy TRU waste for shipment to the Waste Isolation Pilot Plant. Both the mixed TRU waste and TRU waste quantities exceeded the SWEIS ROD projections during 2003 due to the DVRS repackaging activity.

The workforce has been above ROD projections since 1997. The 13,616 employees at the end of CY 2003 represent 2,265 more employees than projected and the highest number of employees over the period. Since 1998, the peak electricity consumption was 394 gigawatt-hours during 2002 and the 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 2003, the highest collective Total Effective Dose Equivalent for the LANL workforce was 241 person-rem during 2003, which is considerably lower than the workforce dose of 704 person-rem projected by the 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 low-level radioactive waste. As of 2003, this expansion had not become necessary. However, construction continued on 44 acres of land that are being developed along West Jemez Road for the Los Alamos Research Park. This project has its own National Environmental Policy Act documentation (an environmental assessment), and the land is being leased to Los Alamos County for this privately owned development.

Cultural resources remained protected, and no excavation of sites at TA-54 of LANL 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.) However, excavations did occur at the Airport East and White Rock tracts beginning in June 2002 and ending in March 2003. These two land tracts are now available to the County of Los Alamos for development.

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 1995–2003 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977. In addition, ecological resources are being sustained as a result of protection afforded by DOE ownership of LANL. These resources include biological resources such as protected sensitive species, ecological processes, and biodiversity. The recovery and response to the Cerro Grande Fire of May 2000 included a wildfire fuels reduction program, burned area rehabilitation and monitoring efforts, and enhanced vegetation and wildlife monitoring.

In conclusion, LANL operations data mostly fell within projections. Operations data that exceeded projections, such as number of employees or chemical waste from cleanup, either produced a positive impact on the economy of northern New Mexico or resulted in no local impact because these wastes were shipped offsite for disposal. Overall, the 2003 operations data indicate that LANL was operating within the SWEIS envelope and still ramping up operations towards the preferred Expanded Alternative in the ROD.

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Acknowledgments

The Site-Wide Issues Program Office was closed on April 4, 2002. This office prepared the first three editions of the Yearbook and initiated preparation of Yearbook 2001. The Ecology Group of the Risk Reduction and Environmental Stewardship Division completed Yearbooks 2001 and 2002 and prepared this edition, Yearbook 2003. Ken Rea served as document manager for Yearbooks 2001 and 2002. Susan Radzinski served as document manager for Yearbook 2003; chief contributor was Marjorie Wright.

Jay Brown and Jill Hefele provided prompt review of the document for classification issues and helped solve several concerns.

Hector Hinojosa provided editorial support; Teresa Hiteman served as the designer and electronic publication specialist. We would also like to thank Kathy Bennett and Andi Kron for creating maps and figures.

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 players from each of the Key Facilities and other operations.

Area of Contribution	Contributor
Air Emissions	Margie Stockton
Air Emissions	David Fuehne
Air Emissions	Walter Whetham
Biosciences (Formerly Health Research Laboratory)	Andrea Pistone
Chemistry and Metallurgy Research Building	Robert Romero
Cultural Resources	Kari Garcia
Ecological Resources	Laura Marsh
Environmental Restoration Project	Virginia Smith
Groundwater	Charles Nylander
Groundwater	Kelly Bitner
High Explosives Processing	Bart Olinger
High Explosives Processing	Kathy Smith
High Explosives Testing	Randy Johnson
High Explosives Testing	Franco Sisneros
Land Use	Sarah Salazar
Liquid Effluents	Holly Wheeler-Benson
Liquid Effluents	Marc Bailey
Liquid Effluents	Tony Grieggs
Los Alamos Neutron Science Center	Charles (John) Graham
Los Alamos Neutron Science Center	Joyce Roberts
Los Alamos Neutron Science Center	Ken Johnson
Los Alamos Neutron Science Center	Frank Merrill
Los Alamos Neutron Science Center	Gabriela Lopez Escobedo
Los Alamos Neutron Science Center	Michael Capiello

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Los Alamos Neutron Science Center	Ron Nelson
Los Alamos Neutron Science Center	Glen Johns
Machine Shops	Ann Sherrard
Materials Science Laboratory	Jennifer Rezmer
National Pollutant Discharge Elimination System Data	Holly Wheeler-Benson
Non-Key Facilities–Atlas	Robert Reinovsky
Non-Key Facilities–Nonproliferation and International Security Center	William (Bill) Hamilton
Non-Key Facilities–Emergency Operations Center	Keith Orr
Non-Key Facilities–Multichannel Communications	Lyle Kerstiens
Non-Key Facilities–Security Systems Support Facility	Bill Sole
Non-Key Facilities–D Division Office Building	William (Bill) Hamilton
Non-Key Facilities–LANL Medical Facility	Aleene Jenkins
Non-Key Facilities–TA-72 Live Fire Shoot House	Skip Andersen
Non-Key Facilities–TA-72 Live Fire Shoot House	Steve Rivera
Non-Key Facilities–National Security Sciences Building	Keith Orr
Non-Key Facilities–FWO Division Office Building	Frederick (Fritz) Kloer
Non-Key Facilities–TA-03 Parking Structure	Lee Lucero
Non-Key Facilities–Pajarito Road Access Control Stations	Michael Grimler
Pajarito Site	Debbie Baca
Plutonium Complex	Harvey Decker
Radioactive Liquid Waste Treatment Facility	Pete Worland
Radioactive Liquid Waste Treatment Facility	Robert McClenahan
Radiochemistry Facility	Sara Helmick
Sigma	Jennifer Rezmer
Socioeconomics	John Pantano
Solid Radioactive and Chemical Waste Facilities	Julie Minton-Hughes
Solid Radioactive and Chemical Wastes	Deba Daymon
Solid Radioactive and Chemical Wastes	Bob Lechel
Solid Radioactive and Chemical Wastes	Tim Sloan
Solid Radioactive and Chemical Wastes	Sean French
Target Fabrication Facility	Jennifer Rezmer
Trend Analysis	Sarah Salazar
Tritium Facilities	Richard Carlson
Utilities	Jerome Gonzales
Utilities	Gilbert Mackey
Utilities	Jim Haugen
Worker Safety/Doses	Tom Buhl

Acronyms

AB	Authorization Basis
AFCI	Advanced Fuel Cycle Initiative
ALARA	as low as reasonably achievable
AOC	area of concern
ARTIC	Actinide Research and Technology Institution Complex
BIO	Basis for Interim Operation
BSL	Biosafety Level
CASA	Critical Assembly and Storage Area
CDC	Centers for Disease Control
CDIS	Change During Interim Status
CGRP	Cerro Grande Rehabilitation Project
Ci	curie
CMR	Chemical and Metallurgy Research
CY	calendar year
D	Decision Applications (Division)
DARHT	Dual-Axis Radiographic Hydrodynamic Test (facility)
DOE	US Department of Energy
DVRS	Decontamination and Volume Reduction System
DX	Dynamic Experimentation (Division)
EISU	Electrical Infrastructure/Safety Upgrades (Project)
EM&R	Emergency Management and Response
EOC	Emergency Operations Center
EPA	US Environmental Protection Agency
ESA	Engineering Sciences and Application (Division)
FITS	Facility Improvement Technical Support (building)
FTE	full-time equivalent (employee)
FWO	Facility and Waste Operations (Division)
FY	fiscal year
HREPCT	Heritage Resources/ Environmental Policy Compliance Team
IAEA	International Atomic Energy Agency
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LEDA	Low-Energy Demonstration Accelerator
LFSH	Live Fire Shoot House
linac	linear accelerator
LIR	Laboratory Implementing Requirement
LLW	low-level radioactive waste
LPSS	Long-Pulse Spallation Source
MDA	Material Disposal Area
MGY	million gallons per year
MLLW	mixed low-level radioactive waste
MSL	Materials Science Laboratory
NEPA	National Environmental Policy Act
NFA	no further action
NMED	New Mexico Environment Department
NM SHPD	New Mexico State Historic Preservation Department
NMT	Nuclear Materials Technology (Division)
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
NRC	US Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NTS	Nevada Test Site
OSR	Offsite Source Recovery (Program)
PNM	Public Service Company of New Mexico
PRS	potential release site

PTLA	Protection Technology Los Alamos
RAMROD	Radioactive Materials Research Operations and Demonstration (facility)
RANT	Radioactive Assay and Nondestructive Test (facility)
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RFI	RCRA Facility Investigation
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
RS	Remediation Services (Project)
S-3	Safeguards and Security Group
SHPO	State Historic Preservation Officer
SNM	special nuclear material
STA	Southern Technical Area
SWEIS	Site-Wide Environmental Impact Statement
SWMU	Solid Waste Management Unit
TA	Technical Area
TEDE	total effective dose equivalent
TFF	Target Fabrication Facility
TRU	transuranic
TSCA	Toxic Substances Control Act
TSFF	Tritium Science and Fabrication Facility
TSTA	Tritium System Test Assembly (facility)
TWISP	Transuranic Waste Inspectable Storage Project
TYCSP	Ten-Year Comprehensive Site Plan
UC	University of California
UF/RO	ultrafiltration/reverse osmosis
VCA	voluntary corrective action
VOC	volatile organic compound
WCRR	Waste Characterization, Reduction, and Repackaging (facility)
WETF	Weapons Engineering Tritium Facility
WIPP	Waste Isolation Pilot Plant
WNR	Weapons Neutron Research (facility)
WTA	Western Technical Area

1.0 Introduction

1.1 The SWEIS

In 1999, the US Department of Energy (DOE)[2] 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 (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 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 calendar year (Chapter 3). These include measures such as number of workers, radiation doses, workplace incidents, utility consumption, air emissions, liquid effluents, and solid wastes. These effects also include changes in the regional aquifer, ecological resources, and other resources for

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[2] 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.

which the DOE has long-term stewardship responsibilities as an administrator of federal lands.

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

- Ten-Year Comprehensive Site Plan (TYSCP; Chapter 5). This summary of LANL projections for the future is not included in this edition of the Yearbook.

- Summary and conclusion (Chapter 6). This chapter summarizes calendar year (CY) 2003 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 2003.

- Radiological facilities list (Appendix C). These data identify the facilities considered as radiological in CY 2003 and indicate their categorization at the time the SWEIS was developed.

- *Qualitative Assessment of Wildfire-Induced Radiological Risk at the Los Alamos National Laboratory Interim Internal Status Report – 2003* (Appendix D). This report is a qualitative assessment of changes to the major parameters originally analyzed in 1999 that potentially alter the risk calculations of a radiological release resulting from wildfire.

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.

DOE regulations require a formal evaluation, called a Supplement Analysis, 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.

The SWEIS also 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.

1.3 This Yearbook

The ROD selected levels of operations, and the SWEIS provided projections for these operations. This Yearbook compares data from CY 2003 to the appropriate SWEIS 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 to use that document, together with the SWEIS 2003 Yearbook, as the primary source of information to determine the adequacy of the existing SWEIS. The 2003 Yearbook will present the fifth year of data compiled since the SWEIS ROD was issued in September 1999. These two Yearbooks together (SWEIS 2002 Yearbook and SWEIS 2003 Yearbook) are an essential component in DOE’s five-year evaluation of how accurately the SWEIS represents LANL current and projected operations.

This year, in addition to preparing the Yearbook, the Ecology Group will prepare a supplement analysis information document to provide the data to be analyzed in the Supplement Analysis. The 2003 Yearbook will not be published as a stand-alone document, but will be an appendix to the information document.

References

Department of Energy, 1999a. "Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory," US Department of Energy document DOE/EIS-0238, Albuquerque, NM.

Department of Energy, 1999b. "Record of Decision: SWEIS in the State of New Mexico," 64 FR 50797, Washington, D.C.

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. In order to present a logical and comprehensive evaluation of LANL's potential environmental impacts, the SWEIS developed the Key Facility concept. Fifteen facilities were identified that 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 more 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).

Taken together, the 15 Key Facilities represent the great majority of environmental risks associated with LANL operations. Specifically, the Key Facilities contribute

- more than 99 percent of all radiation doses to the public,
- more than 90 percent of all radioactive liquid waste generated at LANL,
- more than 90 percent of all radioactive solid waste generated at LANL,
- more than 99 percent of all radiation doses to the LANL workforce, and
- approximately 30 percent of all chemical waste generated by LANL.

In addition, the Key Facilities (as presented in the SWEIS) comprised 42 of the 48 Category 2 and Category 3 Nuclear Structures at LANL[3]. Subsequently, DOE and LANL have published five lists identifying nuclear facilities at LANL [one in 1998 (DOE 1998a), another in 2000 (DOE 2000a), two in 2001 (LANL 2001a and 2001b), and one in 2002 (LANL 2002a)] that significantly changed the classification of some buildings. Appendix B provides a summary of the nuclear facilities and a table has been added to each section of this chapter to explain the differences and identify the 31 structures currently listed by DOE as nuclear facilities. Of these 31 structures, all but one reside within a Key Facility. The former tritium research facility (TA-33-86) was still listed as

[3] 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 onsite 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 as of December 2002 (LANL 2002a).

a Category 2 nuclear facility in 2001, but underwent decommissioning and demolition in 2002, was demolished, and was removed from the nuclear facility list. Appendix C provides a comparison of the facilities identified as radiological when the SWEIS was prepared and those identified as radiological in 2003 (LANL 2002b). The 2003 list is shorter due to better guidance on the radiological designation[4].

The definition of each Key Facility hinges upon operations[5], capabilities, and location and is not necessarily confined to a single structure, building, or technical area (TA). In fact, the number of structures comprising a Key Facility ranges from one, the Materials Science Laboratory (MSL), to more than 400 for the 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 2003. 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 1996–2005. All construction activities will not be complete and projected operations may not reach maximum levels until the end of the 10-year period.

This chapter also discusses Non-Key Facilities, which include all buildings and structures not part of a Key Facility, or the balance of LANL. Although operations at Non-Key Facilities do not contribute significantly to radiation doses or generation of radioactive wastes, the Non-Key Facilities represent a significant fraction of LANL. The Non-Key Facilities comprise all or the majority of 30 of LANL's 48 TAs, and approximately 14,224 of LANL's 26,480 acres. The Non-Key Facilities also currently employ about two-thirds the LANL workforce. The Non-Key Facilities include such important buildings and operations as the Central Computing Facility, the TA-46 sewage treatment facility, and the Main Administration Building. 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.

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4 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.

5 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.

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
Chemical and Metallurgy Research (CMR) Building	TA-03	14
Pajarito Site	TA-18	131
Sigma Complex	TA-03	11
MSL	TA-03	2
Target Fabrication Facility (TFF)	TA-35	3
Machine Shops	TA-03	8
High Explosives Processing	TA-08, -09, -11, -16, -22, -28, -37	1,115
High Explosives Testing	TA-14, -15, -36, -39, -40	8,691
LANSCE	TA-53	751
Biosciences Facilities (Formerly Health Research Laboratory)	TA-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 48 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.

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.

2.1 Plutonium Complex (TA-55)

The Plutonium Complex Key Facility consists of six primary buildings and a number of lesser buildings and structures. As presented in the SWEIS, 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). Additionally, the Nuclear Materials Technology (NMT) Division acquired and took ownership of the TA-50-37 building, designated as the Actinide Research Training and Instruction Center in CY 2003. The DOE listing of LANL nuclear facilities for both 1998 and 2003 (DOE 1998a, LANL 2002a) retained Building TA-55-4 as a Category 2 nuclear hazard facility as shown in Table 2.1-1.

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

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2003 [b]
TA-55-0004	Plutonium-238 Processing	2	2	2
TA-55-0041	Nuclear Material Storage	2		

[a] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)
[b] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

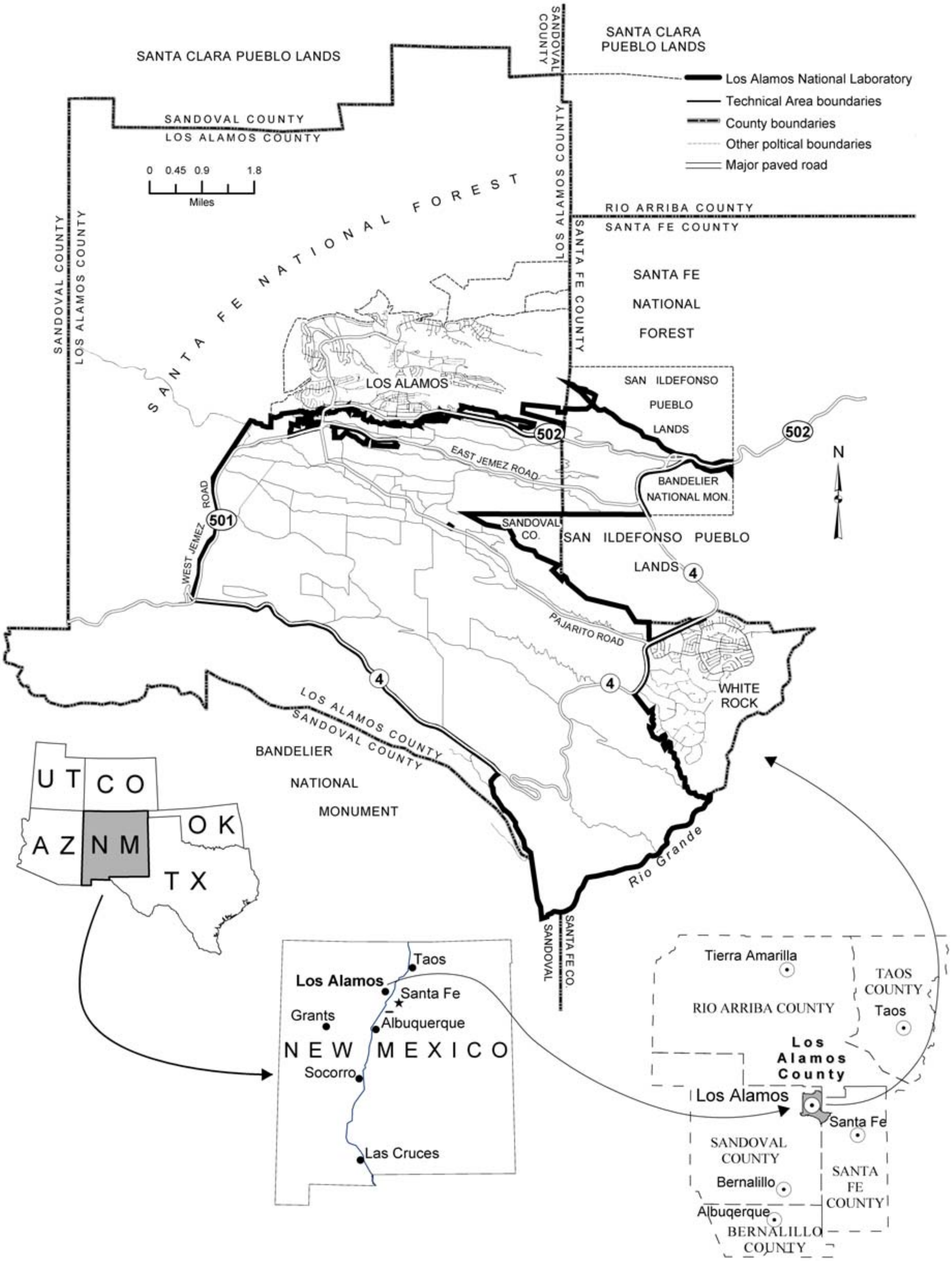

Figure 2-1. Location of LANL

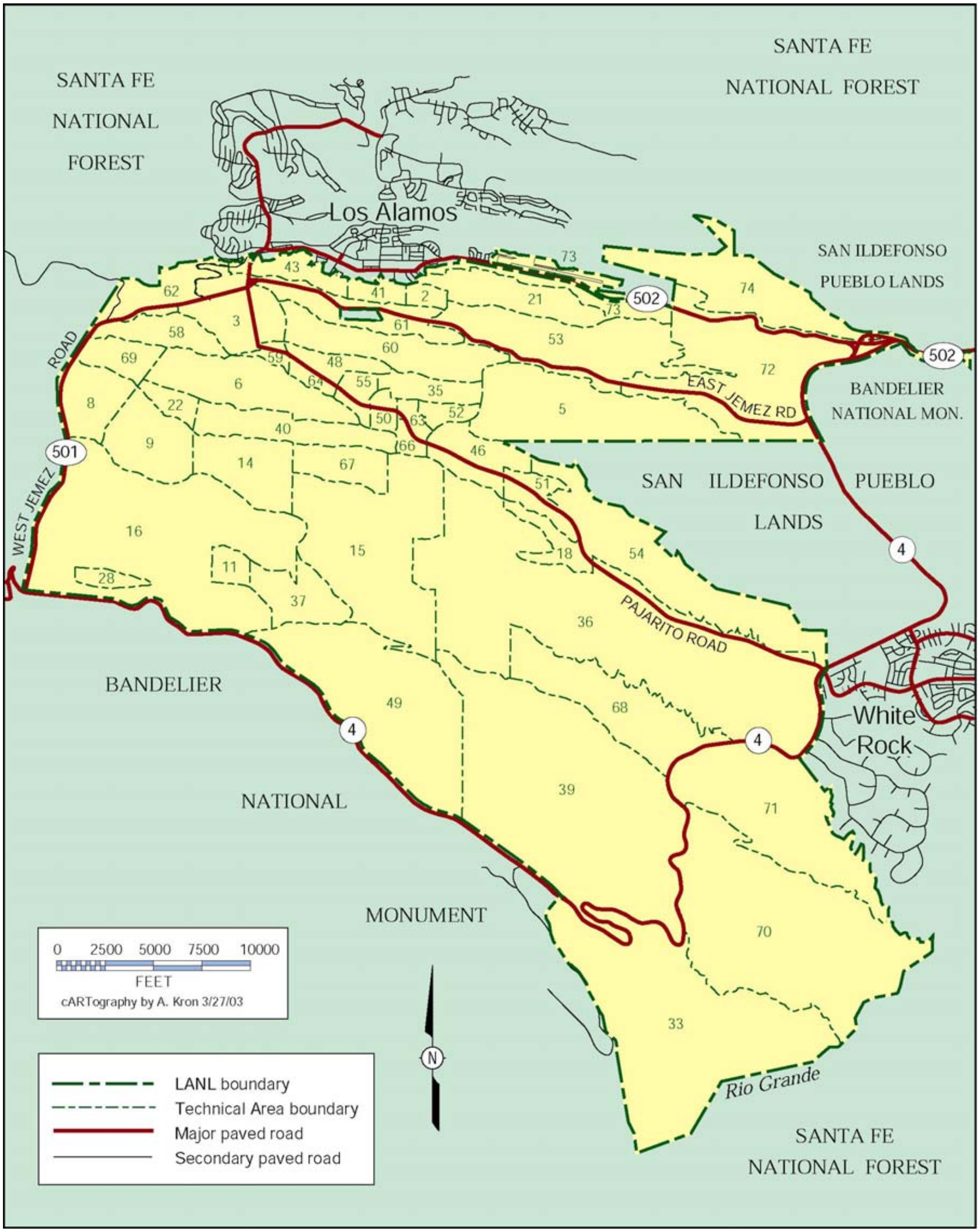

Figure 2-2. Location of technical areas

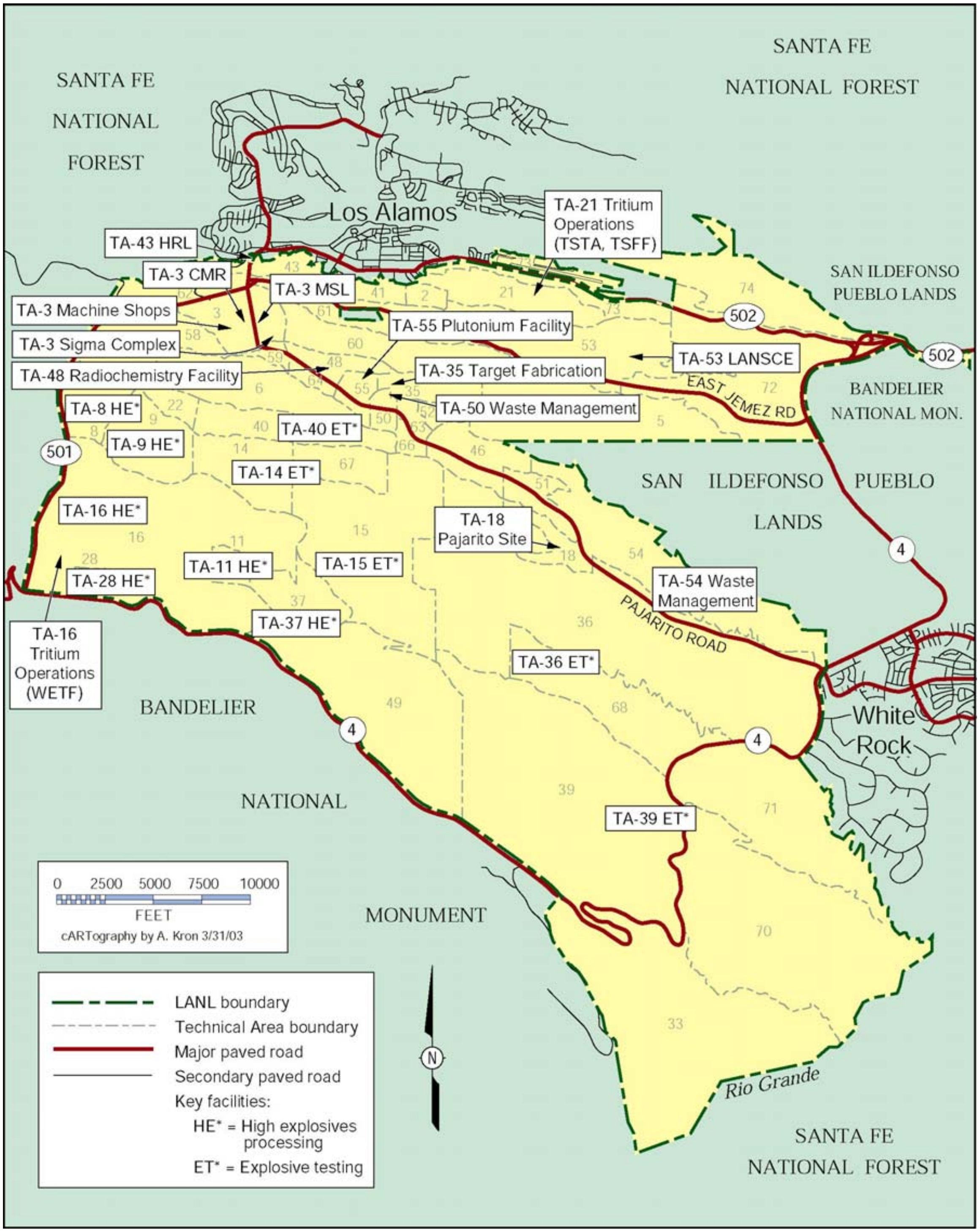

Figure 2-3. Location of Key Facilities

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 calendar year under review, in this case CY 2003. 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 slated for potential modification to bring it into operational status. This was not done, and the DOE 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 (not currently planned to be used to store nuclear materials);
- construction of a new administrative office building (construction of the Facility Improvement Technical Support [FITS] building [PF-66] was completed in 1999);
- 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 2003, a modular construction type office building similar to the FITS building (55-66) was constructed and occupied in August 2003 (LANL 1998a, 2001d, DOE 1996a). This new office building is designated the Manufacturing Technical Support Facility (also known as NMT FY 01 Office Building), 55-313, and located approximately 100 feet east and 50 feet north of the FITS building.

During CY 2003, upgrades to maintain existing capacity were continued, including design on replacement of the current main fire protection water line and pump houses. In addition, the following equipment upgrades were performed or started during CY 2003:

- installation of the part sanitization furnace (system to sanitize classified non-special nuclear material [SNM] materials);
- procurement and installation of a new packaging line (DOE-STD-3013) complete with automation (project identifier 000100685) was initiated;
- procurement and installation of a new disassembly lathe (with automation to reduce worker exposure) (project identifier 000100661) was initiated.

During CY 2001, there were several projects that were started for maintenance or replacement purposes. The projects are listed below with their CY 2003 status:

- NMT Protect Combustible Materials (LANL 2001e, DOE 1996b), ongoing in CY 2003;
- TA-55 Fire Protect Yard Main Replacement (LANL 2001f, DOE 1996c), completed in summer of CY 2003;
- CMR Replacement Project[6] DOE Preconceptual Design (LANL 2001g), ongoing in CY 2003;
- FRIT Transfer System (LANL 2001h; DOE 1996d), ongoing in CY 2003;
- TA-18 Relocation Project Office Building (LANL 2001i, DOE 2002b). At the end of CY 2002, this was no longer scheduled for TA-55. A temporary building was built between TA-55 and TA-48 on the north side of Pajarito Road during CY 2003;
- TA-18 Relocation Project CATIII/IV at TA-55 (LANL 2001j, DOE 2002b). At the end of CY 2003, this was still under consideration;
- NMT Fire Safe Storage Building (LANL 2001k, DOE 1996e). Construction continued during CY 2003; and
- TA-18 Relocation Project CAT-I Piece (LANL 2001l, DOE 2002b). At the end of CY 2002, this was no longer planned for TA-55.

During CY 2002, there were several projects that were started for maintenance or replacement purposes. The projects are listed below with their CY 2003 status:

- TA-55 Radiography/Interim (LANL 2001m), ongoing in CY 2003;
- TA-55 Radiography (LANL 2001n), complements TA-55 Radiography/Interim, ongoing in CY 2003;
- New Radioactive Liquid Waste collection system line tie-ins design phase started, but construction was not started in CY 2003 (DOE 2003b);
- Installation of new liquid nitrogen lines and tank on west side of facility was under construction in CY 2003 (DOE 2003c);
- TA-55 fire loop replacement project (DOE 2001a) was completed in August 2003;
- TA-55 New Parking Lot (LANL 2002d), still not started in CY 2003;
- FITS Parking Lot (LANL 2002e), still not started during CY 2003;
- Temporary Parking (False Perimeter Intrusion, Detection, and Alarm System) (LANL 2002f), completed in CY 2003; and
- CMR Replacement Geotechnical Investigation (LANL 2002g), the first phase in determining the feasibility of constructing the CMR Replacement, was ongoing in CY 2003. Geotechnical surveys were performed in CY 2003; additional surveys may be necessary in CY 2004.

2.1.2 Operations at the Plutonium Complex

The SWEIS identified seven capabilities[7] for this Key Facility. No new capabilities have been added. One capability, SNM Storage, Shipping, and Receiving, had planned to use

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

[7] As defined in the 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.

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 (Building 55-4). For all seven capabilities, activity levels were below those projected by the SWEIS ROD. Table 2.1.2-1 presents details.

Table 2.1.2-1. Plutonium Complex/Comparison of Operations

Capability	SWEIS ROD [a]	2003 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.
Manufacturing Plutonium Components	Produce nominally 20 war reserve pits/yr. (Requires minor facility modifications.)	Fewer than 20 qualified pits were produced in CY 2003.
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 2003. Fewer than 40 pits were destructively examined as part of the stockpile evaluation program (pit surveillance) in CY 2003.
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 2003.
	Process neutron sources up to 5,000 curies/yr. Process neutron sources other than sealed sources.	Neutron sources are not currently being disassembled and chemically processed. Off-site sources are being recovered from government, industrial, and academic activities, repackaged, and sent to TA-54 for final disposition. No new sources are being processed.
	Process up to 400 kilograms/yr of actinides.[b] Provide support for dynamic experiments.	Fewer than 400 kilograms/yr of actinides were processed in CY 2003. Support was provided for dynamic experiments.
	Perform decontamination of 28 to 48 uranium components per month.	In CY 2003, 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 2003.

Table 2.1.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 Operations
Actinide Materials and Science Processing, Research, and Development (cont.)	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 2003.
	Conduct plutonium research and 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 2003.
	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, Science, and Technology Advanced Fuel Cycle Initiative (AFCI) is fabricating actinide nitride fuels for irradiation in a reactor environment. Lead test assemblies are being considered for the future. NMT Division is developing fuels for the Generation 4 reactors. NMT is working with Naval Reactor staff for development of fuel(s) for the Jupiter Icy Moons Orbiter Project.
	Develop safeguards instrumentation for plutonium assay.	Continued support of safeguards instrumentation development during CY 2003.
	Analyze samples in support of actinide reprocessing and research and development activities.	Analysis of actinide samples at TA-55 continued in support of actinide reprocessing and research and development activities.
Fabrication of Ceramic-Based Reactor Fuels	Build mixed oxide test reactor fuel assemblies and continue research and development on fuels.	AFCI mixed oxide fuels are being fabricated for irradiation testing.
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.	Recovered approximately 2.2 kilograms of plutonium-238 and processed approximately 2.0 kilograms of plutonium-238 for heat source fuel during CY 2003.
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 2003.

[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. Radioactive air emissions were less than one percent of projections (less than 5 curies in 2001 compared to 1,000 curies projected). The 11,708 kilograms of chemical waste includes 10,433 kilograms of solid waste material from the replacement of the hydraulic cylinders at the front gate. This waste consisted of dirt, rocks, concrete chips, and asphalt chips.

Table 2.1.3-1. Plutonium Complex/Operations Data

Parameter	Units [a]	SWEIS ROD	2003 Operations
Radioactive Air Emissions:			
Plutonium-239 [b]	Ci/yr	2.70E-5	1.49E-06
Plutonium-238	Ci/yr	Not projected [c]	6.14E-08
Americium-241	Ci/yr	Not projected [c]	5.85E-07
Other actinides [d]	Ci/yr	Not projected [c]	3.90E-08
Strontium-90/Yttrium-90	Ci/yr	Not projected [c]	5.62E-08
Tritium in Water Vapor	Ci/yr	7.50E+2	9.83E+00
Tritium as a Gas	Ci/yr	2.50E+2	5.04E+01
NPDES [e] Discharge 03A–181	MGY	14	3.02
Wastes:			
Chemical	kg/yr	8,400	19,354 [f]
LLW [g]	m^3/yr	754 [h]	392
MLLW [g]	m^3/yr	13 [h]	4.1
TRU [g]	m^3/yr	237 [i]	216
Mixed TRU	m^3/yr	102 [i]	78
Number of Workers	FTEs	589 [j]	715 [j]

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 SWEIS ROD projection was exceeded due to disposition of 9,979 kg of soil contaminated with diesel fuel, 856 kg of waste solutions from experiments, and an additional 371 kg of dirt and rocks contaminated with diesel fuel.
g LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; TRU = transuranic.
h Includes estimates of waste generated by the facility upgrades associated with pit fabrication.
i 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.
j 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 2003 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), KSL, and other subcontractor personnel. The number of employees for 2003 operations is routinely collected information and represents only University of California (UC) 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 2003 were conducted in three buildings: The Weapons Engineering Tritium Facility (WETF, Building TA-16-205), the Tritium Systems Test Assembly (TSTA, Building TA-21-155N), and the Tritium Science and Fabrication Facility (TSFF, Building TA-21-209). 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.

Two facilities, WETF and TSFF, had tritium inventories greater than 30 grams during the entire 2003 year and, thus, were Category 2 nuclear facilities. During 2003, the tritium inventory at TSTA was reduced to less than 1 gram. This facility was reclassified to a radiological facility in June 2003. In August 2003, TSTA was formally transferred from Engineering Sciences and Application (ESA) Division line management to Facility and Waste Operations (FWO) Division line management for surveillance and maintenance and limited equipment removal.

Programmatic activities at the TSFF are also being reduced and will be moved to the WETF in 2004. The transition of TSFF to a radiological facility is estimated to occur in 2006. When funding becomes available, the TSFF will be deactivated.

As shown in Table 2.2-1, the nuclear hazard classification of these three facilities has remained constant. However, WETF was separated into its three component buildings in the SWEIS, but is now considered a single building.

Table 2.2-1. Tritium Buildings with Nuclear Hazard Classification (NHC)

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2003 [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	2
TA-21-0209	TSFF	2	2	2

[a] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)

[b] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

[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 and LANL.

2.2.1 Construction and Modifications at the Tritium Facilities

During 2003, there were no new major construction activities or building modifications at WETF at TA-16. The Operational Readiness Review to extend the tritium processing area of WETF into Building 450 was started in 2002 and continued in CY 2003. At the completion of the Operational Readiness Review and the new Documented Safety Analysis, Building 450 will be integrated into WETF tritium operations. The modification of Building 450 is to accommodate neutron tube target loading operations and related research. This modification was addressed by the SWEIS ROD and has its own NEPA coverage via an environmental assessment and Finding of No Significant Impact (DOE 1995a). When the Operational Readiness Review and Documented Safety Analysis are approved, it is anticipated that the Category 2 nuclear boundary will then be expanded to include Building 450.

There have been no facility modifications made to the TA-21 facilities from 1999 through 2003.

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 2003 operational data for each of these capabilities. Operations in 2003 were below projections by the SWEIS ROD and remained within the established environmental envelope. For example, 25 high-pressure gas fill operations were conducted in 2003 (compared to 65 fills projected by the SWEIS ROD), and approximately 20 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]	2003 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 25 high-pressure gas fills/processing operations.
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 20 gas boost tests and operations.
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 2003.
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 2003.
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 <2% of LANL's tritium emissions to the environment.	Activities resulted in <1% tritium emissions from each facility.

Table 2.2.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 Operations
Thin Film Loading: TSFF (WETF by 2004)	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.	Approximately 1,500 units were loaded. Operations occurred at TSFF.
Gas Analysis: TSFF, WETF	Analytical support to current capabilities. Operations estimated to contribute <5% of LANL's tritium emissions to the environment.	Gas analysis operations were continued at TSFF and WETF during 2003. No changes in facility emissions occurred from this activity.
Calorimetry: TSFF, 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 <2% of LANL's tritium emissions to the environment.	Calorimetry activities were conducted at only WETF. No changes occurred in facility emissions from this activity.
Solid Material and Container Storage: TSTA, TSFF, WETF	Storage of tritium occurs in process systems, process samples, inventory for use, and as waste. Onsite storage could increase by a factor of 10 over levels identified during preparation of the SWEIS, with most of the increase occurring at WETF.	The storage of tritium at TSTA and TSFF decreased. In June 2003, the TSTA storage was less than 1.5 grams. The storage at WETF has increased by approximately 5% over levels identified during preparation of the SWEIS.

[a] Includes the remodel of Building 16-450 to connect it to WETF in support of Neutron Tube Target Loading.

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	2003 OPERATIONS
Radioactive Air Emissions:			
TA-16/WETF, Elemental tritium	Ci/yr	3.00E+2	7.58E+01
TA-16/WETF, Tritium in water vapor	Ci/yr	5.00E+2	6.02E+01
TA-21/TSTA, Elemental tritium	Ci/yr	1.00E+2	1.91E+01
TA-21/TSTA, Tritium in water vapor	Ci/yr	1.00E+2	4.42E+02
TA-21/TSFF, Elemental tritium	Ci/yr	6.40E+2	3.49E+01
TA-21/TSFF, Tritium in water vapor	Ci/yr	8.6E+2	6.84E+02
NPDES Discharge: [a]			
Total Discharges	MGY	0.3	19.0250
02A-129 (TA-21)	MGY	0.1	18.66
03A-158 (TA-21)	MGY	0.2	0.365
Wastes:			
Chemical	kg/yr	1,700	41
LLW	m^3/yr	480	109
MLLW	m^3/yr	3	1.5
TRU	m^3/yr	0	0

Table 2.2.3-1. (cont.)

Parameter	Units	SWEIS ROD	2003 OPERATIONS
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	28 [b]	19 [b]

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 existing outfalls.

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 2003 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 2003 operations is routinely collected information and represents only UC 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-3-29) and a radioactive liquid waste pump house, TA-3-154. The CMR Building consists of three floors: a basement, first floor, and attic. It has seven independent wings connected by a common corridor. The CMR Building remains a Hazard Category 2 per DOE Standard 1027-92 (DOE 1997a).

As shown in Table 2.3-1, DOE has identified the CMR facility, in various levels of detail, as a Category 2 nuclear facility since the publication of the SWEIS ROD (LANL 2002a).

Table 2.3-1 CMR Buildings with Nuclear Hazard Classification (NHC)

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2003 [b]
TA-03-0029	CMR	2		2
TA-03-0029	Radiochemistry Hot Cell		2	
TA-03-0029	SNM Vault		2	
TA-03-0029	Nondestructive analysis/nondestructive examination Waste Assay		2	
TA-03-0029	IAEA Classroom [c]			
TA-03-0029	Wing 9 (Enriched Uranium)		2	

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

b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

c 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 2003.

2.3.1 Construction and Modifications at the CMR Building

The ROD projected five facility modifications by December 2005:

- 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 in the Wing 9 hot cells.

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 Washdown System,
- Heating, Ventilation, and Air Conditioning delta Pressure System,
- Hood Washdown 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, and
- Fire Protection System.

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

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 plutonium. NEPA coverage for this project was provided by a Supplement Analysis to the 1999 SWEIS for the Proposed Disposition of Certain Large Containment Vessels, DOE/EIS-0238-SA-03 (DOE 2003d).

CMR BIO/Technical Safety Requirements Update

Revisions to the CMR BIO and Technical Safety Requirements were started in CY 2003. It is projected that the CMR BIO/Technical Safety Requirements update will be completed and submitted to DOE in April 2004.

2.3.2 Operations at the CMR Building

The eight capabilities identified in the SWEIS for the CMR Facility are presented in Table 2.3.2-1. No new capabilities have been added, but one capability (Nonproliferation Training) was removed from CMR and relocated back to TA-18.

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

Capability	SWEIS ROD [a]	2003 OPERATIONS
Analytical Chemistry	Sample analysis in support of a wide range of actinide research and processing activities. Approximately 7,000 samples/yr.	Approximately 1,200 samples were analyzed in CY 2003.
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 2003, highly enriched uranium was processed. One and one-half batches of uranium nitrate hexahydrate liquids from TA-18 were converted to uranium oxide in CY 2003.
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.
Nonproliferation Training (moved to Pajarito Site [TA-18] and renamed the Nuclear Measurement School).	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 returned to CMR from TA-18 during 2002 and was active in CYs 2002 and 2003. During CY 2003, four 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.	No activity. Mechanical or chemical processing of sources is not allowed in the CMR per the facility Authorization Basis (AB). During CY 2003, sealed sources were brought into Wing 9 for verification of unique identification numbers and were repackaged for eventual shipment to Waste Isolation Pilot Plant (WIPP).

Table 2.3.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 OPERATIONS
Actinide Research and Processing (cont.)	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.	No activity.
	Analysis of TRU waste disposal related to validation of the 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 CY 2001.
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.
	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. Material recovered and retained in inventory. Up to 1,000 kilograms annual throughput.	Process activity was never initiated on this project; during CY 2003, highly enriched uranium project equipment was removed from Wing 9 in preparation for the Bolas Grande Project.

[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 technetium-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.

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 one curie (compared to 1,645 projected)—principally because processing of irradiated molybdenum-99 targets in the hot cells did not occur. Of the wastes generated, only TRU waste exceeded SWEIS ROD projections; the others remained low, ranging from about 2 percent to about 25 percent of these projections. The TRU waste was above projections due to remodeling activities. 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	2003 Operations
Radioactive Air Emissions:			
Total Actinides [a]	Ci/yr	7.60E-4	1.12E-05
Strontium-90/Yttrium-90	Ci/yr	Not projected [b]	2.10E-07
Krypton-85	Ci/yr	1.00E+2	Not measured [c]
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]
Tritium Gas	Ci/yr	Negligible	Not measured [c]
NPDES Discharge:			
03A–021	MGY	0.53	2.1626
Wastes:			
Chemical	kg/yr	10,800	1,651
LLW	m^3/yr	1,820	423
MLLW	m^3/yr	19	4.7
TRU	m^3/yr	28 [d]	7.9
Mixed TRU	m^3/yr	13 [d]	11.5
Number of Workers	FTEs	204 [e]	198 [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 2003 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 2003 operations is routinely collected information and represents only UC

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)

The Pajarito Site Key Facility is located entirely at TA-18. 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 (18-30), three outlying, remote-controlled critical assembly buildings then known as "kivas" (18-23, -32, -116), and a number of additional support buildings, including the hillside vault (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).

As shown in Table 2.4-1, DOE lists this whole Key Facility as a Category 2 nuclear facility and identifies seven buildings with nuclear hazard classifications. The four buildings identified in the SWEIS (TA-18-23, -26, -32, and -116) have remained Category 2 nuclear facilities. Additions to the Nuclear Facilities list represent buildings with inventories meeting the current nuclear facility classification guidelines. It is interesting to note that the IAEA classroom (Building TA-18-258) represents 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. All other schools remain at TA-18.

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

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2003 [b]
TA-18	Site Itself		2	2
TA-18-0023	SNM Vault (CASA 1)	2	2	
TA-18-0026	Hillside Vault	2	2	
TA-18-0032	SNM Vault (CASA 2)	2	2	
TA-18-0116	Assembly Building (CASA 3)	2	2	
TA-18-0127	Accelerator used for weapons x-ray		2	
TA-18-0129	Calibration Laboratory		2	
TA-18-0247	Sealed Sources		3	

a DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)
b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

The new AB, comprised of a BIO document and Technical Safety Requirements, was submitted to NNSA on March 14, 2002, and approved by NNSA on July 31, 2002. Implementation of the new AB, including the Technical Safety Requirements, is in progress and scheduled to be completed by June 2004. The new AB 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 2003 consisted of security and safety enhancements. In CY 2003, all natural gas was removed from all three CASAs. NEPA review for these electrical heat upgrades projects was provided by existing DOE-approved categorical exclusions: CASA 1 (DOE 2003e), CASA 2 (DOE 2003f), and CASA 3 (DOE 2003g).

The environmental impact statement for the proposed relocation of TA-18 (DOE 2002b) was issued for public comment on August 30, 2002. The corresponding ROD, approved on December 5, 2002, identified the Device Assembly Facility at the Nevada Test Site (NTS) as the preferred alternative for the relocation of TA-18.

2.4.2 Operations at the Pajarito Site

The SWEIS identified nine capabilities for this Key Facility. No research capabilities have been deleted. However, the Nuclear Measurement School that was originally moved from TA-18 to CMR (before the SWEIS) was moved back to TA-18 in 2000. The TA-18 facility experienced normal operations during 2003, except for the Solution High-Energy Burst Critical Assembly that was on operational downtime starting August 2000. This critical assembly was restarted in February 2003. The TA-18 facility conducted 164 criticality experiments in 2003. This total of 164 experiments represents only about 16 percent of the SWEIS ROD projection of a maximum of 1,050 experiments in any given year. In addition, the nuclear material inventory level has remained below the SWEIS ROD projection. For 2003, the material inventory was reduced by an additional 10 percent over the 10 percent reduction in 2002; there was not a significant 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]	2003 Operations
Dosimeter Assessment and Calibration	Perform up to 1,050 criticality experiments per year.	Performed 164 criticality experiments.
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.	The nuclear materials inventory for 2003 was approximately the same as the 2002 inventory. The portable linac was not replaced.
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.	Performed 164 criticality experiments.

Table 2.4.2-1. (cont.)

Capabilities	SWEIS ROD [a]	2003 Operations
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%.	Performed 164 experiments. The nuclear materials inventory for 2003 was approximately the same as the 2002 inventory. The SKUA critical assembly was de-fueled at DOE's request and is no longer available for criticality experiments. All expected SKUA material shipments were completed by May 2003.
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.	Performed 164 experiments. The nuclear materials inventory for 2003 was approximately the same as the 2002 inventory.
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%.	Performed 164 experiments. The nuclear materials inventory for 2003 was decreased by 10%.
Skyshine Measurements	Perform up to 1,050 criticality experiments per year.	Performed 164 experiments.
Vaporization	Perform up to 1,050 criticality experiments per year.	Performed 164 experiments.
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%.	Performed 164 experiments. The nuclear materials inventory for 2003 was approximately the same as the 2002 inventory.
Nuclear Measurement School (relocated from CMR and renamed. At CMR it was called "Nonproliferation Training") [b]	Not in SWEIS ROD (was located in CMR).	The IAEA schools were returned to CMR in 2002. All other schools remain at TA-18.

[a] Includes replacement of the portable linac.

[b] This capability was located at TA-18 in years past, but had been moved to CMR. In the effort to reduce the CMR Building to a Category 3 nuclear facility, these operations were moved back to TA-18, necessitating the transfer of additional nuclear material to the facility for use in the classes.

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 2003 activities was 1.0 millirem, compared to 28.5 millirem per year projected by the SWEIS ROD. Chemical waste generation at Pajarito Site was below SWEIS ROD projections from 1998 through 2003. 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	2003 Operations
Radioactive Air Emissions:			
Argon-41 [a]	Ci/yr	1.02E+2	1.0
External Penetrating Radiation	mrem/yr	28.5 [b]	2.6
NPDES Discharge	MGY	No Outfalls	No Oufalls
Wastes:			
Chemical	kg/yr	4,000	28
LLW	m^3/yr	145	10
MLLW	m^3/yr	1.5	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	70 [c]	41 [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.

[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 2003 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 2003 operations is routinely collected information and represents only UC 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.

2.5 Sigma Complex (TA-03)

The Sigma Complex Key Facility consists of four principal buildings: the Sigma Building (03-66), the Beryllium Technology Facility (03-141), the Press Building (03-35), and the Thorium Storage Building (03-159). Primary activities are the fabrication of metallic and ceramic items, characterization of materials, and process research and development. As shown in Table 2.5-1, this Key Facility had two Category 3 nuclear facilities, 03-66 and 03-159 identified in the SWEIS; however, in April 2000, Building 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 03-66 was downgraded from a hazard category 3 nuclear facility and removed from the nuclear facilities list

(LANL 2002a). In September 2001, Buildings 03-35, 03-66, 03-159, and 03-169 were placed on the radiological facility list (LANL 2002b). Building 03-141 is a Non-Nuclear Moderate Hazard Facility.

Table 2.5-1. Sigma Buildings with Nuclear Hazard Classification (NHC)

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2002 [b]
TA-03-0066	depleted uranium storage	3	3	
TA-03-0159	thorium storage	3	3	

[a] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998)
[b] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

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—completed in 2003,
- painted the exterior of Sigma Building—completed in 2003, and
- re-installed the utilities to activate the Press Building—completed in 2003.

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 will 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 in January 2001.

The Beryllium Technology Facility upgrades include

- heating, ventilation, and air conditioning system damper replacements—complete,
- Cartridge Filter house enclosure—initiate in fiscal year (FY) 05,
- PC-3 Vault—initiate in FY 05,
- Locker room expansion—complete, and
- Facility Maintenance System upgrade—initiate in FY 04.

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 2003 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]	2003 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 153 assignments and 759 specimens were characterized.
	Analyze up to 36 tritium reservoirs/yr.	Activity transferred to TFF (See Table 2.7.2-1.) [b]
Characterization of Materials (cont.)	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 66 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 less 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 but did not fabricate any targets.

Table 2.5.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 Operations
Fabrication of Metallic and Ceramic Items (cont.)	Fabricate targets and other components for accelerator production of tritium research.	
	Fabricate test storage containers for nuclear materials stabilization.	Produced approximately 50 containers.
	Fabricate nonnuclear (stainless steel and beryllium) components for up to 20 pit rebuilds/yr.	Fabricated 30 stainless steel and beryllium components.

[a] Includes Sigma Building renovation and modifications for Beryllium Technology Facility.
[b] The SWEIS indicated that this activity would also be accomplished at TFF.

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	2003 Operations
Radioactive Air Emissions:			
Uranium-234	Ci/yr	6.60E-5	Not Measured [a]
Uranium-238	Ci/yr	1.80E-3	Not Measured [a]
NPDES Discharge:			
Total Discharges	MGY	7.3	7.619
03A–022	MGY	4.4	7.619
03A–024	MGY	2.9	0
Wastes:			
Chemical	kg/yr	10,000	878
LLW	m^3/yr	960	124
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]	106 [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 US 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 2003 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 2003 operations is routinely collected information and represents only UC 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 (3-1698) 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 Facility List (LANL 2002b) and remained on the list in CY 2003.

2.6.1 Construction and Modifications at the Materials Science Laboratory

Projected: 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.

Actual: To date, the completion of the top floor of the MSL remains unscheduled and unfunded. In CY 2003, construction of the MST Office Building was initiated.

MST Office Building

This project is consistent with LANL's long-range vision to group materials science activities together in the southeast quadrant of TA-03. The new MST Office Building project location is west of the Sigma Complex security fence. The MSL and the other permanent buildings comprising the materials science complex are all located adjacent to the site proposed for this new office building and a common circulation pattern for that area will be implemented.

This General Plant Project will replace 17 trailers located to the east of 03-1819 and 03-2002 with a multistory office building. This modern, sustainable facility will dramatically reduce operational costs compared to those associated with the "temporary" structures. The project will provide MST Division with a new office building to house approximately 80 staff currently working in a cluster of "temporary" trailers and transportable structures in the materials science complex in TA-03. The project received its own NEPA coverage by Categorical Exclusion #8618 issued December 07, 2001 (DOE 2001b). Construction of the new office building began in December 2002 (corrected from November in Yearbook 2002) and continued throughout CY 2003.

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 2003, there were approximately 106 total researchers and support staff at MSL, about 29 percent more than the 82 projected by the SWEIS ROD.[8] (The primary measurement of activity for this facility is the number of scientists doing research.) Table 2.6.2-1 compares CY 2003 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]	2003 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, and powder processing were expanded in CY 2003. Materials characterization capacity was expanded upon. Cold mock up of weapons assembly and processing as well as other technologies continued to be expanded in CY 2003.
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 2003. 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.

[8] 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 106 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]	2003 Operations
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 Electron microscopy expanding to include atomic scale microscopy X-ray capabilities were improved upon.

[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 decreased from about 57 workers in CY 1998 to about 52 in CY 2003 (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	2003 Operations
Radioactive Air Emissions	Ci/yr	Negligible	Not Measured
NPDES Discharge Volume	MGY	No outfalls	No outfalls
Wastes:			
Chemical	kg/yr	600	196
LLW	m^3/yr	0	0
MLLW	m^3/yr	0	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	57 [a]	52 [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 2003 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 2003 operations is routinely collected information and represents only UC 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.

2.7 Target Fabrication Facility (TA-35)

The TFF is a two-story building (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 prior to 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

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 1996f). There were no other significant facility additions or modifications during the 1996–1998, 1999, 2000, 2001, 2002, or 2003 periods. The ROD did not project any facility changes through 2005.

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 1998–2003 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 the 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 only listed for the Sigma Key Facility.

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

Capability	SWEIS ROD	2003 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. Did not support high-explosive pulsed-power tests at levels identified during preparation of the SWEIS. In addition, did not do any high-energy-density physics tests.
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 400 tests. Did not support high-explosive pulsed-power tests at levels identified during preparation of the SWEIS. Supported no high-energy-density physics tests.

Table 2.7.2-1. (cont.)

Capability	SWEIS ROD	2003 Operations
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 at levels identified during preparation of the SWEIS. Supported no high-energy-density physics tests.
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 1998–2003 waste volumes, which were less than projected. Table 2.7.3-1 details operations data for CY 2003.

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

Parameter	Units	SWEIS ROD	2003 Operations
Radiological Air Emissions	Ci/yr	Negligible	Not Measured [a]
NPDES Discharge:			
4A-127	MGY	0	Eliminated
Wastes:			
Chemical	kg/yr	3,800	1,311
LLW	m^3/yr	10	0
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 2003 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 2003 operations is routinely collected information and represents only UC 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 03-39) and the Radiological Hazardous Materials Machine Shop (Building 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 03-102 was placed on the Radiological Facilities List (LANL 2001c).

2.8.1 Construction and Modifications at the Machine Shops

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

Actual: In CY 2003, one existing project was modified and one minor facility modification was completed at TA-03:

- Depleted uranium was added to the Materials Compatibility Study. A description of the change in project scope was provided by ESH-ID 03-0085 (LANL 2003a). No construction was involved. NEPA coverage for this activity was provided by an amendment to the existing DOE-approved NEPA categorical exclusion LAN-02-012 (DOE 2003h), accession number 9929;

- Controlled storage areas in support of the weapons program were added to TA-03-39. Installation of the controlled storage areas involved only minor modifications to the building (cages were added) as described in ESH-ID 03-0002 (LANL 2003b). The proposed work is within the scope of an existing DOE-approved NEPA categorical exclusion LAN-96-022 (DOE 2003i), accession number 9475.

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	2003 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.

Table 2.8.2-1. (cont.)

Capability	SWEIS ROD	2003 Operations
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.
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 generation was about 0.03 percent of projected generation (156 kilograms generated in 2003, 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	2003 Operations
Radioactive Air Emissions:			
Americium-241	Ci/yr	Not projected [a]	1.03E-10
Thorium-230	Ci/yr	Not projected [a]	5.75E-09
Thorium-232	Ci/yr	Not projected [a]	1.44E-09
Uranium-234	Ci/yr	Not projected [a]	2.16E-08
Uranium-235	Ci/yr	Not projected [a]	5.13E-10
Uranium-238	Ci/yr	1.50E-4	3.42E-09
NPDES Discharge	MGY	No outfalls	No outfalls
Wastes:			
Chemical	kg/yr	474,000	156
LLW	m^3/yr	606	15
MLLW	m^3/yr	0	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	81 [b]	90 [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 2003 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 2003 operations is routinely collected information and represents only UC 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.

2.9 High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, TA-28, TA-37)

The High Explosives Processing Key Facility is located in all or parts of seven technical areas. 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) (Table 2.9-1). In November 2002, the updated LANL Radiological Facility List (LANL 2002b) was published and identified Buildings TA-08-0022, -0070, and -0120; TA-11-0030; TA-16-0088, -0202, -0207, -0300, -0301, -0302, -0332, -0410, -0411, -0413, and -0415; and TA-37-0010, -0014, -0016, -0022, -0024, and -0025 as radiological facilities (see Table 2.9-2).

Table 2.9-1. High Explosives Processing Buildings with Nuclear Hazard Classification (NHC)

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2003 [b]
TA-08-0022	Radiography facility	2	2	
TA-08-0023	Radiography facility	2	2	2
TA-08-0024	Isotope Building	2		
TA-08-0070	Experimental Science	2		
TA-16-0411	Intermediate Device Assembly		2	

[a] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)
[b] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

Table 2.9-2. High Explosives Processing Buildings Identified as Radiological Facilities

Building	Description	LANL 2003 [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-37-0010	Storage Magazine	RAD
TA-37-0014	Storage Magazine	RAD
TA-37-0016	Storage Magazine	RAD

Table 2.9-2. (cont.)

Building	Description	LANL 2003 [a]
TA-37-0022	Magazine	---
TA-37-0024	Storage Magazine	RAD
TA-37-0025	Storage Magazine	RAD

[a] LANL Radiological Facility List (LANL 2002b)

Operations at this Key Facility are performed by two separate Divisions: the Dynamic Experimentation (DX) Division and ESA Division. ESA performs the majority of the high explosives manufacturing and assembly work while DX assesses the parts produced by ESA.

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

The real-time, small-component radiography capability installed in Building TA-16-260 was completed and made fully operational in CY 2001. When this capability became fully operational, Buildings TA-16-220, -222, -223, -224, -225, and -226 were vacated and demolished in CY 2003 (DOE 1997b).

Planning and modification work at TA-09 continued to allow consolidation of high explosives formulation operations previously conducted at TA-16-340 with other TA-09 high explosives operations (DOE 1999b). In CY 2002, all high explosives burning operations were consolidated at TA-16-388 and -399. During CY 2003, burning operations were performed only at TA-16-388, however, TA-16-399 is still available for burning of bulk high explosives.

The new Weapon Engineering Office Building at TA-16 was completed in CY 2003. This project was part of the Office Building Replacement Program for Vulnerable Facilities, a Cerro Grande Rehabilitation Project (CGRP) project, and was covered by a DOE-approved categorical exclusion (DOE 2002c).

In June 2003, construction began on the new Detonator Production Facility, Building 22-115. The proposed work is within the scope of the DOE-approved NEPA categorical exclusion LAN-00-034 (DOE 2000b), accession number 7912.

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 2003 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 decided, however, to keep high explosives production at Pantex Plant. However, the projections for high explosive processing were retained because DOE intends to keep LANL available as a back-up capability for Pantex Plant.

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 2003 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.

Table 2.9.2-1. High Explosives Processing (TA-08, TA-09, TA-11, TA-16, TA-22, TA-28, and TA-37)/Comparison of Operations

Capability	SWEIS ROD [a, b]	2003 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.

Table 2.9.2-1. (cont.)

Capability	SWEIS ROD [a, b]	2003 Operations
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.	DX Division fabricated approximately 6,075 high explosive parts, and ESA Division fabricated approximately 1,061 high explosives parts in CY 2003. Therefore, approximately 7,136 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.	ESA Division provided fewer than 100 major assemblies for NTS 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.	DX Division performed fewer than 15 stockpile related safety and mechanical tests during CY 2003.
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 DX Division resulted in the manufacture of fewer than 40 product lines in CY 2003.

[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 2003 were 7,819 pounds of high explosive and 2,841 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.

In CY 2003, 7,819 pounds of high explosives and 2,841 pounds of high explosives simulant material were used in the fabrication of test components for DX and ESA. The level of high explosives usage was significantly below the SWEIS ROD projection of 82,700 pounds of high explosives, while the usage of high explosives simulant was about half the SWEIS ROD projection of 2,910 pounds. However, use of the high explosive simulant results in chemical waste that is shipped offsite for disposal and does not result in environmental impacts at LANL.

During CY 2003 the ESA Weapon Materials and Manufacturing Group produced 1,061 pieces of explosives weighing 7,819 lbs. In machining experimental components, 3,136 lbs of explosive scrap were generated and burned. The machined components were sent to DX Division and Lawrence Livermore National Laboratory for test detonations, along with an additional 2,426 lbs of raw explosives. During the high explosive processing, 17,246 gallons of explosive-contaminated water was generated, treated, and released. Also, 670 lbs of explosive-contaminated combustible waste and 25 gallons of explosive-contaminated solvent were burned. Finally, 3,775 lbs of explosive-contaminated metal were treated and salvaged.

In CY 2003, 3,136 pounds of explosive scrap were generated and burned at the TA-16 Burn Ground. In addition, 670 pounds of explosive-contaminated combustible solid wastes were burned, 25 gallons of explosive-contaminated solvent-water solutions were burned, 3,775 pounds of explosive-contaminated metal were treated and salvaged, and 17,246 gallons of explosive-contaminated water were generated, treated, and released. These levels were well below those projected by the SWEIS ROD.

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

2.9.3 Operations Data for High Explosives Processing

The details of operations data for CY 2003 are provided in Table 2.9.3-1. The NPDES discharge volume was about 19,200 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	2003 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	0.0192
03A–130 (TA-11)	MGY	0.04	0.0064
05A–055 (TA-16)	MGY	0.13	0.0128
05A–097 (TA-11)	MGY	0.01	0
Wastes:			
Chemical	kg/yr	13,000	24,230 [c]
LLW	m^3/yr	16	28
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 [d]	112 [d]

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-8), 04A-157 (TA-16), 05A-053 (TA-16), 05A-056 (TA-16), 05A-066 (TA-9), 05A-067 (TA-9), 05A-068 (TA-9), 05A-069 (TA-11), 05A-071 (TA-16), 05A-072 (TA-16), 05A-096 (TA-11), 06A-073 (TA-16), 06A-074 (TA-8), and 06A-075 (TA-8).

c SWEIS ROD projection was exceeded in 2003 due to the demolition and waste disposition of Buildings TA-16-220, -222, -223, -224, -225, and –226.

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 2003 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 2003 operations is routinely collected information and represents only UC 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 technical areas, 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), the Pulsed High Energy Radiation Machine Emitting X-Rays (TA-15-184), and the TA-15-306 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 Facility List (LANL 2001c).

2.10.1 Construction and Modifications at High Explosives Testing

Construction of DARHT, the only high explosive testing facility projected for construction or modification by the SWEIS ROD, was completed in 1999. This facility was evaluated in a separate environmental impact statement (DOE 1995b). Installation and component testing of the accelerator and its associated control and diagnostics systems began in late 1999 and continued through 2001. The DARHT firing point was modified for the mitigation of beryllium released during dynamic experiments; this work was conducted under an existing DOE-approved NEPA categorical exclusion (DOE 2002d).

During 2002, construction began on the Vessel Preparation Facility (DOE 1995b), a carpenter shop (DOE 2001c), an x-ray calibration facility (DOE 2001c), and a warehouse (DOE 2001c) located within TA-15. The carpenter shop, x-ray calibration facility, and warehouse were replacement structures for similar operations destroyed in the Cerro Grande Fire. Construction of these three replacement structures was completed during 2003.

Construction of a new High Explosives Preparation Facility (TA-36-78), also part of the CGRP, was conducted under a NEPA categorical exclusion (DOE 2001d) and completed during 2003. This project replaced the temporary trailer (TA-36-82) and transportainer (TA-36-205) with a permanent fire-resistant structure. In addition, the DARHT Vessel Prep Building (TA-15-534) was also constructed during 2003. NEPA review for this building was provided by the existing DARHT Environmental Impact Statement (DOE 1995b).

DX Division Strategic Plan for the Future

In 2002, NNSA determined that an environmental assessment would be required for the DX Division strategic plan including the new structures to be built at TA-22, and the subsequent decommissioning and demolition 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 2003j).

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 2003 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. A total of 175.737 kilograms were expended in 2003, 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 [a]	2003 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 in 2003 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.

Table 2.10.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 Operations
Other Explosives Testing	Develop advanced high explosives or weapons evaluation techniques.	Other explosives testing was conducted at a level below explosives testing projected by the SWEIS ROD.

[a] Includes completion of construction for the DARHT facility and its operation.

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 2003 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	2003 Operations
Radioactive Air Emissions:			
Depleted Uranium	Ci/yr	1.5E-1 [a]	Not Measured [b]
Chemical Usage: [c]			
Aluminum [d]	kg/yr	45,450	376.415
Beryllium	kg/yr	90	36.72
Copper [d]	kg/yr	45,630	28.234
Depleted Uranium	kg/yr	3,930	175.737
Lead	kg/yr	240	0
Tantalum	kg/yr	300	0.418
Tungsten	kg/yr	300	0
NPDES Discharge:			
Number of outfalls [e]	----	14	2
Total Discharges	MGY	3.6	1.7493
03A–028 (TA-15) [f]	MGY	2.2	0.4563
03A–185 (TA-15) [f]	MGY	0.73	1.293
Wastes:			
Chemical	kg/yr	35,300	1,056
LLW	m^3/yr	940	0
MLLW	m^3/yr	0.9	0
TRU [g]	m^3/yr	0.2	0
Mixed TRU [g]	m^3/yr	0	0
Number of Workers	FTEs	227 [h]	251 [h]

[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] Outfalls eliminated before 1999: 04A-101 (TA-40), 04A-139 (TA-15), 04A-141 (TA-39), 04A-143 (TA-15), 04A-156 (TA-39), 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.

[f] 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 2003 reporting.

[g] TRU waste (steel) will be generated as a result of DARHT's Phased Containment Option (see DARHT Environmental Impact Statement [DOE 1995b]).

[h] 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 2003 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 2003 operations is routinely collected information and represents only UC 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

Immediate Effects

About 3,040 acres of land within the High Explosives Testing Key Facility burned during the Cerro Grande Fire. Areas most affected were TA-14, -15, and -40 and, to a lesser extent, TA-36. Fire damage was in excess of $16 million. Approximately 14 facilities were destroyed and approximately 28 additional facilities were damaged within the DX controlled area of LANL as a result of the fire. All of the destroyed facilities were transferred to decommissioning and demolition in 2001. Any reusable items were salvaged and recycled (DOE 2000c).

Continuing Effects

The Cerro Grande Fire has had a long-term effect on the high explosives testing operations. Management has limited high explosives outdoor testing at TA-40 to tests that are contained because of adjacent steep canyon walls and excess forest fuels.

Burned and hazard trees were removed and reduced to ash in an air curtain destructor. Some log decks associated with trees that were close to the firing sites remain on the DX-controlled area of LANL. Fire roads and firebreaks across the DX TAs were improved to facilitate fire fighting vehicles and personnel access.

The Water Quality and Hydrology Group and CGRP staff continue 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 DX-controlled area of LANL by preventing run-off and reducing storm flows onto DX property. These inspection and monitoring efforts will continue through 2005.

Other fire related activities involved fuel wood mitigation efforts that included tree thinning throughout DX Division. The tree thinning is in support of the first phase of the

LANL Wildfire Hazard Reduction Project Plan (LANL 2001o). This phase of the plan addresses forest vegetation treatments that provide the basis for direct programmatic and project-specific actions to reduce the risk of damage to LANL resources and facilities from catastrophic wildfire and its aftermath. The overall goals of the Wildfire Hazard Reduction Project 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, and decrease the risk of wildfire escapes at LANL-designated firing sites by treating fuel, and improving wild land fire suppression capability through fire road improvements (LANL 2001o).

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 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 has 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 which will continue into CY 2004. Full production has not begun. 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 Area C.

Experimental Area C is the location of proton radiography experiments for the Stockpile Stewardship Program. A new experimental facility for the production of ultracold neutrons is under construction in Area B (DOE 2002e). Experimental Area A, formerly used for materials irradiation experiments and isotope production, is currently inactive; construction of a new isotope production facility was completed in CY 2002 and commissioning occurred in December 2003. A second accelerator facility located at TA-53, the Low-Energy Demonstration Accelerator (LEDA), is also inactive and is being decommissioned and demolished.

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 53-7, and Area A East in Building 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 53-954 were placed on the LANL Radiological Facility 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 AB documents for the User Facility.

Table 2.11-1. LANSCE Buildings with Nuclear Hazard Classification (NHC)

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2003 [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/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)
[b] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

2.11.1 Construction and Modifications at Los Alamos Neutron Science Center

Projected: The ROD projected significant facility changes and expansion to occur at LANSCE by December 2005. Table 2.11.1-1 indicates that one project has been completed and that three have been started.

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	Started [a]
LEDA to become operational in late 1998	2-89-R	Yes - 1999 [b]
Short-Pulse Spallation Source enhancements	2-90-L	Started [c]
One-megawatt target/blanket	2-91-L	No
New 100-MeV Isotope Production Facility	2-92-L	Started [d]
Long-Pulse Spallation Source (LPSS), including decontamination and renovation of Area A	3-25-L	No
Dynamic Experiment Lab	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. Cleanup 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. Cleanup of the north lagoon was done in CY 2002. The Lagoons (Solid Waste Management Unit [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 report is in review by New Mexico Environment Department (NMED) and comments have not been received to date.

[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 decommissioning and demolition. The plan is to remove all support equipment and leave the building and the accelerator itself in place.]

c Part of the Short-Pulse Spallation Source upgrades have been performed. Upon completion, the project will upgrade the Proton Storage Ring and 1L line to operate at 200 microamperes at 30 hertz (vs. 70 microamperes at 20 hertz present during preparation of the SWEIS); will install a brighter ion source; and will add three neutron-scattering instruments to the Lujan Center. Through the end of CY 2002, the upgrades to the Proton Storage Ring had been completed, and the three instruments have been installed and commissioned in the Lujan Center. Upgrades to the ion source and 1L line are still in progress. [Note: the latter upgrades have been delayed to CY 2004.]

[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. Full production has not begun as of yet.

[e] The Stockpile Stewardship Program is currently using Experimental Area C, Building 53-3P, for proton radiography, and the Blue Room in Building 53-07 for neutron resonance spectroscopy. 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 Stockpile Stewardship and Management Programmatic Environmental Impact Statement (DOE 1996g) and ROD. 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.

Not Projected: 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 1999c). 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. Flight Path 12 is expected to be completed in February 2004. However, Flight Path 13 remains under construction due to delays in construction of the foundation exterior to MPF-30. Work is expected to be complete in CY 2004.

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 have been deleted. During CY 2001, LANSCE operated both accelerators and three of the five experimental areas. (Area A has been idle for more than two years; Area B has been idle for several years but a new Ultracold Neutron Facility is under construction [DOE 2002e].)

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. There was also no production of medical isotopes during CY 2003, although construction of a new isotope production facility has been completed. 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]	2003 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 new isotope production facility for 10 months/yr (6,400 hrs). Positive ion current 1,250 microampere and negative ion current of 200 microampere.	In 2003, H+ beam was not produced. H- beam was delivered as follows: (a) to the Lujan Center for 2,307 hours at an average current of 92.4 microamperes with 76.2% total reliability. (b) to WNR Target 2 for 321 hours in a "pulse on demand" mode of operation, with an average current below 1 femtoampere with 70.4% total reliability. (c) to WNR Target 4 for 2,436 hours at an average current of 2.7 microamperes with 79% total reliability. (d) through Line X to Lines B and C for 461 hours in a "pulse on demand" mode of operation, with an average current below 1 femtoampere with 75.8% total reliablity.
	Reconfigure beam delivery and support equipment to support new facilities, upgrades, and experiments. [a]	No major upgrades to the beam delivery complex. Material was received for installation of a new switchyard kicker magnet during 2003; this will allow simultaneous operations of Line D (Lujan and WNR) and Line X (Areas B and C)
	Commission/operate/maintain LEDA for 10 to 15 yrs; operate up to approximately 6,600 hrs/yr.	LEDA was shutdown in December 2001 and is now being decommissioned and dismantled.
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 maintained. (Note: Modifications and renovations were not undertaken, however.)
	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 100 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).	128 experiments were conducted at the Lujan Center and 45 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: - None with actinides - Some with nonhazardous materials and high explosives - Some with high explosives, but none with depleted uranium - Some shock wave experiments.
	Provide support for static stockpile surveillance technology research and development.	Support was provided for surveillance research and development.

Table 2.11.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 Operations
Accelerator Transmutation of Wastes [c]	Conduct lead target tests for two years at Area A beam stop.	No tests in CY 2003. No lead tests are expected for at least five years unless funding becomes available from DOE Office of Nuclear Energy, Science, and Technology.
	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 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.	No ultra-cold neutron experiments were run during CY 2003 LANSCE beam operations.
	Conduct proton radiography experiments, including contained experiments with high explosives.	30 experiments involving contained high explosives were conducted in CY 2003.
Medical Isotope Production	Irradiate up to approximately 50 targets/yr for medical isotope production.	No production in 2003.
	Added production of exotic, neutron-rich, and neutron-deficient isotopes (requires modification of an existing target area).	No production in 2003.
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 2003 for LANSCE is the successful completion of the switchyard kicker project. On July 10, 2003, the switchyard kicker system, a complex of four magnets, demonstrated its design goal of delivering interleaved beam pulses for the Lujan Neutron Scattering Center, WNR facility, and proton radiography. Prior to installation of the switchyard kicker, beam delivery to the Lujan Center and WNR precluded beam delivery to proton radiography and vice versa. The LANSCE beam consists of a train of beam pulses. Prior to the new kicker system, this train of pulses could either be directed to the Lujan Center and WNR or to proton radiography. The new system selects one or more pulses from the train to be directed on-demand to the proton radiography experiments, while the remaining pulses continue on to the Lujan Center and WNR. This capability significantly improves the flexibility of the proton radiography program by offering a factor of five increase in the number of days available and allows for the initiation of the user program. The Lujan Center and WNR can now receive about 25 percent more beam time.

LANSCE hosted over 600 user visits this run cycle (June 3–January 26). The facility operated at an average 86 percent availability for the Lujan Center and 88 percent for WNR, allowing the completion of just under 225 experiments for internal and external neutron scattering and neutron nuclear physics users. Construction of two new instruments at the Lujan Center began in CY 2002. One, IN500, will be used for inelastic neutron scattering studies. The other is NPD-gamma, which will look for violations of the weak nuclear interaction.

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 offsite dose. Emissions in 2003, however, totaled only about 6,000 curies (including diffuse emissions), about 40 percent of total LANL radioactive air emissions. The 2000 total was also less than projections of the ROD of 8,496 curies (Garvey and Miller 1996). These small emissions can be attributed to non-use of the Area A beam stop. 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	2003 Operations
Radioactive Air Emissions:			
Argon-41	Ci/yr	7.44E+1	1.29E+01
Particulate/Vapor Activation Products [a]	Ci/yr	Not projected [b]	3.02E+01
Carbon-10	Ci/yr	2.65E+0	2.38E-01
Carbon-11	Ci/yr	2.96E+3	5.08E+02
Nitrogen-13	Ci/yr	5.35E+2	2.78E+01
Nitrogen-16	Ci/yr	2.85E-2	1.91E-01
Oxygen-14	Ci/yr	6.61E+0	1.60E-01
Oxygen-15	Ci/yr	6.06E+2	6.93E+01
Tritium as Water	Ci/yr	Not projected [b]	4.42E+00
LEDA Projections (8-yr average):			
Oxygen-19	Ci/yr	2.16E-3	Not measured [c]
Sulfur-37	Ci/yr	1.81E-3	Not measured [c]
Chlorine-39	Ci/yr	4.70E-4	Not measured [c]
Chlorine-40	Ci/yr	2.19E-3	Not measured [c]
Krypton-83m	Ci/yr	2.21E-3	Not measured [c]
Others	Ci/yr	1.11E-3	Not measured [c]
NPDES Discharge: [c]			
Total Discharges	MGY	81.8	16.4613
03A-047	MGY	7.1	0
03A-048	MGY	23.4	15.494
03A-049	MGY	11.3	0
03A-113	MGY	39.8	0.9673
Wastes:			
Chemical	kg/yr	16,600	6,914
LLW	m^3/yr	1,085	70
MLLW	m^3/yr	1	0.6
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	560 [d]	455 [d]

[a] Particulate/Vapor Activation Products include arsenic-73, bromine-76, bromine-82, mercury-193, mercury-195m, mercury-197, and mercury-203, all of which have been listed individually in previous Yearbooks.

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

[c] Potential emissions from LEDA were sufficiently small that measurement systems were not necessary to meet regulatory or facility requirements.

[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 2003 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 2003 operations is routinely collected information and represents only UC 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.

2.12 Bioscience Facilities (TA-43, TA-3, TA-16, TA-35, and TA-46)

The Bioscience Key Facility definition includes the main Health Research Laboratory (Buildings 43-1, -37, -45, and -20) plus additional offices and labs located at TA-35-85 and -2, TA-03-562 and -1698, and TA-46-158/161, -217, -218, -80, -24, and -31. Additionally, Bioscience has small operations located at TA-16. Operations at TA-43, TA-35-85 and -02, and TA-46-158/161 have 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, -03-1698, and TA-16 have relatively minor impacts because of low numbers of personnel and limited quantities of materials. Bioscience activities at TA-03-1698, the MSL, are accounted for with potential impacts of that Key Facility and are not double-counted here. Bioscience research capabilities focus on the study of intact cells (conducted at Biosafety Levels [BSLs] 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 2002a). TA-43-1 is now 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 importance of Computational Biology activities to Bioscience and the increased staff in this area continue to impact available office space at TA-43-1. This growth will continue to require additional office space. Buildings within TA-43 continue to undergo interior remodeling and rearranging to accommodate new and existing work. The Computational Biology capability does not generate wastes nor use hazardous materials.

In CY 2003, only minor interior changes to accommodate operational changes have occurred (office reconfigurations; heating, ventilation, and air conditioning renovations). As in previous years, the volume of radioactive work at the Health Research Laboratory 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 Health Research Laboratory has BSL-1 and BSL-2 work, which includes very limited work with potentially infectious microbes and low-toxicity biotoxins, as defined by the Centers for Disease Control (CDC). All activities involving infectious microorganisms are regulated by the CDC 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 2003, Bioscience continued construction on the BSL-3 facility (LANL 2000); this activity has progressed substantially. This new addition to the Bioscience Facility will be the first BSL-3 facility in the DOE complex. It is a 3,202 square foot, stand-alone, containment facility located remotely from the Los Alamos town site, on 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 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 provided by the Environmental Assessment for the Proposed Construction and Operation of a BSL-3 Facility at LANL dated February 26, 2002, and a Finding of No Significant Impact (DOE 2002f).

Construction of the BSL-3 facility was almost complete at the end of CY 2003. Some final engineering requirements are being completed. AB and readiness assessments continue.

2.12.2 Operations at the Bioscience Facilities

Bioscience Division has eight broad research capabilities:

1) Biologically Inspired Materials and Chemistry
2) Computational Biology

3) Environmental Microbiology
4) Genomic Science
5) Measurement Science and Diagnostics
6) Molecular and Cell Biology
7) Molecular Synthesis
8) Structural Biology

The In-Vivo Monitoring facility and capability continues to be located in TA-43, HRL-1, and continues at the previously reported level.

Growth in Bioscience has resulted in addition of new personnel and expanded operations. While there have been increases in volumes of chemicals used and generation of chemical wastes, Bioscience continues to decommission unfunded work. BSL-2 work is expanding to include use of a non-pathogenic strain of Bacillus anthracis–delta Ames, low-toxicity biotoxins (defined by CDC), and DNA from other infectious microbes. The Institutional Biosafety Committee reviews all of this work. Expansion of sequencing efforts was most noticeable but does not generate new wastes or increased volumes of regulated wastes. Upgrades and remodeling have generated minimal construction debris as laboratory areas were cleaned out and equipment was replaced or upgraded. This trend in modernization is expected to continue through CY 2004. With the expectation of moving into a new building at the Los Alamos Science Complex in CY 2006, all modernization will be done in a way that can be moved into the new space. TA-43-1 is at capacity for both office and laboratory activities, and future Bioscience expansion is expected to occur at TA-35-85 and TA-46-158.

Table 2.12.2-1 compares CY 2003 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. All but two of the existing capabilities have activity levels greater than those projected by the SWEIS ROD.

Table 2.12.2-1. Bioscience Facilities/Comparison of Operations

Capabilities	SWEIS ROD	2003 Operations
Biologically Inspired Materials and Chemistry	Not in SWEIS ROD	In CY 2003, 20 FTEs [a] were associated with Biologically Inspired Materials and Chemistry
Computational Biology	Not in SWEIS ROD	In CY 2003, 18 FTEs were associated with Computational Biology.
Environmental Biology	Research to characterize the extent of diversity in environmental microbes and to understand their functions and occurrences in the environment. (25 FTEs)	In CY 2003, 24 FTEs were associated with Environmental Biology.

Table 2.12.2-1. (cont.)

Capabilities	SWEIS ROD	2003 Operations
Genomic 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, infectious disease organisms	In CY 2003, 47 FTEs were associated with Genomics.
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 2003, 37 FTEs were associated with Measurement Science and Diagnostics.
Molecular and Cell Biology	Conduct research at current levels 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 2003, 42 FTEs were associated with Molecular Cell Biology.
Molecular Synthesis	Generate biometric organic materials and construct synthetic biomolecules.	In CY 2003, 16 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 DNA and protein molecules. (15 FTEs)	In CY 2003, 20 FTEs were associated with Structural Biology.
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.	Perform 3,000 whole-body scans per year as a service to the LANL personnel monitoring program, which supports operations with radioactive materials conducted elsewhere at LANL. (5 FTEs)	Conducted 1,140 lung and whole-body scans and 767 other counts (detector studies, quality assurance measurements, etc.). In CY 2003, 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 the 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	2003 Operations
Radioactive Air Emissions	Ci/yr	Not estimated	Not measured
NPDES Discharge: [a]			
03A-040	MGY	2.5 [b]	Eliminated in 1999
Wastes:			
Chemical	kg/yr	13,000	2,870
Biomedical Waste	kg/yr	280 [c]	0
LLW	m^3/yr	34	0
MLLW	m^3/yr	3.4	0
TRU	m^3/yr	0	0
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	98 [d]	112 [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 2003 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 2003 operations is routinely collected information and represents only UC 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 four major research buildings—the Radiochemistry Laboratory (Building 48-1), the Diagnostic Instrumentation and Development Building (48-28), the Advanced Radiochemical Diagnostics Building (48-45), and the Analytical Facility (48-107)—and the Machine and Fabrication Shop (48-8). The DOE listing of LANL nuclear facilities for CY 2003 (LANL 2002a) retained Building TA-48-0001 as a Category 3 nuclear facility as shown in Table 2.13-1. However, during CY 2003, the Radiochemistry Facility was downgraded to a radiological Category B facility and during the next year, CY 2004, the building is expected to be further downgraded to a radiological Category C (low hazard) facility.

Table 2.13-1. Radiochemistry Buildings with Nuclear Hazard Classification

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2003 [b]
TA-48-0001	Radiochemistry and Hot Cell	3	3	3

[a] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)
[b] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

2.13.1 Construction and Modifications at the Radiochemistry Facility

The SWEIS ROD projected no facility changes through CY 2005, although a few have occurred over the years (LANL 2003c). During CY 2003, only minor maintenance activities occurred. It is expected that during CY 2004 the fire notification system will be upgraded under the institutional program. In addition, Building RC-1 is scheduled for electrical upgrades during CY 2004 under the institutional Electrical Infrastructure Safety Upgrades program.

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 2003, approximately 170 chemists and scientists were employed, far below the 250 projected by the SWEIS ROD.[9] As seen in Table 2.13.2-1, only two of the 10 capabilities were active at levels projected by the SWEIS ROD: Radionuclide Transport Studies and Sample Counting.

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

Capability	SWEIS ROD	2003 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 2003, operations continued at approximately twice the levels identified during preparation of the SWEIS. (36 FTEs [a])
Environmental Remediation Support	Background contamination characterization pilot studies. Performance assessments, soil remediation research and development, and field support. (34 FTEs [a])	During CY 2003, operations continued at approximately half the levels identified during preparation of the SWEIS. (10 FTEs [a])
Ultra-Low-Level Measurements	Isotope separation and mass spectrometry. (30 FTEs [a])	Level of operations was approximately the same as levels identified during preparation of the SWEIS. (14 FTEs [a])
Nuclear/Radiochemistry	Radiochemical operations involving quantities of alpha-, beta-, and gamma-emitting radionuclides for non-weapons and weapons work. (44 FTEs [a])	Significant decrease in quantities of alpha-emitting radionuclides used in operations. (35 FTEs [a])

9 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.

Table 2.13.2-1. (cont.)

Capability	SWEIS ROD	2003 Operations
Isotope Production	Target preparation. High-level beta/gamma chemistry and target processing to recover isotopes for medical and industrial application. (15 FTEs [a])	Slightly increased level of operations, but approximately the same as levels identified during preparation of the SWEIS. (11 FTEs [a])
Actinide/TRU Chemistry	Radiochemical operations involving significant quantities of alpha-emitting radionuclides. (12 FTEs [a])	Significant decrease in quantities of alpha-emitting radionuclides used in operations. (14 FTEs [a])
Data Analysis	Re-examination of archive data and measurement of nuclear process parameters of interest to weapons radiochemists. (10 FTEs [a])	Slight increase from levels identified during preparation of the SWEIS to six FTEs [a], but less than projected by the SWEIS ROD.
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 [a] —total for both activities)	Same level of activity (35 FTEs [a]) as levels identified during preparation of the SWEIS, but below projections of the SWEIS ROD.
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 [a])	Decreased level of operations from levels identified during preparation of the SWEIS, and about one-third of those projected by the SWEIS ROD. (7 FTEs [a])
Sample Counting	Measurement of the quantity of radioactivity in samples using alpha-, beta-, and gamma-ray counting systems. (5 FTEs [a])	During 2002, slight increase in the number of samples projected by the SWEIS ROD. (6 FTEs [a])

[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. Two 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. An exception is a large quantity of chemical wastes categorized as industrial solid wastes generated from the chemical cleanouts. These industrial solid wastes are nonhazardous, may be disposed in county landfills, and do not present a threat to the local environs. The quantities of TRU and MLLW generated during CY 2003 result from the plans to transition TA-48-1 from a nuclear facility to a radiological facility. The wastes generated were shipped to TA-54.

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

Parameter	Units	SWEIS ROD	2003 OPERATIONS
Radioactive Air Emissions:			
Mixed Fission Products	Ci/yr	1.4E-4	Not detected [a]
Plutonium-239	Ci/yr	1.1E-5	Not detected [a]
Uranium-235	Ci/yr	4.4E-7	Not detected [a]
Thorium-232	Ci/yr	Not projected [b]	1.12E-09
Mixed Activation Products	Ci/yr	3.1E-6	Not detected [a]
Arsenic-72	Ci/yr	1.1E-4	Not detected [a]
Arsenic-73	Ci/yr	1.9E-4	Not detected [a]
Arsenic-74	Ci/yr	4.0E-5	Not detected [a]
Beryllium-7	Ci/yr	1.5E-5	Not detected [a]
Bromine-77	Ci/yr	8.5E-4	Not detected [a]
Germanium-68	Ci/yr	1.7E-5	3.33E-04
Gallium-68	Ci/yr	1.7E-5	3.33E-04
Rubidium-86	Ci/yr	2.8E-7	Not detected [a]
Selenium-75	Ci/yr	3.4E-4	Not detected [a]
NPDES Discharge: [c]			
Total Discharges	MGY	4.1	No Outfalls
03A-045	MGY	0.87	Eliminated – 1999
04A-016	MGY	None	Eliminated – 1997
04A-131	MGY	None	Eliminated – 1998
04A-152	MGY	None	Eliminated – 1997
04A-153	MGY	3.2	Eliminated – 1998
Wastes:			
Chemical	kg/yr	3,300	4,860 [d]
LLW	m^3/yr	270	78
MLLW	m^3/yr	3.8	5.7
TRU [e]	m^3/yr	0	1.25
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	128 [f]	113 [f]

[a] 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.

[b] The radionuclide was not projected in the SWEIS ROD because it was either dosimetrically insignificant or not isotopically identified.

[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] In 2003, TA-48 had several chemical clean outs to dispose of unwanted chemicals. In addition, two mercury-containing shields weighing a total of 8,000 lbs were sent to a mercury recycler for mercury recovery. The clean outs and the disposal of the mercury were all done in support of RC-1 efforts to downgrade the facility from a nuclear facility to a radiological facility.

[e] TRU waste was projected to be returned to the generating facility.

[f] 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 2003 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 2003 operations is routinely collected information and represents only UC 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 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 consisting of the following structures: the RLWTF itself (Building 50-01), the tank farm and pumping station (50-2), the acid and caustic solution tank farm (50-66), and a 100,000-gallon influent holding tank (50-90), were originally considered four Hazard Category 3 segments. This segmentation is no longer allowable. Presently the four segments are considered as a single Hazard Category 2 facility. The Design Safety Analysis was submitted for review by DOE the 2nd quarter of FY 2003. There are no other nuclear facilities and no Moderate Hazard nonnuclear buildings within this Key Facility (LANL 2002a).

2.14.1 Construction and Modifications at the Radioactive Liquid Waste Treatment Facility

Projected: 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 March 22, 1999. Nitrate reduction equipment was installed in 1998 and became operational on March 15, 1999. Unlike the SWEIS description, however, the nitrate reduction treatment was by chemical reduction, rather than by a biological process.

Not Projected: 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 1999d), and #7737, approved 10/29/99 (DOE 1999e). The SWEIS ROD projected neither of these modifications.

In addition, decontamination operations were relocated during 2000 from Building 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, which are trucked to the RLWTF at TA-50. The lead decontamination trailer, formerly located between Buildings 50-83 and 50-02, was sent to Area G and decommissioned. The quantity of lead that needed decontamination had become so small that maintaining this operation was no longer cost effective.

During 2001, the cross-country transfer line, dedicated to the transfer of radioactive liquid wastes from the TA-21 tritium facilities to the TA-50 RLWTF, was taken out of service, flushed, drained, and capped. Environmental protection was the primary reason for removing this pipeline from service; it was a single-walled pipe for its entire length (~two miles). Reduction of radioactive liquid waste volumes generated at the TA-21 facilities enabled the line to be taken out of service; the smaller volumes can now be transported from TA-21 to TA-50 or TA-53 by truck. Also during 2001, nitrate reduction equipment was removed from service. Source 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.

During CY 2002, the RLWTF shop building was moved to TA-54 to make room for the construction of a new 300,000 gallons influent storage facility funded by the CGRP. As of the present, funding still has not been released for this project.

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 2003, all discharge volumes have been less than the projected discharge volume of 35 million liters per year in the SWEIS ROD. In 1998, 23 million liters of treated radioactive waste discharged to Mortandad Canyon. In 1999, the discharged volume of treated radioactive waste was 20 million liters. In 2000, 19 million liters was discharged from the RLWTF. In 2001, the discharged volume of treated radioactive waste was 14 million liters. In 2002, the RLWTF discharged 11.0 million liters of treated radioactive liquid waste to Mortandad Canyon. In 2003, 11.3 million liters were discharged.

Two factors have contributed to reduced waste volumes. Source reduction efforts re-routed two significant waste streams, nonradioactive 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. Internal recycling also reduced radioactive liquid waste volumes. During 2001 and 2002, process waters were used instead of tap water for the dissolution of chemicals needed in the treatment process. This recycle eliminated approximately two million liters per year of fresh water use. Process waters, instead of tap water, were also used for filter backwash operations. This modification reduced waste volumes by 200,000 liters in 2001 and by 500,000 liters in 2002.

In 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 on March 26, 2002, to remove perchlorates from all the RLWTF effluent. 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 2002g).

As seen in Table 2.14.2-1, operations at the RLWTF during the 1998–2003 timeframe were below levels projected by the SWEIS ROD.

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

Capability	SWEIS ROD [a]	2003 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.	Pretreated 24,640 liters of radioactive liquid waste at TA-21.
	Pretreat 80,000 liters/yr of radioactive liquid waste from TA-55 in Room 60.	Pretreated 51,674 liters of radioactive liquid waste in Room 60.
	Solidify, characterize, and package 3 cubic meters/yr of TRU waste sludge in Room 60.	2.9 cubic meters of TRU waste sludge was solidified in Room 60.
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.
	Treat 35 million liters/yr of radioactive liquid waste.	Treated 13.5 million liters of radioactive liquid waste.
	De-water, characterize, and package 10 cubic meters/yr of LLW sludge.	De-watered 28.7 cubic meters of LLW sludge.
	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.
		Installation of ion exchange resin columns to remove perchlorates from all the RLWTF effluent.

Table 2.14.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 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. [b]
	Decontaminate air-proportional probes for reuse (approximately 300/month).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]
	Decontaminate vehicles and portable instruments for reuse (as required).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]
	Decontaminate precious metals for resale (acid bath).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]
	Decontaminate scrap metals for resale (sandblast).	No activity. Decontamination operations were relocated during 2000 from Building 50-01 to TA-54. [b]
	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. [b]

[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] 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. These process modifications have contributed to improved effluent quality. Calendar year 2003 marked the fourth consecutive year that there were zero violations of the State of New Mexico discharge limit for nitrates and total dissolved solids, zero violations of NPDES permit limits, and zero exceedances of the DOE discharge standards for radioactive liquid wastes. Annual average nitrate discharges were reduced from 360 milligrams per liter in 1993 to less than 10 milligrams per liter in 2000 and have remained at the less-than-10-milligram level through 2003. Similarly, annual average radioactive discharges were reduced from greater than 250 picocuries alpha activity per liter during the period 1993–1999 to 13 picocuries per liter in 2000, 18 picocuries per liter in 2001,16 picocuries per liter in 2002, and 10.5 picocuries per liter in 2003.

The SWEIS ROD did not project the quality of effluent, only quantity. Radioactive air emissions continued to be negligible (less than one microcurie); NPDES discharge volume was 11.3 million liters, compared to a projected 35 million liters; the quantity of LLW sludge was higher than projected in part due to the removal of sludge from the concrete sludge storage tank in WM-2. 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	2003 Operations
Radioactive Air Emissions:			
Americium-241	Ci/yr	Negligible	6.89E-09
Plutonium-238	Ci/yr	Negligible	7.37E-09
Plutonium-239	Ci/yr	Negligible	Not detected
Thorium-228	Ci/yr	Negligible	2.21E-08
Thorium-230	Ci/yr	Negligible	1.16E-08
Thorium-232	Ci/yr	Negligible	2.22E-08
Uranium-234	Ci/yr	Negligible	Not detected
NPDES Discharge:			
051	MGY	9.3	2.974
Wastes:			
Chemical	kg/yr	2,200	69
LLW	m^3/yr	160	390
MLLW	m^3/yr	0	0
TRU	m^3/yr	30	0
Mixed TRU	m^3/yr	0	2.7
Number of Workers	FTEs	62 [a]	52 [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 2003 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 2003 operations is routinely collected information and represents only UC 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 -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 are two Category 3 nuclear buildings within this Key Facility: the Waste Characterization, Reduction, and Repackaging (WCRR) Facility (Building 50-69) and the Radioactive Assay and Nondestructive Test (RANT) Facility (Building 54-38). 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 Transuranic Waste Inspection Project (TWISP) for the retrieval of TRU wastes, including storage domes 226 and 229–232; 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).

As shown in Table 2.15-1, the SWEIS recognized 19 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 2003 [b]
TA-50-0037	RAMROD [c]		2	3
TA-50-0069	WCRR Building	2	3	3
TA-50-0069 Outside	Nondestructive Analysis Mobile Activities			2
TA-50-0069 Outside [d]	Drum Storage			
TA-54-Area G	LLW Storage/Disposal	2	2	2
TA-54	TWISP		2	2
TA-54-0002 [e]	TRU Storage Building		3	2
TA-54-0033	TRU Drum Preparation	2		2
TA-54-0038	Radioassay and Nondestructive Testing Facility	2	3	3
TA-54-0048	TRU Storage Dome	2	3	2
TA-54-0049	TRU Storage Dome	2	3	2
TA-54-0144	Shed	2		2
TA-54-0145	Shed	2		2
TA-54-0146	Shed	2		2
TA-54-0153	TRU Storage Dome	2	3	2
TA-54-0177	Shed	2		2
TA-54-0224	Mixed Waste Storage Dome			2
TA-54-0226	TRU Storage Dome	2		2
TA-54-0229	Tension Support Dome	2		2
TA-54-0230	Tension Support Dome	2		2
TA-54-0231	Tension Support Dome	2		2
TA-54-0232	Tension Support Dome	2		2
TA-54-0283	Tension Support Dome	2		2
TA-54-0375	TRU Storage Dome	2		2
TA-54-Pad2	Storage Pad	2		2
TA-54-Pad3	Storage Pad	2		2
TA-54-Pad4	TRU Storage	2		2

[a] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (DOE 1998a)

[b] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

[c] RAMROD: Radioactive Materials Research Operations and Demonstration facility.

[d] In the most recent nuclear facility lists (LANL 2001b) and (LANL 2002a), “Drum Storage” includes drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69.

[e] 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 TWISP). TRU legacy waste in pits and shafts. Low-level disposal of asbestos in pits and shafts. Operations building: TRU waste storage.

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

Projected: 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.

Actual: 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. Planning for the new facility previously intended for construction over Pad 4 to house high-activity drums was stopped after Title I design.

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 (NRC) or agreement state licensee,
- are excess and unwanted and are a DOE responsibility under Public Law 99-240, 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 NRC 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 2,331 sources were collected for storage at TA-54 during CY 2003. Eventually, these sources will be shipped to 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 1996g), 7405 (DOE 1999f), and 7570 (DOE 1999g), the 1999 SWEIS (DOE 1999a), and a Supplement Analysis to the 1999 SWEIS (DOE 2000d).

In CY 2002, LANL submitted a request for Change During Interim Status (CDIS) to the NMED. The CDIS asked for permission to combine two previously Resource Conservation and Recovery Act (RCRA)-regulated units (Pad 2 and Pad 4) into a single

RCRA-regulated storage unit (Pad 10). The CDIS was approved by NMED, and construction of the combined pad was completed in CY 2003.

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 the Actinide Research and Technology Institution Complex (ARTIC), formerly RAMROD. Although the closure plan has not yet been approved, intitial closure activities were completed at the two units at RLWTF in 2002. Initial closure activities were performed at the Actinide Research Training and Instruction Center in CY 2003 (TA-50-37). The three units are scheduled for additional closure actions during 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 managed and volumes of legacy TRU waste and MLLW in storage. A comparison of CY 2003 to projections made by the SWEIS ROD can be summarized as follows:

Chemical wastes: Approximately 670 metric tons of chemical waste were generated at LANL during CY 2003. Of this, approximately 360 metric tons were shipped directly offsite for treatment and/or disposal and approximately 184 metric tons were shipped for offsite treatment and/or disposal from the Solid Radioactive and Chemical Waste Facility. These compare to an average quantity of 3,250 metric tons per year projected by the SWEIS ROD.

LLW: Approximately 4,500 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. This LLW volume is a decrease from the last year of operations but is consistent with the three years prior. No new disposal cells were constructed, and disposal operations did not expand into either Zone 4 or Zone 6 at TA-54. Operations could expand into Zone 4 within the next year.

MLLW: 36 cubic meters were generated and delivered to TA-54 during CY 2003, 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: There were 41 shipments to WIPP during CY 2003, and 560 cubic meters of newly generated TRU wastes were added to storage.

Mixed TRU wastes: SWEIS ROD projections for TRU and mixed TRU waste generated by the Key Facilities were exceeded at the Solid Chemical and Radioactive Waste Facility during CY 2003 due to DVRS repackaging of legacy TRU waste for shipment to WIPP.

In summary, chemical and radioactive waste management activities were at levels below those projected by the SWEIS ROD and also below levels of 1998 and 1999 operations 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 Facility (TA-50 and TA-54)/Comparison of Operations

Capability	SWEIS ROD [a]	2003 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.	Characterized 25 cubic meters of legacy MLLW.
	Characterize 9,010 cubic meters of legacy TRU waste.	Characterized 280 cubic meters of TRU waste in 2003.
	Verify characterization data at the RANT Facility for unopened containers of LLW and TRU waste.	Verified characterization data at RANT Facility for TRU wastes, but not for LLW.
	Maintain waste acceptance criteria for offsite treatment, storage, and disposal facilities.	As projected.
	Over-pack and bulk waste as required.	As projected.
	Perform coring and visual inspection of a percentage of TRU waste packages.	Performed visual examinations on 16 TRU waste packages; 12 drums cored in 2003.
	Vent 16,700 drums of TRU waste retrieved during TWISP.	Vented 500 drums during 2003.
	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 350 cubic meters of LLW were compacted into approximately 77 cubic meters.
Size Reduction	Size reduce 2,900 cubic meters of TRU waste at WCRR Facility and the Drum Preparation Facility.	Approximately 42 cubic meters of TRU waste were 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 offsite land disposal restrictions, treatment, and disposal.	Approximately 184 metric tons of chemical waste and approximately 36 cubic meters of MLLW were shipped for offsite treatment and disposal from the Solid Radioactive and Chemical Waste Facility
	Over the next 10 years, ship no LLW for offsite disposal.	No LLW was shipped for offsite disposal.
	Over the next 10 years, ship 9,010 cubic meters of legacy TRU waste to WIPP.	41 shipments of legacy TRU waste were shipped in 2003.

Table 2.15.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 Operations
Waste Transport, Receipt, and Acceptance (cont.)	Over the next 10 years, ship 5,460 cubic meters of operational and environmental restoration TRU waste to WIPP.	No operational or environmental restoration TRU wastes were shipped to WIPP.
	Over the next 10 years, ship no environmental restoration soils for offsite solidification and disposal.	No environmental restoration soils were shipped for offsite solidification and disposal in 2003. [b]
	Annually receive, on average, 5 cubic meters of LLW and TRU waste from offsite locations in 5 to 10 shipments.	There were 0.5 cubic meters of LLW waste receipts from offsite locations.
Waste Storage	Stage chemical and mixed wastes before shipment for offsite treatment, storage, and disposal.	Chemical and mixed wastes were staged before shipment
	Store legacy TRU waste and MLLW.	Legacy TRU waste and MLLW stored.
	Store LLW uranium chips until sufficient quantities have accumulated for stabilization.	There were 7 cubic meters of uranium chips in storage awaiting stabilization.
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 2003.
Other Waste Processing	Demonstrate treatment (e.g., electrochemical) of MLLW liquids.	No activity.
	Land farm oil-contaminated soils at Area J.	Closure of Area J is now complete.
	Stabilize 870 cubic meters of uranium chips.	Stabilized 7 cubic meters of uranium chips.
	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.
Disposal	Over next 10 years, dispose of 420 cubic meters of LLW in shafts at Area G.	Approximately 66 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 onsite LLW disposal operations beyond existing Area G footprint.)	Approximately 4,500 cubic meters of LLW were 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 [c] 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 [d]	Decontaminate LANL personnel respirators for reuse (approximately 700/month).	In 2003, decontaminated 500 personnel respirators per month at TA-54-1009.
	Decontaminate air-proportional probes for reuse (approximately 300/month).	In 2003, decontaminated 70 faces and 70 bodies per month at TA-54-1009.

Table 2.15.2-1. (cont.)

Capability	SWEIS ROD [a]	2003 Operations
Decontamination Operations (cont.)	Decontaminate vehicles and portable instruments for reuse (as required).	No activity in 2003.
	Decontaminate precious metals for resale (acid bath).	No activity. [e]
	Decontaminate scrap metals for resale (sandblast).	No activity. [e]
	Decontaminate 200 cubic meters of lead for reuse (grit blast).	No activity. [e]

[a] Includes the construction of four new storage domes for the TWISP.
[b] The Environmental Restoration Project usually ships soils removed in remediation of a potential release site (PRS) directly to an offsite disposal facility. These wastes do not typically require processing at TA-54 and do not go through the TA-54 operations for shipment.
[c] In the SWEIS, the term “industrial solid waste” was used for construction debris, chemical waste, and sensitive paper records.
[d] The Decontamination Operations capability was identified with the RLWTF Key Facility in the SWEIS. Activities prior to 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.
[e] Although there has been no activity in CYs 2001, 2002, and 2003, 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 2003 were less than projected by the SWEIS ROD and so were air emissions. Table 2.15.3-1 provides details.

The exception is mixed TRU waste generation at the Solid Chemical and Radioactive Waste Key Facility. SWEIS ROD projections for TRU and mixed TRU waste generated by the Key Facilities were exceeded at the Solid Chemical and Radioactive Waste Facility during CY 2003 due to DVRS repackaging of legacy TRU waste for shipment to WIPP.

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

Parameter	Units	SWEIS ROD	2003 Operations
Radioactive Air Emissions: [a]			
Tritium	Ci/yr	6.09E+1	Not monitored [a]
Americium-241	Ci/yr	6.60E-7	7.58E-11
Plutonium-238	Ci/yr	4.80E-6	2.20E-09
Plutonium-239	Ci/yr	6.80E-7	5.21E-10
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	8.19E-10
Strontium-90/Yttrium-90	Ci/yr	Not projected [b]	3.41E-09
Thorium isotopes	Ci/yr	Not projected [b]	3.50E-09
NPDES Discharge	MGY	No outfalls	No outfalls
Wastes: [c]			
Chemical	kg/yr	920	816
LLW	M^3/yr	174	204
MLLW	M^3/yr	4	0

Table 2.15.3-1. (cont.)

Parameter	Units	SWEIS ROD	2003 Operations
TRU	M^3/yr	27	88 [d]
Mixed TRU	M^3/yr	0	59 [d]
Number of Workers	FTEs	65 [e]	56 [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, high-efficiency particulate air filters, personnel protective clothing and equipment, and process wastes from size reduction and compaction.

d SWEIS ROD projections were exceeded due to the DVRS repackaging of legacy TRU waste for shipment to WIPP.

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 2003 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 2003 operations is routinely collected information and represents only UC 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 48 technical areas and comprise approximately 14,224 of LANL's 26,480 acres. As expressed in Section 2.16.2 below, activities in the Non-Key Facilities encompass seven of the eight LANL direct-funded activities (DOE 1999a).

As shown in Table 2.16-1, the SWEIS identified six buildings within the Non-Key Facilities with nuclear hazard classification. The High-Pressure Tritium Facility (Building TA-33-86), classified in 2001 as a Category 2 nuclear facility, was removed from the Nuclear Facility List in March 2002 and downgraded to a radiological facility.

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

Building	Description	NHC SWEIS ROD	NHC DOE 1998 [a]	NHC LANL 2003 [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	

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

b DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2002a)

The decommissioning and demolition of the formerly used tritium facility, TA-33-86, the High-Pressure Tritium Laboratory, was completed in 2002. At the present time, there are no Category 2 or 3 nuclear facilities among the Non-Key Facilities.

Additionally, several Non-Key Facilities were identified as radiological facilities in September 2002 (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 2003.

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

Building	Description	LANL 2001 [a]	LANL 2003 [b]
TA-2-1	Omega Reactor	RAD	RAD
TA-3-16	Ion Exchange	---	RAD
TA-3-34	Cryogenics Building B	RAD	RAD
TA-3-40	Physics Building (HP)	RAD	RAD
TA-3-169	Warehouse	---	RAD
TA-3-1819	Experiment Material Laboratory	---	RAD
TA-21-5	Laboratory Building	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 Laboratory	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 Facility List (LANL 2001c)
[b] LANL Radiological Facility List (LANL 2002b)

2.16.1 Construction and Modifications at the Non-Key Facilities

In 2002, NEPA coverage for disposition of the Omega West Facility was provided by the Environmental Assessment of the Proposed Disposition of the Omega West Facility (DOE 2002h) and a Finding of No Significant Impact. Demolition activities began in July 2002. At TA-61, Buildings 24, 25, and 26 have been completely demolished. TA-41-30 and the front of TA-41-4 were demolished from August through October 2002. TA-02-1, the Omega West building and reactor, were completely demolished in June and July 2003. The demolition project was completed on schedule in September 2003.

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 2001o). Major projects 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 5 megawatt hours of electrical energy annually (less than one percent of total LANL consumption); will have a peak electrical demand of 4 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 1996g).

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 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.

Status: During 2002, a new building was constructed at the NTS to accommodate the relocation of Atlas. The relocation of Atlas to the NTS had its own NEPA coverage in the form of an environmental assessment and Finding of No Significant Impact issued 06/05/2001 (DOE 2001e). The physical transfer of the Atlas machine to the NTS 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. It is expected that Atlas will become operational at the NTS in September 2004. LANL personnel will continue to be involved in experimentation activities at the NTS.

b) Los Alamos Research Park

The Los Alamos Research Park (DOE 1997c) is now complete. A description of this project is located in the 2002 SWEIS Yearbook (LANL 2003c), Section 2.16.

c) Strategic Computing Complex

The Strategic Computing Complex (DOE 1998d) is now complete. A description of this project can be found in the 2002 SWEIS Yearbook (LANL 2003c), Section 2.16.

d) Nonproliferation and International Security Center

Description: The Nonproliferation and International Security Center is a four-story building plus basement of 164,000 square feet with a capacity to house 465 people. It has been constructed adjacent to the new Strategic Computing Complex within TA-03 and has been occupied. The building has laboratories, a machine shop for fabrication of satellite parts, a high-bay fabrication area, an area for the safe handling of sealed radioactive sources, and offices. Building heating and cooling is by closed-loop water systems.

Because all occupants were relocated from other LANL buildings, there has been no increase in quantities of sewage, solid wastes, or chemical wastes, nor increased demand for utilities. To accommodate both the Strategic Computing Complex and Nonproliferation and International Security Center, nearby parking lots are being expanded to accommodate an additional 800 to 900 vehicles.

Status: NEPA review for the Nonproliferation and International Security Center was provided by the Environmental Assessment for the Nonproliferation and International Security Center (DOE 1999h) and a Finding of No Significant Impact. Design of the building began in 1999 and continued through 2000. Construction started in March 2001, and the building was substantially complete in December 2002. The building was occupied in July 2003.

e) Emergency Operations Center

Description: The Cerro Grande Fire demonstrated several inadequacies within the current Emergency Operations Center (EOC) and Multi-Channel Communications capabilities. The fire showed that the EOC has outlived its useful life. Further research showed that upgrading it would be neither economical nor practical, and the decision was made to have a new EOC designed and built.

Status: During CY 2001, the conceptual design was completed and the final design was initiated. Also during CY 2001, an environmental assessment (DOE 2001f) was prepared to address both the EOC and the Multi-Channel Communications Center. Construction began in early CY 2002 and the final design was completed in May 2002. Beneficial occupancy was granted in September 2003 and the LANL Emergency Management and Response (EM&R) staff began transitioning to the new facility at that time. The new EOC became fully operational in December 2003.

f) Multi-Channel Communications Project

Description: The Multi-Channel Communications Center Project addresses communication vulnerabilities made evident in the Cerro Grande Fire. The new communications and information systems will provide flexibility to communicate between the LANL EOC and external entities to respond to future emergencies with the most up to date information. The conceptual design was received in 2001 and procurement of long lead items was initiated. Also during 2001, an environmental assessment (DOE 2001f) was prepared to address both the EOC and the Multi-Channel Communications Center.

Equipment for the Radio Upgrade to increase the number of channels to 15 has been received and will be installed during CY 2003 at the Communications, Computing, and Networking site on Pajarito Mountain. The Multi-band Radio System which allows the EOC to communicate with outside agencies was received and programmed, is functional, and will be installed in the EOC. The Mobile Communications Van was received; its radios have been programmed and it has been formally placed into service by EM&R.

The Media Interface System and Emergency Alert System equipment were procured and set up by the Public Affairs Office. This equipment will be moved into the new EOC building for use by EOC and Public Affairs personnel. LANL now has the capability to produce press releases directly and transmit to local television stations as well as generate emergency banners.

The Portable Monitoring System, which will provide emergency response personnel remote monitoring capability, was ordered as well as the associated chemical and radiological sensors. Chemical sensors were received and tested. The robot will be delivered mid FY 2003 and will be transferred to EM&R personnel after acceptance testing.

The contract was awarded for procurement and installation of Electronic Message Signs, Video Surveillance, and Video Database Interface equipment. This system will give the EOC the capability to view and remotely record video of LANL property and emergency response and to inform and direct traffic through the use of electronic message signs. Excavation permits were reviewed and approved for electronic sign installation. Approval was obtained from the Meteorology and Air Quality Group to use existing meteorological towers to mount closed-circuit television equipment and approval was given by DOE Albuquerque Operations Office to utilize wireless communications to transmit real-time video to the EOC. All closed-circuit television equipment and electronic signs will be field-installed mid FY 2003 and monitoring and programming equipment will be installed in the EOC.

The Data Mirror task demonstrated the feasibility of MaxResponder emergency response software on a Predator ruggedized laptop. Laptops were ordered for installation in LANL and Los Alamos County emergency vehicles. Databases were identified for inclusion in the Data Mirror system at the EOC. The clustered, high-availability server system was procured and installed in the Communications and Computing Facility for database population. Full database population and user interfaces will occur in FY 2003 and computing equipment will be moved to the EOC.

Status: The Multi-Channel Communications Center Project received CD-3 in May of 2002 and was 48 percent complete as of the end of January 2003. The project was fully operational by October 1, 2003. Past operational system optimization started in October and was completed by December 2003.

g) S-3 Security Systems Support Facility

Description: The mission of the Safeguards and Security Group (S-3) is to design, install, and maintain physical security systems in order to provide detection and deterrence of security violations. S-3 also designs, implements, and maintains the software systems that protect nuclear material and control intrusion detection. S-3 provides access control systems, access area training, fire protection integration, and interior and perimeter intrusion detection systems.

The S-3 Facility project (TA-03-1409) is located on the south side of TA-03, along Pajarito Road, immediately west of the existing Security Division Complex. The new S-3 Facility will be a two-story building with parking for approximately 95 vehicles. This project consolidates the S-3 organization into a single facility designed to meet the long-term needs of the group's activities. S-3 is currently occupying space in six transportable buildings and buildings SM-30 and SM-142. The primary mission of this project is to improve efficiency by consolidating personnel and activities in order to meet increasing LANL demands for physical security systems, as well as the increase in facility revitalization and reinvestment.

This project utilizes the design/build approach and has two distinct phases: 1) project development and procurement and 2) execution of the design/build contract. The building is to be designed to LANL technical standards and all other applicable codes and standards. The design-build contract will include complete and operational building systems (i.e., electrical, heating, ventilation, and air conditioning, potable water, sanitary sewer, fire protection, telephone, computer/communication systems and furniture). The project accommodates Physical Security System design; fabrication; maintenance; operations; data control; testing of security components; logistical support, to include receiving and warehousing; light electrical laboratory and machine shop operations; and supporting administration. The size of the completed facility will be 20,400 square feet, accommodating over 63 employees.

Status: NEPA categorical exclusion #8612 was issued by NNSA/DOE on December 04, 2001 (DOE 2001g). Design of the building began in CY 2002. The contract was awarded in June 2002 and construction started in July 2002. The building was completed in August 2003. Certificate of Occupancy was issued on September 3, 2003. S-3 moved into the facility on September 5, 2003.

h) D Division Office Building

Description: The Decision Applications (D) Division Office Building project provides replacement office space for D Division. The Design/Build contractor has provided a two-story, 24,813 square foot building that houses 100 D Division personnel. This project has allowed D Division to consolidate functions and employees within physical proximity.

Status: NEPA categorical exclusion #8595 was issued by NNSA/DOE on February 22, 2002 (DOE 2002i); the contract was awarded in May 2002; the design was completed in September 2002; construction started in September 2002 and was substantially complete in June 2003. The building was occupied in September 2003.

i) LANL Medical Facility

Description: Employee health is monitored to assure the effectiveness of site health and safety programs and hazard control plans in protecting employees. The Occupational Medicine Program provides the DOE with operational assurance that regulatory requirements are being met, that employees are fit (both physically and psychologically) to perform work at LANL, and that mission activities are not harming our workers. The new facility supports Occupational Medicine functions to include human reliability, medical survey and certification evaluations, and illness/injury management.
This project will construct an approximately 20,000-square-foot structure employing a pre-engineered building with interior design to specifically support DOE/NNSA and LANL requirements for occupational medicine certification, monitoring, intervention, and quality control. The building will house 60 medical staff personnel and support approximately 2,500 patients per month. The project replaces existing non-permanent facilities that have exceeded their life expectancy and are rapidly deteriorating to the point that their condition is currently impacting delivery of medical programs.

Status: The project received NEPA coverage through Categorical Exclusion #8398, approved May 30, 2001 (DOE 2001h). The design/build subcontract was awarded in September 2002. Construction start was in October 2002. In 2003, design and construction of the facility was completed with "Substantial Completion" as defined in the subcontract acknowledged September 2003. The project then focused on punch list issues from various Laboratory subject matter experts. As planned, the readiness assessment was completed in December 2003.

j) Chemistry Division Office Building (Chemistry Technical Support Building)
The Chemistry Division Office Building (DOE 2001i) is now complete. A description of this project is located in the 2002 SWEIS Yearbook (LANL 2003c), Section 2.16.

k) TA-72 Live Fire Shoot House

Description: PTLA currently provides security support for LANL and its environs. Their mission requires PTLA support to be trained to a high state of security readiness and to be able to respond to any emergency situation relative to the security of LANL. The purpose of the newly constructed Live Fire Shoot House (LFSH) is to provide an environment for the safe and realistic conduct of advanced tactical training for the PTLA. In addition, this General Plat Project enables LANL security officers to satisfy all DOE requirements for training and LFSH qualifications. Prior to construction of the LFSH in

2002, all training activities were conducted at the firing ranges at TA-72 with the exception of the LFSH training and qualifications which were conducted at off-site facilities. This consolidation of PTLA training activities into one location will result in a substantial cost savings for the PTLA training program, a more efficient use of personnel, and a more effective means of complying with DOE and LANL training requirements.

The LFSH is an entirely lead-free structure installed on a reinforced concrete pad at TA-72. The facility consists of ballistic-resistant, steel-walled, 60-foot by 76-foot modular structure. The entire house and concrete pad are covered with a steel-framed roof structure, similar to a metal building but open on four sides, to protect the facility from the weather and to permit training in inclement weather. Exterior and interior walls consist of 4-foot-wide by 12-foot-high modular panels. These walls are designed to contain the bullets and fragmentation from multiple impacts. Bullet traps are placed in the LFSH as the primary impact target for rounds fired. These traps are constructed of armor steel that cannot be penetrated by handgun rounds and can withstand 5.56-mm full-metal-jacket rounds.

The LFSH has an Elevated Observation Control Platform which is essentially a catwalk constructed over a portion of the house to allow instructor monitoring and evaluation of the training. This catwalk is accessed by a set of stairs adjacent to the exterior of the house. The stairway was built to Occupational Safety and Health Administration safety specification; the stairs and platform have appropriate guardrails.

NEPA review for this project was provided under ESH-ID 97-0130, Shooting House/Concrete Pad, and ESH-ID 98-0168, Live-Fire-Shoot-House (LFSH). NEPA coverage for the project was finally provided by Categorical Exclusion #7245, issued on 03/16/2000 (DOE 2000e).

Status: Construction of the new LFSH began in November 2002 and was completed in January 2003. The facility became operational in March 2003.

l) Security Truck Inspection Station

Construction of the Security Truck Inspection Station (DOE 2002j) is now complete. A description of this project is located in the 2002 SWEIS Yearbook (LANL 2003c), Section 2.16.

m) NPDES Outfall Project

The NPDES Outfall Project (DOE 1996f) is described in detail in the 2002 SWEIS Yearbook (LANL 2003b), section 2.16.

n) National Security Sciences Building

Description: As described in the environmental assessment (NNSA 2001), the National Security Sciences Building within LANL's TA-03, will provide approximately 275,000 square feet of space for theoretical and applied physics, computation science and program, and senior-management functions. This building will be an eight-story-high building to house about 700 personnel and their functions, which would move from Building 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 to build. When personnel are completely removed from Building 03-0043 to the new building, 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 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, which is scheduled for completion in CY 2006. Occupancy of the building is scheduled to begin in March 2006.

o) FWO Division Office Building

Description: The FWO Division Office Building was proposed to help consolidate some of the FWO personnel that were scattered throughout LANL in numerous trailers and transportables located at TA-03 and TA-63. This building is a two story, with approximately 20,000 square feet and a capacity of between 75 to 80 people.

Status: The project received NEPA coverage through an existing DOE-approved categorical exclusion (DOE 2001j) issued May 4, 2001. The method of execution was Design Build. The contractor selected was issued the Notice To Proceed on April 23, 2003. The contractor began the design shortly thereafter with the initial emphasis on the site preparation design. It is expected that the primary construction and Beneficial Occupancy will occur in the spring of CY 2004.

p) TA-03 Parking Structure

Description: A parking structure was constructed in the TA-03 area in order to ease the critical shortage of parking spaces in that area. This structure is located west of Building SM-31 and south of Building SM-30. The pre-cast concrete structure is four stories tall and is capable of holding 337 vehicles.

Status: NEPA categorical exclusion #9443 was issued by NNSA/DOE on March 17, 2003 (DOE 2003k). Construction of the new TA-03 Parking Structure began July 2003.

q) Pajarito Road Access Control Stations

Description: Two staffed access control stations were constructed on Pajarito Road. One station was constructed on the east end of Pajarito Road (west of intersection with New Mexico State Road 4 in White Rock), and the other station was constructed on Pajarito Road east of the LANL core and west of TA-55. The staffed access control stations are about 200 square feet in floor space with an adjacent support building up to about 2,000 square feet. Each station is equipped with appropriate utilities with electricity and lighted parking. The adjacent support building is equipped with various video systems, electric control devices, and fencing to preclude drive arounds as well as appropriate utilities including electricity, potable water, and sewage services.

Status: This project had its own NEPA coverage provided by the Environmental Assessment for Proposed Access Control and Traffic Improvements at Los Alamos National Laboratory, Los Alamos, New Mexico (DOE 2002k). Construction Notice to Proceed was issued on October 3, 2003.

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 2003, no new capabilities were added to the Non-Key Facilities and none of the eight was deleted.

The 5,576 employees in the Non-Key Facilities at the end of CY 2003 reflect an increase of 333 employees over the 4,816 employees reported in the 2002 SWEIS Yearbook (LANL 2003c).

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 69 percent of the workforce. In previous years, activities in these facilities have typically contributed less than 20 percent of most operational effects. However, in CY 2003, operational effects in the Non-Key Facilities have increased. For example, the 1,964 cubic meters of LLW generated at the Non-Key Facilities constituted about 52 percent of the total LANL LLW volume in CY 2003. Also in CY 2003, the Non-Key Facilities generated about 87 percent of the total LANL chemical waste volume; about 56 percent of the MLLW volume; and about 22 percent of the TRU waste volume. Table 2.16.3-1 presents details of the operations data from CY 2003.

The combined flows of the sanitary waste treatment plant and the TA-03 Steam Plant account for about 86 percent of the total discharge from Non-Key Facilities and about 64 percent of all water discharged by LANL. Section 3.2 has more detail. Operations data are summarized in Table 2.16.3-1.

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

Parameter	Units	SWEIS ROD	2003 Operations
Radioactive Air Emissions: [a]			
Tritium	Ci/y	9.1E+2	None measured [b]
Plutonium	Ci/y	3.3E-6	None measured [b]
Uranium	Ci/y	1.8E-4	None measured [b]
NPDES Discharge:			
Total Discharges	MGY	142	156.794
001	MGY	114	131.427
013	MGY	c	c
03A-027	MGY	5.8	8.02
03A-160	MGY	5.1	17.347
03A-199	MGY	---	0 [d]
22 others	MGY	17	e
Wastes:			
Chemical	kg/yr	651,000	624,826
LLW	m^3/yr	520	3,783 [f]
MLLW	m^3/yr	30	20
TRU	m^3/yr	0	90 [g]
Mixed TRU	m^3/yr	0	5.9 [h]
Number of Workers	FTEs	4,601 [i]	5,576 [i]

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 Most of the stacks in the Non-Key Facilities are not sampled for radioactive airborne emissions because the potential emissions from these stacks are sufficiently small that measurement systems are not necessary to meet regulatory or facility requirements.

c 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 existing outfall.

d New Outfall 03A-199 was permitted by the EPA on 12/29/00. It had no discharge during CY 2003.

e 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.

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

g TRU waste generated at the Non-Key Facilities during CYs 2002 and 2003 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.

h 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 from Shipping and Receiving, it is attributed to that location as the point of generation.

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 2003 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 2003 operations is routinely collected information and represents only UC 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 Remediation Services Project (previously the Environmental Restoration Project)

The Remediation Services (RS) Project, previously called the Environmental Restoration Project, may generate a significant amount of waste during cleanup activities; therefore, the project is included as a section of Chapter 2. The SWEIS ROD forecast that the RS Project would contribute 60 percent of the chemical wastes, 35 percent of the LLW, and 75 percent of the MLLW generated at LANL over the 10 years from 1996–2005. The RS Project will also affect land resources in and around LANL.

The DOE established the RS Project in 1989 to characterize and remediate over 2,100 PRSs known, or suspected, to be contaminated from historical operations. Many of the sites remain under DOE 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 and/or DOE.

In CY 2003, RS Project activities included drafting and finalizing several characterization and remediation reports for the NMED, conducting characterization field work on sites that could potentially be affected by upcoming infrastructure and construction projects, and formally tracking all work performed.

Some characterization and remediation reports included

- Voluntary Corrective Action (VCA) Completion Report for SWMU 21-024(f) and Areas of Concern (AOCs) 21-030 and C-21-015,
- Investigation Work Plans and Historic Investigation Reports for Material Disposal Areas (MDAs) C, G and L,
- RCRA Facility Investigation (RFI)/VCA Completion Report for SWMU 21-013(d)-99,
- MDA H Corrective Measures Study Report,
- DP Road VCA/Interim Action Completion Report,

- PRS 16-021(c)-99, 260 Outfall, Phase III RFI Report,
- 2nd re-formatted MDA P deliverable, the Phase II Closure Implementation Report,
- TA-21 non-traditional in-situ vitrification, SWMU 21-018(a)-99, Interim Measures Completion Report, and
- Interim Action Completion Report for SWMU 21-024(i).

Continued field investigations included

- Sampling at PRS 03-012(b)-00 in support of the Combustion Turbine Generator Project,
- Sampling at SWMUs 03-010(a) and 03-011 in support of the TA-03 Parking Structure Project,
- Sampling at SWMU 03-056(l) in support of the Beryllium Facility Storage Vault Project, and
- Sampling at SWMUs 03-028, 03-036(a, c & d), 03-045(g); and 60-002 and AOCs 03-043(b); 03-036(b); and C-03-016 in support of the TA-03/TA-60 Asphalt Batch Plant Project.

2.17.1 Operations of the Remediation Services Project

The RS Project originally identified 2,124 PRSs, consisting of 1,099 PRSs administered by NMED and 1,025 PRSs administered by DOE. By the end of CY 2003, only 833 discrete PRSs remain. Approximately 707 (694 in CY 2002 plus 5 DOE and 8 NMED no future actions [NFAs] in CY 2003) units have been approved for NFA[10], 139 units have been removed from the LANL's Hazardous Waste Facility Permit. Of the 139 total PRSs removed from the permit, no sites were removed in CY 2003.

Combustion Turbine Generator Project Support

RS personnel provided support to the Combustion Turbine Generator Project at the TA-03 Power Plant. The utility lines required for the new turbine will be located within the boundary of PRS 03-012(b)-00. Phase I RFI samples were collected and analyzed in accordance with Addendum 1 of the Operable Unit 1114 RFI work plan and RS Project personnel worked with the facility contractor in conducting background comparisons and screening assessments of the analytical results to determine the steps necessary to move forward with the construction project.

TA-03 Parking Structure Support

RS personnel met with facility personnel regarding the TA-03 parking structure construction planned near SWMUs 03-010(a) and 03-011. A borehole was advanced and core samples collected and analyzed for geotechnical purposes to ensure that volatile organic compound (VOC) and tritium contamination from SWMU 03-010(a) was not present at this location. A 10-day notification letter was sent to NMED and the borehole

[10] NFA means that the site is considered "clean" for its intended purpose. An industrial site would not be cleaned up to the same level as a residential site.

was drilled in early April 2003. RS obtained verbal approval of NFA determination from NMED for SWMU 03-011 allowing construction of the new parking structure.

Beryllium Facility Storage Vault Project Support

RS personnel worked with facility personnel regarding the planned construction of a new storage vault and cartridge filter house adjacent to the Beryllium Facility (03-141) at TA-03. The proposed location of the new storage vault overlapped the location of SWMU 03-056(l). Eberline Services, a KSL subcontractor, collected confirmation samples within the boundary of SWMU 03-056(l) in support of a pending NFA determination. RS personnel also worked with the Sampling Management Office and Eberline Services to ensure the samples were collected and analyzed in accordance with RS Project quality assurance requirements. Results showed no detected beryllium and supported NFA determination.

TA-03 Asphalt Batch Plant Project Support

RS personnel developed and implemented a “fast track” Field Implementation Plan to complete the RFI at SWMUs 03-028, 03-036(a, c & d), 03-045(g); and 60-002 and AOCs 03-043(b); 03-036(b); and C-03-016 as part of the removal of the old TA-03 asphalt batch plant and installation of a new parking lot, and prior to installation of a new asphalt batch plant at TA-60. RS personnel provided oversight and direction of sampling activities completed at the TA-03 asphalt batch plant and the new location of the asphalt plant at TA-60. RS successfully integrated with FWO Infrastructure Projects to quickly collect characterization data at several SWMUs and AOCs during the relocation of the asphalt batch plant before new construction activities disturbed these areas or rendered them inaccessible in the future. Nineteen boreholes and 2 hand auger holes were drilled and sampled. Forty-five samples were submitted for off-site laboratory analyses and 63 screening samples were analyzed in the field for total petroleum hydrocarbons. The new parking lot was completed before the September 30, 2003, deadline.

Technical Area 21 Investigation and Cleanup Activities

Fieldwork at SWMU 21-011(k) is complete. The final radiological survey shows that all areas are below the cleanup criteria. A small road repair was completed in June 2003 and revegetation occurred in July 2003.

SWMU 21-013(d)-99 is a consolidated site made up of former SWMUs 21-013(d) and 21-013(e). The site, referred to as the “cold dump,” received construction and building debris. The former Zia Company supervisor confirmed that no toxic, explosive, or radioactive substances were dumped at the site. Sampling was completed the first week of March 2003.

A removal action and site restoration was conducted at SWMU 21-024(f), located at TA-21. The action involved the removal of 8 cubic yards of soil from an outfall area associated with a former septic system and was conducted as a best management practice.

This SWMU will be transferred to Los Alamos County. A VCA completion report was submitted to NMED in June 2003.

DP Canyon Tracer Study

The RS Canyons Team implemented a groundwater tracer study in DP Canyon. The tracer study addressed key questions related to an evaluation of potential remedial options for strontium-90 contamination in sediment and alluvial groundwater. The study, in combination with existing water quality and contaminant characterization data, is part of an effort to understand how strontium-90 is moving through DP Canyon. The strontium-90 in DP Canyon resulted from historical discharges (1952 through 1986) of radioactive effluent from Buildings 21-35 and 21-237 at DP Site. The buildings housed operations associated with plutonium chemistry. Bromide was injected into the alluvial groundwater and is being used as the tracer because it is a non-reactive anion in solution and can "trace" the movement of groundwater. Groundwater samples are collected manually from over 100 monitoring points and with an automated down-hole probe and data-logger network. Alluvial groundwater flow rates and pathways will be assessed from the bromide measurements.

45 Million Gallons of Water Salvaged

RS Project staff developed water conservation measures and implemented them during an aquifer test in Los Alamos County where more than 45 million gallons of water were salvaged. Typically, water produced during such tests is discharged into the environment under applicable federal/state permits. However, in December 2002, normal water production at most municipal supply wells was suspended and the combined 40-million-gallon storage capacity of Los Alamos County and the LANL municipal well water was depleted to accommodate water produced by the test. A constant-rate pumping test at a supply well (PM-2) started in February 2003. The well yielded about 1,250 gallons per minute for 25 continuous days. Production waters were diverted into numerous storage tanks located throughout Los Alamos County and LANL facilities where it will be used. During the test period, no interruptions in water services were reported and no water discharges into the environment occurred. These operations required extensive planning and close coordination with Los Alamos County Utilities Department.

French Drain Removal at Omega West Reactor

Staff from the RS Program and the CGRP integrated their efforts during CGRP's removal of the French drain, dry well, and contaminated soil at SWMU 02-006(a) on April 1, 2003. Seventeen characterization and confirmation samples were collected at eight sampling locations. Staff from the CGRP collected the samples that will be used by RS to determine that cleanup goals have been achieved and that the nature and extent of contamination have been defined. SWMU 02-006(a) is a French drain associated with operation of the Omega West Reactor gas stack. The stack and drain are located on the mesa above TA-02, in TA-61. The drain was designed to catch condensation that might flow down the exhaust stack. The drain was made of 2-inch stainless steel, and was located on the mesa top south of Los Alamos Canyon. The drain ran 20 feet northwest of the exhaust stack into a dry well. The liquid subsequently was released to the soil. The Omega West Reactor operated from 1953 until 1993. Suspect contaminants at SWMU 02-006(a) are radionuclides and metals. The samples will be analyzed for gross alpha/beta, gross gamma, gamma spectroscopy, strontium-90, technitium-99, isotopic uranium, gamma spectroscopy, tritium, and metals. Facility integration between the RS Program and CGRP yielded many benefits, including maximizing opportunities to complete site characterization and remediation; fulfilling communication and notification requirements; and identifying cost and schedule efficiencies.

Best Management Practices in Pueblo Canyon

The RS Canyons Team implemented a project to study transport of plutonium in post-Cerro Grande Fire floods in Pueblo Canyon. Automated storm water samplers located at key points along the canyon were used to collect data to evaluate variations in plutonium transport. The data support a conceptual model that channel banks in the upper canyon (below the Acid Canyon confluence) are sources of sediment and plutonium during floods and the wetland area in the lower canyon (below the Los Alamos County sewage treatment plant) is effective at trapping suspended sediment. Based on these findings, a pilot project has been implemented to evaluate the effectiveness of a low-tech method to reduce bank erosion. In July, the Canyons Team and Shaw Environmental placed 450 meters of jute matting along erodable banks in upper Pueblo Canyon. Samples are being collected to evaluate the effectiveness of the jute matting.

2.17.2 Operations Data for the Remediation Services Project

Waste quantities generated during FY 2003 are shown in Table 2.17.2-1. The RS Project generated 30 cubic meters of chemical waste (including the categories RCRA, Toxic Substances Control Act [TSCA], and New Mexico Special Waste) in FY 2003—all below the projections made by the SWEIS ROD.

Table 2.17.2-1. Remediation Services Project/Operations Data

Waste Type	Units	SWEIS ROD	2003 Operations
Chemical [a]	m^3/yr	2,000,000	30
LLW	m^3/yr	4,260	216
MLLW	m^3/yr	548	0
TRU	m^3/yr	11	0
Mixed TRU	m^3/yr	0	0

[a] The chemical waste volume includes the categories of RCRA, TSCA, and New Mexico Special Waste.

2.17.3 Cerro Grande Fire Effects on the Remediation Services Project

RS staff provided support to the CGRP during the decommissioning and demolition of the TA-02 Omega West Reactor and stack. Personnel performed data analyses, prepared sampling plans and memoranda of understanding to integrate sample collection (83 samples were collected from 9 PRSs). Soil remediation and radiological walkover surveys were performed at PRSs following decommissioning and demolition activities.

During CY 2003, the LANL Nuclear Facility List (LANL 2002a) added 11 Environmental Sites that are categorized as Hazard Category 2 and Hazard Category 3 Nuclear Facilities, as shown in Table 2.17.3-1.

Table 2.17.3-1. Environmental Sites with Nuclear Hazard Classification

Zone	PRS	Description	HAZ CAT
TA-10	10-0029(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 decommissioning and demolition in 1963. The remaining materials were placed in a pit that remains in place.	3
TA-21	21-014	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 decommissioning and demolition activities, and radioactive liquids generated at TA-21. The area contains two buried 50,000 gallons 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	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	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	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 Pu-239 that may have been introduced from a breach of one or two fuel elements during the operational life of LAMPRE-1.	3
TA-35	35-003(a)-99	The Wastewater 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 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.	3

Table 2.17.3-1. (cont.)

Zone	PRS	Description	HAZ CAT
TA-35	35-003(d)-00	The former structures associated with the Pratt Canyon component of the treatment plant. All buildings, foundations, and structures were removed during decommissioning and demolition activities in 1981 and 1985, then backfilled with 20 ft of clean fill material.	3
TA-49	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	50-009	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 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 25 ft by 180 ft by 12 ft), 107 shafts (each typically 2 ft dia. 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. Contaminants of potential ecological concern included inorganic chemicals, VOCs, semivolatile organic compounds, and radionuclides.	2
TA-53	21-014	Three inactive underground tanks associated with the former radioactive liquid waste system at TA-53. One tank (Structure 53-59) is 28 in dia by 65 ft long and contains spent ion exchange resin. Two empty tanks are 6 ft dia by 12 ft long and are not included here.	2
TA-54	Area G	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.	2

[a] DOE/LANL list of Los Alamos National Laboratory Nuclear Facilities (LANL 2001b)

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3.0 Site-Wide 2003 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 2003 totaled approximately 2,060 curies, just under 10 percent of the 10-year average of 21,700 curies projected by the ROD. These low emissions result from operations at the Key Facilities not being performed at projected levels and from the conservative nature of the emissions calculations performed for the SWEIS.

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 1,320 curies. Clean-up activities at TA-33 and TA-41 (both Non-Key Facilities) were completed, and neither of these facilities was monitored in 2004.

Emissions of activation products from LANSCE were lower than 2002 levels. The total point source emissions were approximately 620 curies. As in recent years, the Area A beam stop did not operate during 2003; however, operations in Line D resulted in the majority of emissions reported for 2003.

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 120 curies. Additional detail about radioactive air emissions is provided in LANL's 2003 annual compliance report to the EPA (LANL 2004a) submitted on June

30, 2004, and in the 2003 Environmental Surveillance Report, to be issued after October 1, 2004.

Maximum offsite dose continued to be relatively small for 2003. The final dose is 0.65 millirem, well under the EPA air emissions limit for DOE facilities of 10 millirem per year.

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 2003 emissions of criteria pollutants are within the estimated emissions presented in the SWEIS ROD, with the exception of particulate matter and sulfur oxides. These increased emissions are attributable primarily to the operation of three air curtain destructors used to burn wood and slash from wildfire mitigation activities. These air curtain destructors emitted a total of 19.1 tons of particulate matter and 1.3 tons of sulfur oxides during CY 2003. The air curtain destructors were shut down in September 2003.

Table 3.1.2.1-1. Emissions of Criteria Pollutants [a]

Pollutants	Units	SWEIS ROD	2000 Operations	2001 Operations	2002 Operations	2003 Operations
Carbon monoxide	Tons/year	58	26	29.08	28.1	31.9
Nitrogen oxides	Tons/year	201	80	93.8	64.7	49.6
Particulate matter	Tons/year	11	3.8	5.5	15.5 [b]	22.1 [b]
Sulfur oxides	Tons/year	0.98	4.0 [c]	0.82	1.3 [d]	1.6 [d]

[a] Emissions presented here are those reported on LANL's annual emission inventory. Emissions from insignificant sources are not included.

[b] The increased emissions are attributable primarily to the operation of the three air curtain destructors to burn wood and slash from the fire mitigation activities around LANL.

[c] The higher emissions of sulfur oxides in CY 2000 were due to the main steam plant's burning fuel oil during the Cerro Grande Fire.

[d] The higher emissions of sulfur oxides in CYs 2002 and 2003 are due to the operation of the three air curtain destructors to burn wood and slash from the fire mitigation activities around LANL.

In CY 2003, approximately one-third of the most significant criteria pollutant, nitrogen oxides, resulted from the TA-03 steam plant. In late CY 2000, LANL received a permit from the NMED to install flue gas recirculation equipment on the steam plant boilers to reduce emissions of nitrogen oxides. This equipment was operational for all of CY 2003. Emission stack testing conducted in September 2002 demonstrated that the flue gas recirculation equipment resulted in a reduction in nitrogen oxide emissions of approximately 64 percent. The air curtain destructors resulted in approximately 50 percent of LANL's nitrogen oxide emissions in CY 2003 (24.6 tons).

Sulfur oxide emissions for CY 2003 resulted from the operation of three air curtain destructors to burn wood and slash from fire mitigation activities. Total emissions for CY 2003 from these units were 1.3 tons of sulfur oxides. The majority of particulate matter emissions in CY 2003 are also from the air curtain destructors. These units accounted for 19.1 tons of particulate matter.

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 paper shredder, rock crusher, carpenter shops, degreasers, oil storage tanks, and permitted beryllium machining operations are reported. For more information, refer to LANL's 2001 and 2002 Emissions Inventory Reports (LANL 2003a, 2003b).

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 the new EX3 chemical inventory system 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 calendar year. 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) and for reporting regulated air pollutants estimated from research and development operations in the annual Emissions Inventory Report (LANL 2003a, 2003b).

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, 2000, 2001, and 2002 Yearbooks (LANL 2000a, 2001a, 2002a, 2003c, respectively). 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 VOCs and hazardous air pollutants estimated from research and development operations is shown in Table 3.1.2.2-1. Projections by the SWEIS ROD for VOCs and hazardous air pollutants 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 calendar year. The hazardous air pollutant emissions reported from research and development activities generally reflect quantities procured in each calendar year. 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. Operation of the air curtain destructors resulted in increases of VOCs and hazardous air pollutants emissions during CY 2003. The air curtain destructors accounted for 36.0 and 3.3 tons of VOCs and hazardous air pollutants, respectively. The air curtain destructor emissions are not reflected in Table 3.1.2.2-1, which shows emissions only from chemical use on research and development activities.

Table 3.1.2.2-1 Emissions of Volatile Organic Compounds and Hazardous Air Pollutants from Chemical Use in Research and Development Activities

Pollutant	Emissions (Tons/year)				
	1999	2000	2001	2002	2003
Hazardous Air Pollutants	13.6	6.5	7.4	7.74	7.32
Volatile Organic Compounds	20	10.7	18.6	14.9	11.2

3.2 Liquid Effluents

LANL may discharge wastewater via 21 outfalls operating under its NPDES permit. On December 29, 2000, the EPA issued a new NPDES permit to LANL with an effective date of February 1, 2001. Based on discharge monitoring reports as reported by the LANL's Water Quality and Hydrology Group, flow was recorded at only 16 of the 21 permitted outfalls. Effluent flow through the 16 NPDES outfalls totaled an estimated 209.82 million gallons in CY 2003. This is an approximate increase of 31.64 million gallons over CY 2002 (178.18 million gallons); however, this volume of discharge is below the SWEIS ROD projection of 278.0 million gallons.

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, the Water Quality and Hydrology Group is collecting and reporting actual flows being 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. Details on all NPDES noncompliance will be provided in the 2003 Annual Environmental Surveillance Report (LANL 2004b).

Key Facilities accounted for approximately 47 million gallons of the total. This flow can be examined by watershed (Table 3.2-1) and by facility (Table 3.2-2) to understand differences from projections.

Of the 21 outfalls listed in the NPDES permit only 16 discharged during CY 2003, which is one less than in CY 2002. Table 3.2-2 compares NPDES discharges by facility. The Non-Key Facilities showed a difference of about 14.7 million gallons between CY 2003 discharges and SWEIS ROD projections (156.79 million gallons versus 142.1 million gallons, respectively). For the Non-Key Facilities, discharge of 38.9 million gallons from Outfall 001 at the TA-03 Power Plant was higher than the CY 2002 discharge of 8.29 million gallons. Approximately 92.5 million gallons of the discharge from Outfall 001 at the power plant were attributable to treated sanitary effluent piped from Outfall 13S at

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

Watershed	# Outfalls (SWEIS ROD)	# Outfalls (2003) [a]	Discharge (SWEIS ROD)	Discharge 2003
Cañada del Buey	3	1 [b]	6.4	0
Guaje	7	0	0.7	0
Los Alamos	8	5	44.8	34.52
Mortandad	7	5	37.4	33.12
Pajarito	11	0	2.6	0
Pueblo	1	0	1.0	0
Sandia	8	5	170.7	140.41[b]
Water	10	5 [c]	14.2	1.77
Totals	55	21	278.0	209.82

[a] Twenty-one outfalls were permitted to discharge during 2003.

[b] Includes Outfall 13S from the Sanitary Wastewater Systems Consolidation, which is registered as a discharge to Cañada del Buey or Sandia. The effluent is actually piped to TA-3 and ultimately discharged to Sandia Canyon via Outfall 001.

[c] Includes 05A-055 discharge to Cañon de Valle, a tributary to Water Canyon.

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

Facility	# Outfalls (SWEIS ROD)	# Outfalls (2003)	Discharge (SWEIS ROD)	Discharge (2003)
Plutonium Complex	1	1	14.0	3.02
Tritium Facility	2	2	0.3	19.03
CMR Building	1	1	0.5	2.16
Sigma Complex	2	2	7.3	7.62
High Explosives Processing	11	3	12.4	0.02
High Explosives Testing	7	2	3.6	1.75
LANSCE	5	4	81.8	16.46
Biosciences	1	0	2.5	0
Radiochemistry Facility	2	0	4.1	0
RLWTF	1	1	9.3	2.97
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	156.79
Totals	55	21	278.0	209.82

TA-46 to TA-03 to be used as "makeup water" in the cooling towers. While the volume contributed from 13S decreased by about half a million gallons over what it was in CY 2002, the total discharged through Outfall 001 has increased by about 30 million gallons. The combined flows of the sanitary waste treatment plant and the TA-03 Steam Plant account for about 84 percent of the total discharge from Non-Key Facilities and about 63 percent of all water discharged by LANL.

For the Key Facilities, LANSCE discharged approximately 16 million gallons for CY 2003, about 8 million gallons less than in CY 2002, accounting for about 31 percent of the total discharge from all Key Facilities (see Table 3.2-2). This percentage has decreased from almost 51 percent in CY 2002 because other Key Facilities experienced an increase in discharge in CY 2003. In addition, the reduced LANSCE discharge volume is attributed to overall reduced activity and fewer hours of "beam time" than anticipated. See Section 2.11 for more information.

LANL has three principal wastewater treatment facilities—the sewage plant (sanitary wastewater system) at TA-46, the RLWTF at TA-50, and the High Explosives Wastewater Treatment Facility at TA-16. As discussed above, the sewage treatment plant at TA-46 processed about 92.5 million gallons of treated wastewater and sewage during CY 2003, all of which was pumped to the TA-03 Power Plant to provide make-up water for the cooling towers or to be discharged directly into Sandia Canyon via Outfall 001.

The RLWTF, Building 50-01, Outfall 051, discharges into Mortandad Canyon. During CY 2003, about 2.97 million gallons of treated radioactive liquid effluent, about 0.5 million gallons less than CY 2002, were released to Mortandad Canyon from the RLWTF, compared to 9.3 million gallons projected by the SWEIS ROD. The TA-16 High Explosives Wastewater Treatment Facility discharged about 0.0128 million gallons compared to 12.4 projected by the SWEIS ROD.

Treated wastewater released from LANL's NPDES outfalls rarely leaves the site. However, the NPDES Permit Program also regulates storm water discharges from certain activities. During CY 2003, 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 of DOE property. Flow measurements and water quality data for surface water are detailed in the LANL's annual reports, Environmental Surveillance at Los Alamos (an example is LANL 2004c) and Surface Water Data at Los Alamos National Laboratory (an example is LANL 2003d).

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, low-level radioactive, 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 (LIR) program. 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 RS activities as shown in Table 3.3-1. Waste generators are assigned to one of three categories—Key Facilities, Non-Key Facilities, and the Environmental Restoration Project (now called RS). 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 decommissioning and demolition of buildings.

Table 3.3-1. LANL Waste Types and Generation

Waste Type	Units	SWEIS ROD Projection	2002	2003
Chemical	10^3 kg/yr	3,250	1,734 [a]	689
LLW	m^3/yr	12,200	7,310	5,625
MLLW	m^3/yr	632	20.54	36.10
TRU	m^3/yr	333	119.1	403.37
Mixed TRU	m^3/yr	115	87.01	156.95

a This volume was erroneously reported as 602 in Table 3.3-1 of the 2002 Yearbook.

In general, waste quantities from operations at the Key Facilities were below SWEIS ROD projections for nearly all waste types, reflecting normal levels of operations at the Key Facilities. The exception is the Solid Chemical and Radioactive Waste Key Facility that exceeded the SWEIS ROD projections for generation of both TRU and mixed TRU waste. Waste minimization efforts put forth by the Environmental Stewardship Office are beginning to show a LANL-wide trend in overall waste reduction across most categories. There have been improvements made in various facility processes to try and minimize waste generation. Additionally, other processes are substituting non-hazardous chemicals for commonly used hazardous chemicals in an effort to improve effluent quality.

3.3.1 Construction and Demolition Debris (Previously Identified in Yearbooks before CY 2002 as Industrial Solid Wastes)

As projected by the SWEIS ROD, chemical waste includes not only construction and demolition debris, but also all other nonradioactive 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 offsite disposal facilities. For CY 2003, construction and demolition debris was 42 percent of the total chemical waste generated and consisted primarily of asbestos and construction debris from decommissioning and demolition 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.)

3.3.2 Chemical Wastes

Chemical waste generation in CY 2003 was only about 21 percent of the chemical waste volumes projected by the SWEIS ROD. Table 3.3.2-1 summarizes chemical waste generation during CY 2003.

Table 3.3.2-1. Chemical Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2002	2003
Key Facilities	10^3 kg/yr	600	267	64
Non-Key Facilities	10^3 kg/yr	650	334	594
Remediation Services (formerly called the Environmental Restoration Project)	10^3 kg/yr	2,000	1,133	31
LANL	10^3 kg/yr	3,250	1,734	689

RS wastes accounted for only about 4.5 percent of the total chemical wastes generated. The RS projects that contributed to the waste generated were cleanups at PRS 21-011 (k), AOC 00-027, the TA-3/60 asphalt batch plant, and drilling regional wells R-16, -20, and -23.

3.3.3 Low-Level Radioactive Wastes

LLW generation in 2003 was about 46 percent of LLW volumes projected by the SWEIS ROD. As can be seen in Table 3.3.3-1, only the Non-Key Facilities exceeded projections in the SWEIS ROD. This is attributed to 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	2002	2003
Key Facilities	m^3/yr	7,450	1,292	1,843
Non-Key Facilities	m^3/yr	520	534 [a]	1,964 [a]
Remediation Services	m^3/yr	4,260	5,484	1,819
LANL	m^3/yr	12,230	7,310	5,625

[a] LLW generation at the Non-Key Facilities slightly exceeded the SWEIS ROD projection due to heightened activities and new construction.

Significant differences occurred at the CMR Building (423 cubic meters versus 1,820 cubic meters per year projected by the SWEIS ROD), the Sigma Complex (960 cubic meters versus 124 actual), and High Explosives Testing (940 cubic meters projected versus 0 actual). In addition, LANSCE generated lower volumes than projected (1,085 cubic meters projected versus 70 actual) because decommissioning and renovation of Experimental Area A did not occur. Normal to low workloads accounted for lower waste volumes at the other Key Facilities. LLW generation at Non-Key Facilities was almost four times greater than the volume projected in the SWEIS ROD due to heightened activities and new construction at Non-Key Facilities.

3.3.4 Mixed Low-Level Radioactive Wastes

Generation in 2003 approximated 5.7 percent of the MLLW volumes projected by the SWEIS ROD. RS did not produce any MLLW in 2003. 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	2002	2003
Key Facilities	m^3/yr	54	12	16.55
Non-Key Facilities	m^3/yr	30	9	19.55
Remediation Services	m^3/yr	548	0	0
LANL	m^3/yr	632	21	36.10

3.3.5 Transuranic Wastes

During CY 2003, the LANL TRU waste volumes exceeded the SWEIS ROD projections. 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 RS. RS did not produce any TRU wastes in 2003. TRU waste generated at the Non-Key Facilities during CY 2003 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. 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	2002	2003
Key Facilities	m^3/yr	322	82	312.91
Non-Key Facilities	m^3/yr	0	37 [a]	90.46 [a]
Remediation Services	m^3/yr	11	0	0
LANL	m^3/yr	333	119	403.37

[a] TRU waste generated at the Non-Key Facilities during CYs 2002 and 2003 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.

3.3.6 Mixed Transuranic Wastes

LANL mixed TRU waste generation in 2003 exceeded the mixed TRU waste volumes projected by the SWEIS ROD. As projected, mixed TRU wastes are expected to be generated at only two facilities—the Plutonium Facility Complex and the CMR Building. Table 3.3.6-1 examines mixed TRU wastes by generator categories.

Both the Plutonium Facility Complex (78 cubic meters actual versus 102 cubic meters per year projected by the SWEIS ROD) and the CMR Building (11.5 cubic meters actual versus 13 cubic meters per year projected by the SWEIS ROD) produced less mixed TRU waste than projected because full-scale production of war reserve pits had not begun.

Table 3.3.6-1. Mixed Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	2002	2003
Key Facilities	m^3/yr	115	87	151.04 [a]
Non-Key Facilities	m^3/yr	0	0	5.91 [b]
Remediation Services (formerly called the ER Project)	m^3/yr	0	0	0
LANL	m^3/yr	115	87	156.95

[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 from Shipping and Receiving, it is attributed to that location as the point of generation.

However, the Solid Radioactive and Chemical Waste Key Facility generated 58.66 cubic meters of mixed TRU waste (SWEIS ROD projection is 0) due to the DVRS repackaging of legacy TRU waste for shipment to WIPP.

3.4 Utilities

Ownership and distribution of utility services continue to be split between NNSA and Los Alamos County. 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 fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.

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 2003. Approximately 97 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.

As shown in Table 3.4.1-1, total gas consumption for FY 2003 was less than projected by the SWEIS ROD. During FY 2003, more natural gas was used for heating than in FY 2002, and there was less electric generation at the TA-03 Power Plant than in FY 2002. Table 3.4.1-2 illustrates steam production for FY 2003.

Table 3.4.1-1. Gas Consumption (decatherms [a]) at LANL/Fiscal Year [b] 2003

SWEIS ROD	Total LANL Consumption	Total Used for Electric Production	Total Used for Heat Production	Total Steam Production
1,840,000	1,220,137	41,632	1,178,505	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 fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.

Table 3.4.1-2. Steam Production at LANL/Fiscal Year [a] 2003

TA-3 Steam Production (klb [b])	TA-21 Steam Production (klb)	Total Steam Production (klb)
351,905 [c]	26,147	378,052

a Routine data collection for both gas and electricity are done on a fiscal year basis, and keeping with the Yearbook goal of using routinely collected data, this information is presented by fiscal year. Water data, however, are routinely collected and summarized by calendar year.
b klb: Thousands of pounds
c TA-03 steam production has two components: that used for electric production (29,373 klb for FY 2003) and that used for heat (322,532 klb in FY 2003).

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 NNSA 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.

Onsite 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 greater than 10 megawatts. Rewinding should be finished and the unit re-installed about August 2004. 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 2005. Implementation of these improvements should increase the output of the TA-03 Co-generation Complex to greater than 20 megawatts.

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 56 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 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 2000). 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 WTA 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. Construction of the transmission line and uncrossing of the two existing 115-kilovolt lines within LANL is projected to start in the spring of 2005 and take approximately a year to complete.

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. 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, "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 issued a Finding of No Significant Impact in December 2002. Installation of the first combustion turbine generator at the TA-03 Power Plant is scheduled to occur during the FY 2004–FY 2005 timeframe.

Table 3.4.2-1 shows peak demand and Table 3.4.2-2 shows annual use of electricity for FY 2003. 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

Table 3.4.2-1. Electric Peak Coincident Demand/Fiscal Year [a] 2003

Category	LANL Base	LANSCE	LANL Total	County Total	Pool Total
SWEIS ROD	50,000 [b]	63,000	113,000	Not projected	Not projected
FY 2003	50,008	20,859	70,687	16,910	87,597

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

Table 3.4.2-2. Electric Consumption/Fiscal Year [a] 2003

Category	LANL Base	LANSCE	LANL Total	County	Pool Total
SWEIS ROD	345,000 [b]	437,000	782,000	Not projected	Not projected
FY 2003	294,993	87,856	382,849	109,822	492,671

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

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.

Operations at several of the large LANL loads changed during 2003. Notably the Strategic Computing Complex operations increased to about 4 megawatts of load in FY 2003.

LANSCE operations were reduced in operating time in FY 2003 due to shortened programmatic operations and a reduction of direct operating funds. This represented no significant reduction in the total peak demand of loading on the LANL power system in FY 2003 (in fact it increased). It is expected that operating funds will be restored in future years such that the LANSCE operations will be restored to the level of prior years operations at high power levels.

The LEDA funding was curtailed in FY 2001 resulting in the loss of 2 to 4 megawatts of load. This situation continued through FY 2002. LEDA will continue in mothballed maintenance mode until a new sponsor is secured, hopefully as early as FY 2004.

The National High Magnetic Field Laboratory continued to sit out operations during FY 2002. The 60-Tesla superconducting magnet that failed in 2000 is in redesign and reconstruction and should be operational again by FY 2003. This represents a temporary reduction of approximately 2 megawatts load in FY 2002.

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 scheduled to become operational in late FY 2004.

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 (EISU) 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 decommissioning and demolition. 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 February 2004, four EISU projects have been completed (TA-3-43, TA-16-200, TA-40-1, TA-3-40), five projects are in construction (TA-3-40 S&W, TA-3-261, TA-43-1, TA-46-31, TA-8-21), and three projects are scheduled for design (TA-46-1, TA-53-2, TA-48-1) in FY 2004.

Project History

Initially, the EISU Project was a DOE FY 2000 line item project whose primary objective was to improve the electrical power distribution systems at selected facilities at LANL. The facilities listed were selected due to their impact on mission requirements and their relative ranking based on safety, age, difficulty of maintenance, and other criteria. The proposed facilities support the Stockpile Stewardship Program or are landlord responsibilities that are funded through the NNSA, formerly the Office of Research and Development within DOE Defense Programs. Beginning in FY 1999, a subset of selected facilities was chosen in yearly lots for design and construction. The facilities were prioritized by LANL based on the relative scoring of Risk Assessment Code assigned to each building as described in Part I Section F of the approved Conceptual Design Report dated January 7, 1998, and amended April 5, 1998.

LANL notified DOE in August 1998 that the EISU Project would be removed as a line item project and would be accomplished as a series of stand alone General Plant Projects. The Conceptual Design Report would be used as a basis for development of the General Plant Projects and the project management approach and processes would be continued to properly address these safety needs. Beginning in FY 1999, the Project Team requested Readiness in Technical Base and Facilities funding and began design and construction of the highest priority General Plant Projects. In FY 2003, the project transitioned to funding from the Facilities and Infrastructure Recapitalization Program for all remaining scheduled work.

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 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. 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, prior to further investment.

LANL is in the process of installing additional water meters and 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-50-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 2003. Under the expanded alternative, water use for LANL was projected to be 759 million gallons per year. LANL consumed about 378 million gallons during CY 2003. Actual use by LANL in 2003 was about 381 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 2003 was about 155 million gallons less than the estimated CY 2003 consumption of 533 million gallons. The calculated NPDES discharge of 209.8 million gallons (see Table 3.2-2) in CY 2003 was about 56 percent of the total LANL usage of 378 million gallons.

Table 3.4.3-1. Water Consumption (thousands of gallons) for Calendar Year 2003

Category	LANL	Los Alamos County	Total
SWEIS ROD	759,000	Not Projected	Not Applicable
CY 2003	377,768	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

Working conditions at LANL have remained essentially the same as those identified in the SWEIS. DARHT and Atlas—major construction activities—were reflected in the SWEIS analysis, and several other major facilities are also under construction for which separate NEPA documentation was prepared. More than half the workforce remains routinely engaged in activities that are typical of office and computing industries. Much of the remainder of the workforce is engaged in light industrial and bench-scale research activities. Approximately one-tenth of the general workforce at LANL continues to be engaged in production, services, maintenance, and research and development within Nuclear and Moderate Hazard facilities.

3.5.1 Accidents and Injuries

Table 3.5.1-1 summarizes occupational injury and illness rates during CY 2003. Occupational injury and illness rates for workers at LANL during CY 2003 continue to be small as shown in Table 3.5.1-1. These rates correlate to 258 reportable injuries and illnesses during the year, or less than 51 percent of the 507 cases projected by the SWEIS ROD.

Table 3.5.1-1. Occupational Injury and Illness Rates at LANL

Calendar Year	UC Workers Only		LANL (all workers)	
	TRC [a]	DART [b]	TRC	DART
2003	2.11	1.08	2.30	1.26

[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

3.5.2 Ionizing Radiation and Worker Exposures

Occupational radiation exposures for workers at LANL during CY 2003 are summarized in Table 3.5.2-1. The collective Total Effective Dose Equivalent, or collective TEDE, for the LANL workforce during CY 2003 was 241 person-rem, considerably lower than the workforce dose of 704 person-rem projected for the ROD.

These reported doses in Table 3.5.2-1 for 2003 could change with time. Estimates of committed effective dose equivalent in many cases are based on several years of bioassay results, and as new results are obtained the dose estimates may be modified accordingly.

Table 3.5.2-1. Radiological Exposure to LANL Workers

Parameter	Units	SWEIS ROD	Value for 2003
Collective TEDE (external + internal)	person-rem	704	241
Number of workers with non-zero dose	number	3,548	1,989
Average non-zero dose:			
• external + internal radiation exposure	millirem	Not projected	121
• external radiation exposure only	millirem	Not projected	111

Of the 241 person-rem collective TEDE reported for CY 2003, external radiation and tritium exposure accounted for 221 person-rem. The remaining 20 person-rem are from internal exposure.

The highest individual doses in CY 2003 were 10.197, 8.097, 1.710, 1.569, and 1.214 rem. The two doses that exceeded the DOE's 5 rem/year Radiation Protection Standard resulted from an exposure to plutonium-238 at TA-55 in August 2003 (discussed below). All the other doses were below this limit, and also below the 2 rem/year performance goal set by 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 1998–2003.

Table 3.5.2-2. Highest Individual Doses from External Radiation to LANL Workers (rem) [a]

CY 1998	CY 1999	CY 2000	CY 2001 [b]	CY 2002	CY 2003
1.846	1.910	1.048	1.284	2.214	10.197 [c]
1.804	1.866	1.013	1.225	1.897	8.097 [c]
1.581	1.783	0.905	1.123	1.813	1.710
1.536	1.755	0.828	1.002	1.644	1.569
1.523	1.749	0.815	0.934	1.619	1.214

[a] Data on highest doses have only been presented in the Yearbooks since CY 2000.
[b] During CY 2001, five individual doses were greater than 1 rem but less than 2 rem. Only the highest dose was identified.
[c] Two workers were exposed to plutonium-238 while performing inventories at TA-55 in August 2003.

Comparison with the SWEIS Baseline

The collective TEDE for CY 2003 is 116 percent of the 208 person-rem of 1993–1995 used as the baseline in the ROD. Several offsetting factors are responsible in 2003 for increasing and for lowering the dose from the SWEIS baseline. Two factors that were important in raising the 2003 collective TEDE were as follows:

Exposure of two workers at TA-55

Two workers were exposed to plutonium-238 while performing inventories at TA-55 in August 2003. Subsequent bioassay measurements determined that the workers had received doses of 10.197 and 8.097 rem, almost entirely from internal radiation. The DOE conducted a Type B investigation of the incident during September and October 2003. This was a non-routine exposure, and non-routine exposures were not included in the dose estimates for baseline operations made for the SWEIS.

Decontamination of the Omega West Reactor

The Omega West Reactor was decontaminated primarily in early CY 2003. The workers performing this work received a collective TEDE of 32.4 person-rem. This was a decommissioning and demolition project, and these projects were not included in the SWEIS baseline.

The following factors were responsible for affecting and often lowering the CY 2003 dose from the SWEIS baseline:

Work and Workload

Changes in workload and types of work have been varied and have tended to both increase and decrease the collective TEDE, depending on the type of work. Of special importance is that the radionuclide power source for the Cassini spacecraft was being constructed at TA-55 during the baseline time period. This project incurred higher neutron exposure for the workers. After the project was completed in the 1995–1996 time frame, the LANL collective TEDE was reduced. At the same time other plutonium-238 programs at TA-55 remained active, and pit production increased, which would increase the collective TEDE.

ALARA Program

Improvements from the ALARA Program, such as the continuing addition of shielding at LANL workplaces, have also resulted in lower worker exposures and consequently a reduced collective TEDE for LANL.

Improved Personnel Dosimeter

An improved personnel dosimeter was introduced on a LANL-wide basis in April 1998. The dosimeter's increased accuracy in measuring the external neutron dose removed some conservatism that had been previously used in estimating the dose, which resulted in lower reported doses. (The actual dose did not change, but the ability to measure it accurately improved.)

Comparison with the Projected TEDE in the ROD

While the CY 2003 collective TEDE slightly exceeds the baseline collective TEDE levels in CYs 1993–1995, the collective TEDE for CY 2003 is less than the 704 person-rem collective TEDE projected in the ROD. The implementation of war reserve pit manufacture, which was approved in the ROD, has not become fully operational at LANL. This contributed to lower doses than projected. The collective dose may increase once the pit manufacture program is fully implemented.

Collective TEDEs for Key Facilities

In general, collective TEDEs by Key Facility or technical area 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 technical area 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. Nevertheless, the group working at TA-18 is well defined, and the 2003 collective TEDE for the Pajarito Site Key Facility is 4.14 person-rem.

Many of the groups working at TA-55 have been reorganized to include workers at other facilities. However, 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 these groups in CY 2003, plus the estimated collective TEDE for the health physics personnel and KSL personnel working at TA-55, is 142 person-rem, which is 59 percent of the total LANL collective TEDE of 241 person-rem.

3.6 Socioeconomics

The LANL-affiliated workforce continues to include UC employees and subcontractors. As shown in Table 3.6-1, the number of employees has exceeded SWEIS ROD projections. The 13,616 employees at the end of CY 2003 are 2,265 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 13,616 total employees at the end of CY 2003 reflect an increase of 92 employees over the 13,524 employees reported in the 2002 Yearbook (LANL 2003c).

Table 3.6-1. LANL-Affiliated Work Force

Category	UC 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 2003	10,200	1,189	238	1,388	601	13,616

[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 fiscal year 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's 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 LANL's 2003 economic contribution was similar to the three years analyzed for DOE.

The residential distribution of UC employees reflects the housing market dynamics of three counties. As seen in Table 3.6-2, 88 percent of the UC employees continued to reside in the three counties of Los Alamos, Rio Arriba, and Santa Fe.

Table 3.6-2. County of Residence for UC 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 2003	5,022	1,797	2,194	738	9,751	449	10,200

a Includes both Regular and Temporary employees, including students who may not be at the Laboratory 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 technical area 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 UC 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 calendar year total.

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

Key Facility	Reference Year 1999 [b]	Calendar Year 2003
Plutonium Complex	589	715
Tritium Facilities	28	19
CMR	204	198
Pajarito Site	70	41
Sigma Complex	101	106
MSL	57	52
Target Fabrication	54	49
Machine Shops	81	90
High Explosive Testing	227	251
High Explosive Processing	96	112
LANSCE	560	455
Bioscience	98	112
Radiochemistry Laboratory	128	113
Waste Management – Radioactive Liquid Waste	62	52
Waste Management – Radioactive Solid and Chemical Waste	65	56
Rest of LANL	4,601	5,576
Total Employees	7,021	7,984

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 UC 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 2002, 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 private ownership under Public Law 105-119. No lands were transferred during CY 2003.

During 2000, land resources were impacted by the Cerro Grande Fire, which burned across approximately 7,500 acres or 27 percent of LANL's land. Of the 332 structures affected by the fire, 236 were impacted, 68 damaged, and 28 destroyed (ruined beyond economic repair). Fire mitigation work, such as flood retention structures, modified fewer than 50 acres of undeveloped land.

A number of projects were completed in CY 2003 such as the Nicholas G. Metropolis Computing Center (formerly known as the Strategic Computing Complex), the Nonproliferation and International Security Center, several General Plant Projects, and the related but non-LANL Los Alamos Research Park. Most of these projects are on previously developed or disturbed land (LANL 2000a). However, the Research Park occupies about 44 acres of previously undeveloped land along West Jemez Road.

Also during CY 2000, LANL's new Comprehensive Site Plan (LANL 2000b) 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's land) over 5,500 acres have been developed, leaving about 4,000 acres as undeveloped. The majority of this undeveloped land is located in TA-58, -70, -71, and -74. Because of the remote locations and adjacent land uses of TA-70, -71, and -74, they are not considered prime developable lands for LANL activities.

CY 2003 was similar to the previous calendar years: the land acreage (Table 3.7-1) remained constant; the ongoing construction projects from CY 2002 continued; and the mitigation efforts and repairs from the Cerro Grande Fire of 2000 continued.

Table 3.7-1. Site-wide Land Use

Land Use Category	Acreage in CY 2003
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

RS (formerly called the Environmental Restoration Project) is unique from a land use standpoint. Rather than using land for development, the project cleans up legacy wastes and makes land available for future use. Through these efforts, several large tracts of land will be made available for use by LANL, Los Alamos County, or other adjacent landowners. For example, under Public Law 105-119, the DOE 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. Several tracts of land were identified for conveyance or transfer and, pending cleanup by RS, will be made available for future use.

CY 2002 marked the first land transfers under Public Law 105-119. In CY 2003, no land was transferred to private ownership. Table 3.7-2 provides a summary of the potential land parcels remaining to be transferred.

Table 3.7-2 Potential Land Transfer Tracts

Tract	Size	Location
TA-21	244 acres	Located on the eastern end of the same mesa on which the central business district of Los Alamos is located.
DP Road	50 acres	Located between the western boundary of TA-21 and the major commercial districts of the Los Alamos town site.
DOE Los Alamos Site Office	13 acres	Located within the Los Alamos town site between Los Alamos Canyon and Trinity Drive.
Airport	198 acres	Located east of the Los Alamos town site, close to the East Gate Business Park.
Rendija Canyon	909 acres	Located north of and below Los Alamos town site's Barranca Mesa residential subdivision.
White Rock Y	435 acres	A complex area that incorporates the alignments and intersections of State Routes 4 and 502 and the easternmost part of Jemez Road.

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 2002 (LANL 2003c). The conclusions of the assessment are stated below.

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 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 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 2003e). LANL used about between 50 percent and 27 percent of the total water pumped from 1999 to 2001 (LANL 2003e). 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 1 to 2 feet per year for most production wells (LANL 2003e, 1998a). When pumping stops in the production wells, the static water level returns in about 6 to 12 months. Hence, the water level trends suggest no adverse impacts on long-term water supply production from groundwater withdrawals (LANL 2003e, 1998a).

Sampling and analysis of water from water supply wells (Figure 3-1) 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 25 characterization wells installed in the regional aquifer over the past five years and each of the wells has been sampled. 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 1995a, 2001b, 2002b, 2002c). Silica is the second most abundant solute found in surface water and groundwater because of

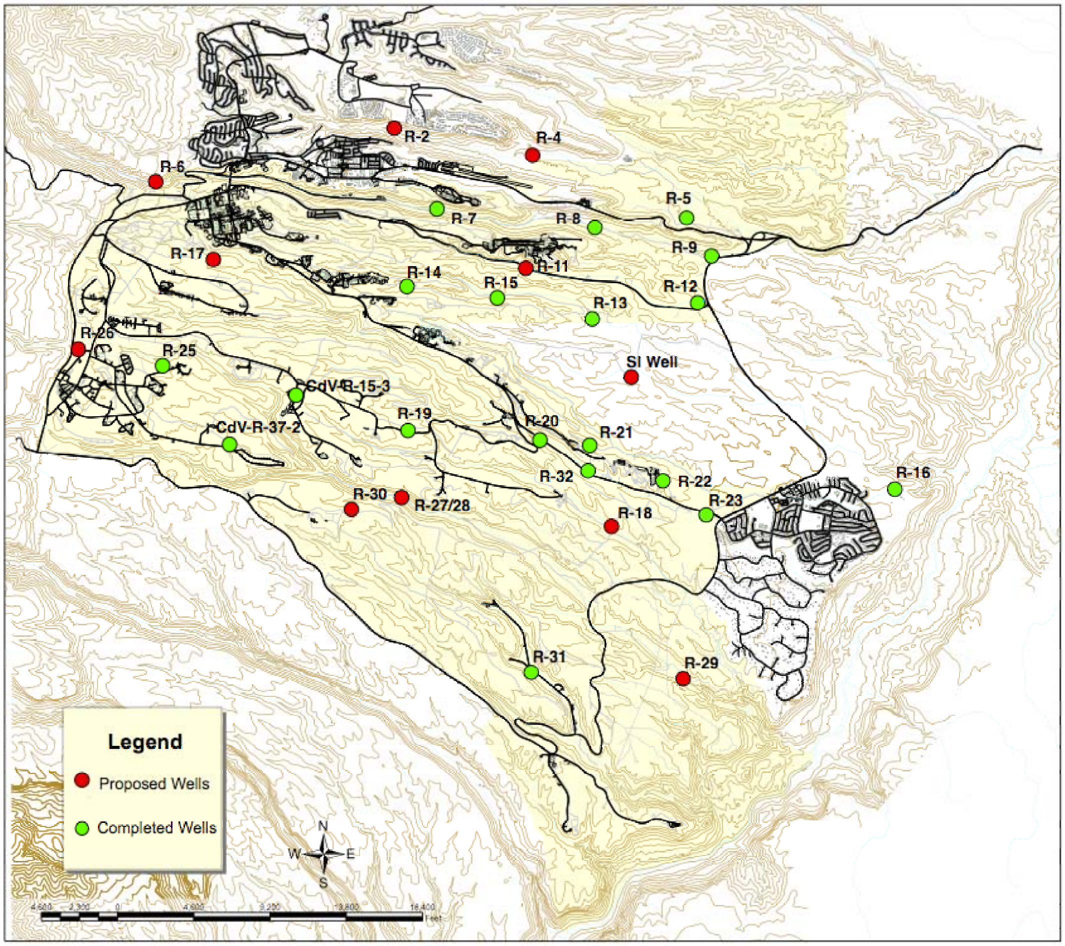

Figure 3-1. Regional aquifer wells at Los Alamos National Laboratory.

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 Road 4) or where a structure pools water (for example, in Mortandad Canyon at the sediment traps). Infiltration carries contaminants to intermediate perched groundwater 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, 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).

Work underway as part of the Hydrogeologic Characterization Program, and described in the Hydrogeologic Workplan, provided new information on the regional aquifer and details of the hydrogeologic conditions. By the end of 2003, six additional characterization wells were complete. The characterization wells were drilled using air rotary in the vadose zone and rotary with stiff foam or bentonite mud in the saturated zone. Casing advance with fluid assist methods, used in drilling previous characterization wells, was employed only when swelling clays were encountered in the boreholes. Geologic core was collected in the upper vadose zone 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 each well to enhance the understanding of the stratigraphy and rock characteristics. The six completed characterization wells include

- R-1 and R-28 in Mortandad Canyon,
- R-2 and R-4 in Pueblo Canyon,
- R-11 in Sandia Canyon, and
- R-26 in Cañon de Valle.

R-1 is located in Mortandad Canyon, near Test Well 8, at the area where the canyon widens significantly. The primary purpose of the well is to determine regional aquifer water quality downgradient of releases in Mortandad Canyon and to replace Test Well 8 as described in the Mortandad Canyon Groundwater Work Plan (LANL 2003f). Drilling started in October 2003 and was completed at a total depth of 1,165 feet in December 2003. The regional aquifer water table is at a depth of 1,003 feet in the Puye Formation. The well was constructed with a single screen at the water table. A water sample was collected from the borehole, before well installation. That water sample contained 0.39 parts per million of nitrate and perchlorate and tritium below the detection limit (LANL 2004d).

R-2 is located in upper Pueblo Canyon. The primary purpose of the well is to determine regional aquifer water quality downgradient of releases in Pueblo Canyon and Acid Canyon. Drilling started in September 2003 and was completed at a total depth of 944 feet in October 2003. The regional aquifer water table is at a depth of 893 feet in the unassigned Tertiary fanglomerates. The well was constructed with a single screen at the water table. A water sample was collected from the borehole, before well installation.

That water sample contained 0.36 parts per million of nitrate, 0.39 parts per billion perchlorate, and tritium below the detection limit (LANL 2004d).

R-4 is located in Pueblo Canyon, near the inactive emergency landing strip in TA-74. The primary purpose of the well is to determine regional aquifer water quality downgradient of releases in Pueblo Canyon. Drilling started in August 2003 and was completed at a total depth of 843 feet in September 2003. The regional aquifer water table is at a depth of 736 feet in the unassigned Tertiary fanglomerates. The well was constructed with a single screen at the water table. A water sample was collected from the borehole, before well installation. That water sample contained 1.39 parts per million of nitrate, 19.5 picoCuries per liter tritium, and perchlorate below the detection limit (LANL 2004d).

R-11 is located in Sandia Canyon, southwest of the TA-72 firing range. The primary purpose of the well is to determine regional aquifer water quality downgradient of releases in Sandia Canyon. Drilling started in August 2003 and was completed at a total depth of 926 feet in September 2003. The regional aquifer water table is at a depth of 833 feet in the lower Puye Formation. The well was constructed with a single screen at the water table. A water sample was collected from the borehole, before well installation. That water sample contained 4.9 parts per million of nitrate, 12.8 picoCuries per liter tritium, and 0.78 parts per billion of perchlorate (LANL 2004d).

R-26 is located on a mesa south of Cañon de Valle, in TA-16. It is located on the down-thrown side of the Pajarito Fault Zone. The primary purpose of the well is to determine regional aquifer water quality upgradient of Laboratory releases and function as a background monitoring point. Drilling started in September 2003 and was completed at a total depth of 1,490 feet in September 2003. The regional aquifer water table is at a depth of 604 feet in the Cerro Toledo interval of the Bandelier Tuff. The well was constructed with two screens: one screen at the water table (652 to 670 feet) and one screen in a productive zone in the Puye Formation at 1,422 to 1,445 feet. Water samples were collected from the borehole, before well installation. The screening water sample from the upper interval contained 0.37 parts per million of nitrate and perchlorate and tritium below the detection limit. The screening water sample from the lower interval also contained 0.37 parts per million of nitrate and perchlorate and tritium below the detection limit (LANL 2004d).

R-28 is located in Mortandad Canyon, near the sediment traps. The primary purpose of the well is to determine regional aquifer water quality downgradient of releases in Mortandad Canyon, as described in the Mortandad Canyon Groundwater Work Plan (LANL 2003f). Drilling started in November 2003 and was completed at a total depth of 1,005 feet in December 2003. The regional aquifer water table is at a depth of 889 feet in the Puye Formation. The well was constructed with a single screen at the water table. A water sample was collected from the borehole, before well installation. That water sample contained 7.2 parts per million of nitrate, 0.86 parts per billion perchlorate, and 114.4 picoCuries per liter tritium (LANL 2004d).

3.9 Cultural Resources

LANL has a large and diverse number of historic properties. Approximately 85 percent of DOE 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). More than 85 percent of these archeological 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 2003 [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]
LANL 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

a Source: Information on LANL provided by DOE/Los Alamos Site Office and LANL Heritage Resources/Environmental Policy Compliance Team (HREPCT) (formerly the Cultural Resources Management Team) 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 CY 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 HREPCT 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.

LANL continues to evaluate buildings and structures from the Manhattan Project and the early Cold War period (1943–1963) for eligibility to the 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[11] communities as traditional cultural properties.

[11] 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.

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. 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 DOE Los Alamos Site Office, the New Mexico State Historic Preservation Office, and the Advisory Council on Historic Preservation. Additionally, the HREPCT 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 757. 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
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	33
2002	753	301	218	83	42
2003	757	404	254	150	71

[a] Source: Information on LANL provided by DOE/Los Alamos Site Office and LANL HREPCT 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 fiscal year.

[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.

[c] This represents both eligible and non-eligible sites.

LANL has recorded 137 historic sites (correction from SWEIS Yearbook 2002 that identified 139 historic sites). All have been given unique New Mexico Laboratory of Anthropology site numbers. Some of the 137 are experimental areas and artifact scatters dating from the Manhattan Project and early Cold War periods. The majority, 124 sites, are structures or artifact scatters associated with the Historic Pueblo, US Territorial, Statehood, or Homestead periods. Of these 137 sites, 99 have been declared eligible for the NRHP. LANL's Manhattan Project and early Cold War period buildings account for the remaining 620 of the 757 historic period properties. At this time, the New Mexico State Historic Preservation Division (NM SHPD) does not assign Laboratory of

Anthropology numbers to LANL buildings. Of these historic buildings, 267 have been evaluated for eligibility and inclusion on the NRHP. One-hundred-twelve of these evaluated buildings have been declared not eligible for the NRHP; the remaining 155 are NRHP-eligible.

The HREPCT has documented 55 of the NRHP-eligible buildings in accordance with the terms of official Memorandums of Agreement between the DOE and the NM SHPD. They have subsequently been decontaminated, decommissioned, and demolished through the Decommissioning and Demolition Program. Twenty-nine of the 112 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 2003 (October 2002 through September 2003), the HREPCT evaluated 1,020 LANL proposed actions and conducted one new field survey to identify cultural resources. DOE sent 11 survey results to the SHPO for concurrence in findings of effects and determinations of eligibility for the NRHP of cultural resources located during the survey.

The American Indian Religious Freedom Act of 1978 (42 USC 1996) stipulates that it is federal policy to protect and preserve the right of American Indians to practice their traditional religions. Tribal groups must receive notification of possible alteration of traditional and sacred places. The Governors of San Ildefonso, Santa Clara, Cochiti, and Jemez Pueblos and the President of the Mescalero Apache Tribe received copies of six reports to identify any traditional cultural properties that a proposed action could affect. HREPCT identified adverse effects to nine historic buildings that are scheduled for decommissioning and decontamination in 2004. Historic building documentation and interpretation are being conducted to resolve the adverse effects.

The Native American Graves Protection and Repatriation Act of 1990 (25 USC 1996) 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. No discoveries of burials or cultural objects occurred in FY 2003 from federal undertakings. However, one inadvertent discovery, exposed by erosion, occurred in FY 2003. This burial was found during the routine monitoring/patrolling by rangers from Bandelier National Monument of LANL property open to the public (for hiking). The burial was stabilized and is being monitored in consultation with San Ildefonso Pueblo. The Archaeological Resources Protection Act of 1979 (16 USC 1996) provides protection of cultural resources and sets penalties for their damage or removal from federal land without a permit. No violations of this Act were recorded on DOE land in FY 2003.

3.9.2 Compliance Activities

Nake'muu

During FY 2003, as part of the DARHT Facility Mitigation Action Plan (LANL 1995b), the HREPCT continued a long-term monitoring program at the ancestral pueblo of Nake'muu to assess the impact of LANL mission activities on cultural resources. 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. Over the six-year monitoring program, the site has witnessed a 0.6 percent displacement rate of chinking stones and 0.2 percent displacement of masonry blocks. The annual loss rate ranges from 0.5 percent to 2.0 percent for the chinking stones and 0.05 percent to 1.3 percent for the masonry blocks. Statistical analyses indicate that these displacement rates are significantly correlated with annual snowfall, but not with annual rainfall or shots from the DARHT facility. During FY 2003 the post-Cerro Grande Fire Pueblo Site Rehabilitation Team removed all the trees that could potentially fall and damage the standing wall architecture at the site.

Traditional Cultural Properties Comprehensive Plan

During FY 2003, the HREPCT continued to assist DOE in implementing the Traditional Cultural Properties Comprehensive Plan (LANL 2000c). This included formal meetings with the Pueblo of San Ildefonso. A plan was developed with San Ildefonso Pueblo to prioritize their issues, beginning with consideration of TA-03, previously identified (1993) traditional cultural properties in Rendija Canyon, along with resources in Mortandad Canyon.

Land Conveyance and Transfer

The Programmatic Agreement Among the United States Department of Energy, the Advisory Council on Historic Preservation, the New Mexico State Historic Preservation Officer, and the Incorporated County of Los Alamos, New Mexico, Concerning the Conveyance of Certain Parcels of Land to Los Alamos County, New Mexico was signed in May 2002. Excavations at the Airport Central/South and Rendija tracts began in June 2003 and are expected to be completed in January 2004. The Airport tracts would then be available to the County of Los Alamos for development. In the 2004 archeological field season, the Rendija tract is scheduled for excavation and historic building documentation will be completed at the DOE/NNSA Los Alamos Site Office building and the classified incinerator.

Cerro Grande Fire Recovery

During 2003, the HREPCT continued to assist the CGRP in support of a contract with the Pueblos of San Ildefonso and Santa Clara to provide specific recommendations for rehabilitative treatments at approximately 118 archaeological sites most heavily impacted by the May 2000 Cerro Grande Fire, and in support of actual rehabilitation efforts by the Pueblo of San Ildefonso. A total of 107 sites were selected for treatments of various kinds for the purpose of erosion control, prevention of future fires, and the enhancement of protections for sites from future fire suppression and emergency management activities. These treatments included the removal of snags, the filling of stump holes, the thinning of live trees (primarily juniper and oak), and the scatter of the resulting slash for erosion control, the sowing of native seed, the placement of straw wattles in strategic locations, and the construction of protective fences.

3.9.3 Integrated Cultural Resources Management Plan

The Integrated Cultural Resources Management Plan will provide 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, and the American Indian Religious Freedom Act and in the context of UC/LANL's mission.

The Comprehensive Plan for Consideration of Traditional Cultural Properties and Sacred Sites at Los Alamos National Laboratory, New Mexico (LANL 2000c), issued August 2000, presents a framework for collaborating with Native American Tribal organizations and other ethnic groups in identifying traditional cultural properties and sacred sites. The Integrated Cultural Resources Management Plan will provide high-level guidance for implementation of this Comprehensive Plan.

The Integrated Cultural Resources Management Plan is due to be completed in 2004 and will be updated every five years after issuance.

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 water plans will 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. For FYs 2001 and 2002, the number of buildings for which documentation was complete was corrected from last years report. Additionally, to date, not all buildings that have been documented have been demolished.

2003 Land Transferred

Excavations at 24 cultural sites are expected to continue in the Rendija tract during 2004. No tracts were transferred in CY 2003 (see Land Resources Section 4.7).

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
Pre 1995	1	Unknown
1995	21	Unknown
1998	5	Unknown
1999	5	Unknown
2000	0	Unknown
2001	8	Unknown
2002	37	10
2003	5	28
TOTAL	82	42 [a]

[a] Although buildings were demolished in the years before 2002, the HREPCT did not monitor the dates when the building demolitions actually occurred. The total number of building demolitions through 2003 is 42.

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). Data collected for CY 2003 support this projection. These data are reported in the 2003 Environmental Surveillance Report (LANL 2004b).

Probably the greatest natural resources management issue for LANL in 2003 was the continuing recovery and response to the Cerro Grande Fire of May 2000 and the onset of severe drought conditions. The Wildfire Fuels Reduction Program has treated several thousand acres of forest and woodland. Burned area rehabilitation and monitoring efforts are ongoing. Vegetation and wildlife monitoring efforts continue to evaluate the effects of the fire and the thinning activities. The Mitigation Action Plan Annual Report for the Special Environmental Analysis for Actions Taken in Response to the Cerro Grande Fire was submitted to DOE during CY 2003 (LANL 2003g).

Drought conditions have encouraged the infestation of bark beetles. In CYs 2002–2003, tree die-off began and is presently up to about 80 percent for trees up to 5 feet tall (Balice, personal communication). Studies continue to determine what management practices will further aid in sustainable stewardship given these conditions.

3.10.1 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, and Biological LIR document (LANL 2000d) developed during 1999. The LIR program provides training to LANL personnel on the proper implementation of the Threatened and Endangered Species Habitat Management Plan.

In CY 2003, LANL continued to assess the effects of the Cerro Grande Fire on threatened and endangered species. As reported in the 2002 Yearbook (LANL 2003c), there is no evidence that the fire caused a long-term change to the overall number of federally listed threatened or endangered species inhabiting LANL land. LANL's species of greatest concern, the Mexican spotted owl, resumed normal breeding activities in CYs 2001, 2002, and 2003. Some state-listed species, including the Jemez Mountains salamander, have shown signs of displacement, habitat loss, and potentially reduced numbers (LANL 2004e).

LANL continues to operate under the original Threatened and Endangered Species Habitat Management Plan guidelines. Work is continuing on a habitat model of Mexican spotted owls at LANL. The results of this project will refine the model of Mexican spotted owl habitat requirements and will be used to modify the Threatened and Endangered Species Habitat Management Plan and to reflect post-fire habitat changes, if any.

LANL continued the Migratory Bird Monitoring Program in CY 2003. The expanded monitoring program will provide better data on the distribution and abundance of migratory species at LANL. It will also allow LANL staff to better manage these habitats and to meet obligations under the Migratory Bird Treaty Act (16 USC 703-711).

In CY 2003, bark beetle infestations killed large numbers of ponderosa pine and piñon pine throughout the Southwest, including LANL property. In some stands, over 80 percent of the pines have died in the region. At this time, the ecological consequences of this event can only be postulated, but with the enhanced monitoring capability, LANL staff will be better able to evaluate effects on sensitive species in subsequent years.

In CY 2003, LANL staff continued several contaminant studies and risk assessment studies of threatened and endangered species inhabiting LANL lands. These studies include evaluating potential impacts from the Cerro Grande Fire, assessing organic chemical contamination in the food chain for selected endangered species, and monitoring polychlorinated biphenyls and organochlorine pesticides in fish of the Rio Grande.

3.10.2 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 2003, LANL completed three biological compliance packages for projects requiring an ESA biological assessment. The compliance package includes the biological assessment, a wetlands and floodplains assessment, a migratory birds assessment, and an assessment of state-listed species of interest. Compliance packages were written in support of the CMR Facility replacement project (LANL 2003h), sanitary landfill (LANL 2003i), and power grid infrastructure upgrade project (LANL 2003j, 2003k). The US Fish and Wildlife Service concurred in determinations that all three projects may affect, but are not likely to adversely affect, the Mexican spotted owl and the bald eagle and will have no effect on other threatened or endangered species. In addition to the compliance packages, LANL produced three independent floodplains/wetlands assessments: for the installation of a multiple permeable reactive barrier in Mortandad Canyon (LANL 2003l), the improvement of fire roads (LANL 2003m), and the security perimeter project (LANL 2003n).

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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 is 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 onsite natural resources (for example, RS Project exhumed material shipped offsite). 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); or, 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 RS (formerly called the Environmental Restoration Project) and demolition of vacated buildings also affect strategic planning. To date, however, RS 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. No additional land transfers occurred during CY 2003.

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 2000), which guides LANL land development.

Though construction and modification often result in substantial loss of greenfields (previously undeveloped areas), this has not been the case for the period 1998–2003. 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. Nor do they include emergency activities performed during the Cerro Grande Fire, such as cutting firebreaks. Although the CGRP thinned trees over a large portion of LANL, both greenfield and brownfield areas, the basic character (greenfield or brownfield) was not altered by these actions.

LANL's major projects between 1998 and 2003 have affected or will affect (in some cases, actual construction has not begun) about 247 acres. About 117 acres of greenfield (about 30 acres attributable to the Research Park) have been developed or proposed for development; the remaining 120 acres consist of brownfield areas. Most of the greenfield development consists of installation of monitoring wells and new utilities and creation of short access roads. The only construction project during 2003 that could be described as affecting a greenfield area would be the expanded parking lot to the west of the Wellness Center in TA-03. The affected area consists of about 1 to 2 acres. The construction of a new FWO Facility at TA-63 is a General Plant Project in an area that had some ground cover, but which had been previously disturbed. CGRP projects, such as the flood retention structure in Pajarito Canyon, also contributed significantly to the total.

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. 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.

A major new project that commenced in CY 2003 is the Nuclear Security Sciences Building (formerly the Administration Building Replacement project)—which included the removal of the former badge office building. This project will include the removal of a TA-03 parking area, construction of a new parking structure, and the addition of a new office building to accommodate DOE Los Alamos Site Office in TA-03 as well.

Other projects started in CY 2003 include a new MST office building near the Sigma Mesa Building in TA-03, the TA-22 Hydro-test Design Facility, the FWO Office

Building at TA-63, the new parking structure at TA-03, TA-16 intersection improvements, and the new guard facilities on the east and west ends of Pajarito Road.

4.2 Waste Quantities

Wastes have been generated at levels below quantities projected by the SWEIS ROD with the exception of RS Project chemical wastes. For three of the last six years (1999–2001), RS Project wastes (Table 4.2-1) have been generated at levels at least seven times the SWEIS projection. RS Project wastes are typically shipped offsite for disposal at EPA-certified waste treatment, storage, and disposal facilities and do not impact local environs. 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.

Table 4.2-1. LANL Sanitary Waste Generation in 2003 (metric tons)

	Routine	Nonroutine	Total
Recycled	2,240	5,860	8,100
Landfill disposal	1,481	699	2,180
Total	3,721	6,559	10,280

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

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 have not been representative of LANL's sanitary waste disposal over the long term.

LANL has instituted an aggressive waste minimization and recycling program that has reduced the amount of waste disposed in sanitary landfills. Recycling initiatives include cardboard and paper recycling, a pilot concrete crushing operation, construction debris sorting, uncontaminated soil fill reuse, brush mulching, and metal and plastic recycling (LANL 2003). The recycle of total (routine + nonroutine) sanitary waste currently stands at 79 percent. LANL has already exceeded the DOE's recycle goal for 2005.

Routine sanitary waste consists mostly of food and food-contaminated waste, paper, plastic, wood, glass, styrofoam packing material, old equipment, and similar items. 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 111 kilograms per person per year in 2003, equivalent to a 58 percent decrease in routine waste generation (LANL 2003).

Nonroutine sanitary waste is typically derived from construction and demolition projects. The CGRP also generated large quantities of nonroutine waste as a result of various cleanup activities. In general, construction and demolition waste is the largest single component of the sanitary waste stream and constitutes virtually all of the current nonroutine sanitary waste generation. 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. In FY 2003, approximately 89 percent of the uncontaminated construction and demolition waste was recycled (LANL 2003). The portion of construction debris that is recycled is expected to remain the same or to increase in the future.

LANL performance goals for sanitary waste reduction are based on waste generation in 1993. LANL's total waste generation can be classified as routine and non-routine. The waste can also be categorized as recyclable and non-recyclable. Table 4.2-1 shows LANL sanitary waste generation for FY 2003. Compared to 1993, LANL has increased the recycled portion of sanitary waste from about 10 percent in 1993 to about 34 percent in FY 1999 to about 70 percent in FY 2002, and to about 79 percent for 2003.

The SWEIS projected that the Los Alamos County Landfill would not reach capacity until about 2014. In 2002, NMED issued a 35-year permit for operation of the current landfill—five years of additional disposal of waste and 30 years of post-closure operation. Therefore, the existing landfill will no longer accept waste after 2007. Currently NNSA is preparing an environmental assessment of the effects of locating a new landfill within LANL boundaries. Other waste disposal alternatives may also be evaluated.

Chemical Waste

Waste projections for the RS Project 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 Environmental Restoration Project 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 RS Project. In 1996–1997, it was assumed that the life of the Environmental Restoration Project 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 RS Project caused by changing requirements and refined waste calculations as additional data were gathered.

One task of the RS Project 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 RS Project 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: RS Project cleanup activities during 1999, 2000, and 2001 and the Legacy Materials Cleanup Project during 1998. The variability in RS Project 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 RS Project cleanups of PRSs within the Non-Key Facilities. When comparing the subtotal of Key and Non-Key Facilities, only the Legacy Program in 1998 pushes the quantities over SWEIS ROD projections. Regardless, these wastes (both RS and Legacy Program) were and are shipped offsite, 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 are mostly due to new construction and some expanded operations.

Low Level Waste

LANL generation of LLW is generally below that projected in the SWEIS ROD (Table 4.2-3). Although data from 2003 show that SWEIS projections were exceeded at the Non-Key Facilities, total waste volumes remain within SWEIS projections.

Table 4.2-2. Chemical Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003
Key Facilities	10^3 kg/yr	600	120	49	1,121	513	267	64
Non-Key Facilities	10^3 kg/yr	650	1,506 [a]	765	368	1,255 [b]	334	594
RS Project	10^3 kg/yr	2,000	144	14,630 [c]	26,185 [d]	25,816 [e]	1,133	31
LANL	10^3 kg/yr	3,250	1,771	15,441	27,674	27,583	1,734	689

[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, 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 Environmental Restoration Project accounted for the large waste volumes, almost 95 percent of the total. Most of the 14.5 million kilograms of chemical waste generated by this project 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 Environmental Restoration Project 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 Environmental Restoration Project generated waste in 2001.

Table 4.2-3. LLW Generators and Quantities

Waste Generator	Units	SWEIS ROD Projection	1998	1999	2000	2001	2002	2003
Key Facilities	m^3/yr	7,450	1,045	1,017	1,172	2,776	1,202	1,843
Non-Key Facilities	m^3/yr	520	36	286	578 [a]	601 [a]	624 [a]	1,964 [a]
RS Project	m^3/yr	4,260	726	407	2,467	562	5,484	1,819
LANL	m^3/yr	12,230	1,807	1,710	4,217	3,939	7,310	5,625

[a] LLW generation at the Non-Key Facilities slightly exceeds the SWEIS ROD due to heightened activities and new construction.

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 2001, 2002, and 2003. 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
Key Facilities	m^3/yr	54	8	17	11	20	11	16.55
Non-Key Facilities	m^3/yr	30	55 [a]	3	10	9	9	19.55
ER Project	m^3/yr	548	9	1	577 [b]	29	0	0
LANL	m^3/yr	632	72	21	598	58	20	36.10

[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 Program 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
Key Facilities	m^3/yr	322	108	143	122	83	82	312.91
Non-Key Facilities	m^3/yr	0	0	0	3	25	37 [a]	90.46 [a]
ER Project	m^3/yr	11	0	0	0	0	0	0
LANL	m^3/yr	333	108	143	125	108	119	403.37

[a] TRU waste generated at the Non-Key Facilities during CYs 2002 and 2003 was the result of the OSR Program. Because this waste comes from 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
Key Facilities	m^3/yr	115	34	72	89	35	87	151.04 [a]
Non-Key Facilities	m^3/yr	0	0	0	0	0	0	5.91 [b]
ER Project	m^3/yr	0	0	0	0	0	0	0
LANL	m^3/yr	115	34	72	89	35	87	156.95

[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 Program. Because this waste comes from 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. The following tables demonstrate 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 1991–2003.

Table 4.3-1. Electric Peak Coincident Demand/Fiscal Years 1991–2003

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	28,846	62,653	13,661	76,314
FY 1998	39,064	24,773	63,837	13,268	77,105
FY 1999	43,976	43,976	68,486	14,399	82,885
FY 2000	45,104	45,104	65,447	15,176	80,623
FY 2001	50,146	50,146	70,878	14,583	85,461
FY 2002	45,809	20,938	66,747	16,653	83,400
FY 2003	50,008	20,859	70,687	16,910	87,597

[a] All figures in kilowatts.

Table 4.3-2. Electric Consumption/Fiscal Years 1991–2003

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	397,715	96,271	493,986
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

[a] All figures in megawatt-hours

Table 4.3-3 shows water consumption in thousands of gallons for CYs 1992 through 2003.

Table 4.3-3. Water Consumption (thousands of gallons) for Calendar Years 1992–2003

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]

Table 4.3-3. (cont.)

Category	LANL	Los Alamos County	Total
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]

[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 2003.

Table 4.3-4. Gas Consumption (decatherms [a]) at LANL/Fiscal Years 1991–2003

Fiscal Year	SWEIS ROD	Total LANL Consumption	Total Used for Electric Production	Total Used for Heat Production	Total Steam Production
1991	1,840,000	1,480,789	64,891	1,415,898	803,168
1992	1,840,000	1,833,318	447,427	1,385,891	744,300
1993	1,840,000	1,843,936	411,822	1,432,113	1,192,803
1994	1,840,000	1,682,180	242,792	1,439,388	1,094,812
1995	1,840,000	1,520,358	111,908	1,408,450	967,587
1996	1,840,000	1,358,505	11,405	1,347,100	701,792
1997	1,840,000	1,444,385	96,091	1,348,294	464,066
1998	1,840,000	1,362,070	128,480	1,233,590	415,242
1999	1,840,000	1,428,568	241,490	1,187,078	606,016
2000	1,840,000	1,427,914	352,126	1,075,788	662,598
2001	1,840,000	1,492,635	273,312	1,219,323	560,958
2002	1,840,000	1,325,639	212,976	1,112,663	504,213
2003	1,840,000	1,220,137	41,632	1,178,505	378,052

[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 1996–2003

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

[a] klb: Thousands of pounds

[b] TA-03 steam production has two components: that used for electric production (29,373 klb in FY 2003) and that used for heat (322,532 klb in FY 2003).

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.

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5.0 Ten-Year Comprehensive Site Plan

In previous Yearbooks, the TYCSP has presented a summary of what LANL is projecting for the future relative to land usage; structure maintenance, construction, and decommissioning, and demolition; and infrastructure maintenance and improvement. However, the TYCSP is not included in this edition of the Yearbook because it contains Official Use Only information that cannot be released to the public. Since the Yearbooks have always been approved for public release with an unlimited distribution, the TYCSP overview of DOE/NNSA's long-range planning process at LANL will not be included in the 2003 Yearbook.

6.0 Summary and Conclusions

6.1 Summary

The 2003 SWEIS Yearbook reviews CY 2003 operations for the 15 Key Facilities (as defined by the SWEIS) 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 compares this 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 modifications at CMR for safety testing of pits in the Wing 9 hot cells, 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 2003, planned construction and/or modifications continued at 12 of the 15 Key Facilities. These activities were both modifications within existing structures and new or replacement facilities. New structures completed and occupied during 2003 included the Manufacturing Technical Support Facility (also known as the NMT FY 01 Office Building) at TA-55, the Weapon Engineering Office Building at TA-16, a Carpenter Shop at TA-15, the X-Ray Calibration Facility at TA-15, a Warehouse at TA-15, the High Explosives Prep Facility at TA-36, and the DARHT Vessel Prep Building at TA-15. Additionally, 13 major construction projects were either completed or continued for the Non-Key Facilities. These projects were as follows:

- Construction was completed on the Nonproliferation and International Security Center; the building was occupied in July 2003.
- Atlas was reassembled at the NTS during 2003.
- The EOC was occupied in September 2003 and became fully operational in December 2003.
- Construction of the S-3 Security Systems Support Facility was completed in August 2003; the building was occupied in September 2003.
- Construction of the D Division Office Building was completed in June 2003; the building was occupied in September 2003.
- Construction of the new Medical Facility continued in 2003.

- The Multi-Channel Communications Project was fully operational by October 2003.
- Construction of the National Security Sciences Building began in August 2003.
- Construction of the TA-72 LFSH was completed in January 2003; the building became fully operational in March 2003.
- Construction of the new FWO Office Building began in 2003.
- Construction of the TA-03 Parking Structure began in July 2003.
- Demolition of the Omega West Reactor Facility was completed in September 2003.
- Construction Notice to Proceed was issued for the Pajarito Road Access Control Stations in October 2003.

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. The Cryogenic Separation Capability at the Tritium Key Facilities was lost. Also, following the events of September 11, 2001, the Laboratory was requested to provide support for homeland security.

During CY 2003, 88 capabilities were active. The eight inactive capabilities were Manufacturing Plutonium Components at the Plutonium Complex; both the Cryogenic Separation and the Diffusion and Membrane Purification capabilities at the Tritium Facilities; both the Destructive and Nondestructive Assay and the Fabrication and Metallography capabilities at CMR; both the Accelerator Transmutation of Wastes and the Medical Isotope Production capabilities at LANSCE; and Other Waste Processing at the Solid Radioactive and Chemical Waste Facilities.

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 2,741 hours in 2001, at an average current of 55 microamps, compared to 6,400 hours at 200 microamps projected by the ROD. Similarly, a total of 140 criticality experiments were conducted at Pajarito Site, compared to the 1,050 projected experiments.

As in 1998 through 2000, only three of LANL's facilities operated during 2001 at levels approximating those projected by the ROD—the MSL, the Biosciences Facilities (formerly Health Research Laboratory), and the Non-Key Facilities. The two Key Facilities (MSL and Biosciences) are more akin to the Non-Key Facilities and represent the dynamic nature of research and development at LANL. More importantly, none of these facilities are major contributors to the parameters that lead to significant potential environmental impacts. The remaining 13 Key Facilities all conducted operations at or below projected activity levels.

Operations Data and Environmental Parameters. This 2001 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 owner of a large tract of land.

Radioactive airborne emissions from point sources (i.e., stacks) during 2003 totaled approximately 2,060 curies, just under 10 percent of the 10-year average of 21,700 curies projected by the SWEIS ROD. The final dose is 0.65 millirem per year (compared to 5.44 projected), well under the EPA emissions limit of 10 millirem per year for DOE facilities. The final dose for 2003 was reported to the EPA by June 30, 2003. Calculated NPDES discharges totaled 209.8 million gallons per year compared to a projected volume of 278 million gallons per year. However, the apparent decrease in flows 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. Quantities of solid radioactive and chemical wastes generated in 2003 ranged from approximately 5.7 percent of the mixed LLW waste projection to 137 percent of the mixed TRU waste projection. The larger than projected quantity of mixed TRU waste was the result of the DVRS repackaging of legacy TRU waste for shipment to WIPP. Both the mixed TRU waste and TRU waste quantities exceeded the SWEIS ROD projections during 2003 due to the DVRS repackaging activity.

The workforce has been above ROD projections since 1997. The 13,616 employees at the end of CY 2003 represent 2,265 more employees than projected and the highest number of employees over the period. Since 1998, the peak electricity consumption was 394 gigawatt-hours during 2002 and the 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 2003, the highest collective TEDE for the LANL workforce was 241 person-rem during 2003, which is considerably lower than the workforce dose of 704 person-rem projected by the 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 2003, this expansion had not become necessary. However, construction continued on 44 acres of land that are being developed along West Jemez Road for the Los Alamos Research Park. This project has its own NEPA documentation (an environmental assessment), and the land is being leased to Los Alamos County for this privately owned development.

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.) However, excavations did occur at the Airport East and

White Rock tracts beginning in June 2002 and ending in March 2003. These two land tracts are now available to the County of Los Alamos for development.

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 1995–2003 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977. In addition, ecological resources are being sustained as a result of protection afforded by DOE ownership of LANL. These resources include biological resources such as protected sensitive species, ecological processes, and biodiversity. The recovery and response to the Cerro Grande Fire of May 2000 included a wildfire fuels reduction program, burned area rehabilitation and monitoring efforts, and enhanced vegetation and wildlife monitoring.

6.2 Conclusions

In conclusion, LANL operations data mostly fell within projections. Operations data that exceeded projections, such as number of employees or chemical waste from cleanup, either produced a positive impact on the economy of northern New Mexico or resulted in no local impact because these wastes were shipped offsite for disposal. Overall, the 2003 operations data indicate that LANL was operating within the SWEIS envelope and still ramping up operations towards the preferred Expanded Alternative in the ROD.

One purpose of the 2003 Yearbook is to compare LANL operations and resultant 2003 data to the SWEIS ROD to determine if LANL were still operating within the environmental envelope established by the SWEIS and the ROD. Data for 2003 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 envelope.

6.3 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 2004 Yearbook will follow that developed for the previous Yearbooks—comparison to the SWEIS ROD.

The 2003 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

Table A-1. Chemical and Metallurgy Research Building Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
CMR Building	Acetic Acid	64-19-7	kg/yr	0.45	1.29
	Acetone	67-64-1	kg/yr	1.38	3.95
	Acetylene	74-86-2	kg/yr	0.00	22.35
	Ammonium Chloride (Fume)	12125-02-9	kg/yr	0.53	1.50
	Arsenic, el.&inorg.,exc. Arsine, as As	7440-38-2	kg/yr	0.20	0.56
	Bromine	7726-95-6	kg/yr	1.09	3.12
	Ethanol	64-17-5	kg/yr	0.14	0.39
	Formic Acid	64-18-6	kg/yr	0.64	1.83
	Hydrogen Bromide	10035-10-6	kg/yr	2.36	6.75
	Hydrogen Chloride	7647-01-0	kg/yr	18.11	51.75
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.17	0.49
	Hydrogen Peroxide	7722-84-1	kg/yr	0.25	0.70
	Iron Oxide Fume, as Fe	1309-37-1	kg/yr	2.45	7.00
	Mercury numerous forms	7439-97-6	kg/yr	0.01	1.36
	Molybdenum	7439-98-7	kg/yr	0.36	1.02
	N,n-Dimethylformamide	68-12-2	kg/yr	0.33	0.95
	Nitric Acid	7697-37-2	kg/yr	57.38	163.94
	Propane	74-98-6	kg/yr	0.00	0.40
	Sulfuric Acid	7664-93-9	kg/yr	13.20	37.72
	Tellurium & Compounds, as Te	13494-80-9	kg/yr	0.22	0.63
	Tungsten as W insoluble compounds	7440-33-7	kg/yr	0.01	0.70

Table A-2. Bioscience Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
HRL	Acetic Acid	64-19-7	kg/yr	12.66	36.18
	Acetone	67-64-1	kg/yr	0.28	0.81
	Acetonitrile	75-05-8	kg/yr	10.59	30.25
	Acrylamide	79-06-1	kg/yr	2.84	8.11
	Ammonium Chloride (Fume)	12125-02-9	kg/yr	0.18	0.50
	Chloroform	67-66-3	kg/yr	2.08	5.93
	Ethanol	64-17-5	kg/yr	54.38	155.37
	2-Ethoxyethanol (EGEE)	110-80-5	kg/yr	1.30	3.72
	Formamide	75-12-7	kg/yr	0.56	1.59
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	0.46	1.32
	Hydrogen Chloride	7647-01-0	kg/yr	3.53	10.09
	Hydrogen Peroxide	7722-84-1	kg/yr	1.48	4.22
	Isopropyl Alcohol	67-63-0	kg/yr	9.62	27.49
	Methyl Alcohol	67-56-1	kg/yr	31.86	91.03
	n-Butyl Alcohol	71-36-3	kg/yr	0.28	0.81
	Nitric Acid	7697-37-2	kg/yr	6.28	17.93
	Phenol	108-95-2	kg/yr	0.33	0.95
	Potassium Hydroxide	1310-58-3	kg/yr	0.26	0.75
	Propylene Oxide	75-56-9	kg/yr	0.32	0.90
	Styrene	100-42-5	kg/yr	0.18	0.50
	Sulfuric Acid	7664-93-9	kg/yr	0.64	1.84
	Tetrahydrofuran	109-99-9	kg/yr	0.62	1.78
	Trichloroacetic Acid	76-03-9	kg/yr	0.09	0.25
	Xylene (o-,m-,p-Isomers)	1330-20-7	kg/yr	0.15	0.43

Table A-3. High Explosive Processing Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
High Explosive Processing	Acetic Anhydride	108-24-7	kg/yr	0.19	0.54
	Acetone	67-64-1	kg/yr	71.61	204.59
	Acetonitrile	75-05-8	kg/yr	9.90	28.29
	Acetylene	74-86-2	kg/yr	0.00	7.89
	Bromine	7726-95-6	kg/yr	0.27	0.78
	Chloroform	67-66-3	kg/yr	8.31	23.73
	Ethanol	64-17-5	kg/yr	32.89	93.96
	Ethylene Dichloride	107-06-2	kg/yr	10.38	29.65
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	1.85	5.28
	Hydrogen Chloride	7647-01-0	kg/yr	15.37	43.92
	Hydrogen Peroxide	7722-84-1	kg/yr	1.97	5.63
	Iron Oxide Fume, as Fe	1309-37-1	kg/yr	1.27	3.63
	Isophorone Diisocyanate	4098-71-9	kg/yr	0.09	0.25
	Isopropyl Alcohol	67-63-0	kg/yr	6.60	18.85
	Mercury numerous forms	7439-97-6	kg/yr	0.03	3.22
	Methyl Alcohol	67-56-1	kg/yr	20.50	58.56
	Methyl Ethyl Ketone (MEK)	78-93-3	kg/yr	31.01	88.60
	Methyl Isobutyl Ketone	108-10-1	kg/yr	1.12	3.19
	Methylene Chloride	75-09-2	kg/yr	19.04	54.39
	Nitric Acid	7697-37-2	kg/yr	4.01	11.45
	Potassium Hydroxide	1310-58-3	kg/yr	3.50	10.00
	Propane	74-98-6	kg/yr	0.00	0.60
	Pyridine	110-86-1	kg/yr	0.33	0.93
	Sulfuric Acid	7664-93-9	kg/yr	25.51	72.87
	tert-Butyl Alcohol	75-65-0	kg/yr	0.28	0.79
	Tetrahydrofuran	109-99-9	kg/yr	6.85	19.56
	Toluene	108-88-3	kg/yr	7.28	20.81
	1,1,2-Trichloroethane	79-00-5	kg/yr	0.35	1.00

Table A-4. High Explosive Testing Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
High Explosive Testing	Acetone	67-64-1	kg/yr	6.59	18.84
	Acetylene	74-86-2	kg/yr	0.00	12.82
	Ethanol	64-17-5	kg/yr	10.22	29.20
	Isopropyl Alcohol	67-63-0	kg/yr	0.95	2.71
	Kerosene	8008-20-6	kg/yr	2.12	6.06
	Nitromethane	75-52-5	kg/yr	0.80	2.27
	Propane	74-98-6	kg/yr	0.00	228.39
	Sulfur Hexafluoride	2551-62-4	kg/yr	14.21	40.60

Table A-5. LANSCE Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
LANSCE	Acetic Acid	64-19-7	kg/yr	1.84	5.25
	Acetone	67-64-1	kg/yr	25.23	72.10
	Acetonitrile	75-05-8	kg/yr	0.27	0.79
	Acetylene	74-86-2	kg/yr	0.00	30.24
	Ammonia	7664-41-7	kg/yr	0.24	0.68
	Boron Oxide	1303-86-2	kg/yr	0.35	1.00
	Carbon Disulfide	75-15-0	kg/yr	0.44	1.26
	Chlorodifluoromethane	75-45-6	kg/yr	0.60	1.72
	Chloroform	67-66-3	kg/yr	1.04	2.97
	Cumene	98-82-8	kg/yr	1.14	3.26
	Ethanol	64-17-5	kg/yr	13.51	38.61
	2-Ethoxyethanol (EGEE)	110-80-5	kg/yr	2.60	7.44
	Ethyl Ether	60-29-7	kg/yr	0.74	2.10
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	1.39	3.96
	Hydrogen Chloride	7647-01-0	kg/yr	5.19	14.84
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	2.23	6.38
	Hydrogen Peroxide	7722-84-1	kg/yr	0.49	1.41
	Isopropyl Alcohol	67-63-0	kg/yr	7.68	21.94
	Lead, el.&inorg.compounds, as Pb	7439-92-1	kg/yr	0.01	0.58
	Methyl Alcohol	67-56-1	kg/yr	1.61	4.59
	Methyl Chloride	74-87-3	kg/yr	0.18	0.50
	Methylene Chloride	75-09-2	kg/yr	0.93	2.65
	n-Butyl Alcohol	71-36-3	kg/yr	0.14	0.40
	Nitric Acid	7697-37-2	kg/yr	17.63	50.36
	Nitroethane	79-24-3	kg/yr	0.39	1.12
	Pentane (all isomers)	109-66-0	kg/yr	1.64	4.70
	Phosphoric Acid	7664-38-2	kg/yr	14.76	42.18
	Propane	74-98-6	kg/yr	0.00	245.15
	Propyl Alcohol	71-23-8	kg/yr	0.28	0.81
	p-Toluidine	106-49-0	kg/yr	0.09	0.25
	Pyridine	110-86-1	kg/yr	0.33	0.93
	Silver (metal dust & soluble comp., as Ag)	7440-22-4	kg/yr	0.32	0.91
	Styrene	100-42-5	kg/yr	0.32	0.91
	Tetrahydrofuran	109-99-9	kg/yr	1.24	3.56
	Thionyl Chloride	7719-09-7	kg/yr	0.35	1.00
	Toluene	108-88-3	kg/yr	0.76	2.17
	1,1,2-Trichloroethane	79-00-5	kg/yr	2.52	7.21
	Trichloroethylene	79-01-6	kg/yr	2.05	5.86
	Triethylamine	121-44-8	kg/yr	0.51	1.46
	VM & P Naphtha	8032-32-4	kg/yr	0.66	1.88
	Zinc Chloride Fume	7646-85-7	kg/yr	0.18	0.50

Table A-6. Machine Shops Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
Machine Shops	Ethanol	64-17-5	kg/yr	4.18	11.95
	Kerosene	8008-20-6	kg/yr	1.05	3.00
	Propane	74-98-6	kg/yr	0.00	122.34

Table A-7. Materials Science Laboratory Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
MSL	Acetone	67-64-1	kg/yr	13.24	37.83
	Acetonitrile	75-05-8	kg/yr	0.71	2.04
	Ethanol	64-17-5	kg/yr	4.42	12.63
	2-Ethoxyethanol (EGEE)	110-80-5	kg/yr	1.30	3.72
	Ethyl Acetate	141-78-6	kg/yr	0.32	0.90
	Ethyl Ether	60-29-7	kg/yr	1.23	3.50
	Ethylene Diamine	107-15-3	kg/yr	2.52	7.20
	Hydrogen Chloride	7647-01-0	kg/yr	1.66	4.75
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.17	0.49
	Hydrogen Peroxide	7722-84-1	kg/yr	0.25	0.70
	Isopropyl Alcohol	67-63-0	kg/yr	0.27	0.79
	Manganese Dust & Compounds or Fume	7439-96-5	kg/yr	0.09	0.25
	Methyl Alcohol	67-56-1	kg/yr	7.76	22.16
	n,n-Dimethylformamide	68-12-2	kg/yr	1.53	4.36
	Nitric Acid	7697-37-2	kg/yr	2.14	6.10
	Pentane (all isomers)	109-66-0	kg/yr	0.13	0.38
	Silver (metal dust & soluble comp., as Ag)	7440-22-4	kg/yr	1.09	3.11
	Toluene	108-88-3	kg/yr	0.30	0.87

Table A-8. Pajarito Site Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
Pajarito Site	Propane	74-98-6	kg/yr	0.00	146.23

Table A-9. Plutonium Facility Complex Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
Plutonium Facility Complex	Acetic Acid	64-19-7	kg/yr	0.70	2.00
	Acetone	67-64-1	kg/yr	0.55	1.58
	Acetylene	74-86-2	kg/yr	0.00	0.66
	Ammonia	7664-41-7	kg/yr	0.09	0.24
	Ammonium Chloride (Fume)	12125-02-9	kg/yr	0.25	0.71
	Cadmium, el. & compounds, as Cd	7440-43-9	kg/yr	0.30	0.86
	Copper	7440-50-8	kg/yr	0.01	0.50
	Ethanol	64-17-5	kg/yr	12.29	35.12
	Formic Acid	64-18-6	kg/yr	0.21	0.61
	Hydrogen Chloride	7647-01-0	kg/yr	312.84	893.82
	Hydrogen Peroxide	7722-84-1	kg/yr	7.88	22.51
	Manganese Dust & Compounds or Fume	7439-96-5	kg/yr	0.09	0.25
	n,n-Dimethylformamide	68-12-2	kg/yr	1.99	5.69
	Nitric Acid	7697-37-2	kg/yr	26.97	77.06
	Oxalic Acid	144-62-7	kg/yr	45.50	130.00
	Phosphoric Acid	7664-38-2	kg/yr	5.14	14.67
	Potassium Hydroxide	1310-58-3	kg/yr	122.85	351.01
	Sulfuric Acid	7664-93-9	kg/yr	0.32	0.92
	Zirconium Compounds, as Zr	7440-67-7	kg/yr	0.01	0.65

Table A-10. Radiochemistry Site Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
Radiochemistry Site	Acetic Acid	64-19-7	kg/yr	2.56	7.32
	Acetone	67-64-1	kg/yr	88.55	253.00
	Acetonitrile	75-05-8	kg/yr	4.07	11.64
	Benzene	71-43-2	kg/yr	2.24	6.39
	Carbon Tetrachloride	56-23-5	kg/yr	1.12	3.19
	Chloroform	67-66-3	kg/yr	4.78	13.65
	Chromium, Metal &Cr III Compounds, as Cr	7440-47-3	kg/yr	1.26	3.60
	Cyclohexane	110-82-7	kg/yr	0.55	1.56
	Dicyclopentadiene	77-73-6	kg/yr	0.11	0.30
	Ethanol	64-17-5	kg/yr	15.10	43.15
	2-Ethoxyethanol (EGEE)	110-80-5	kg/yr	2.21	6.31
	Ethyl Acetate	141-78-6	kg/yr	11.19	31.96
	Ethyl Ether	60-29-7	kg/yr	11.53	32.95
	Furfural	98-01-1	kg/yr	0.10	0.29
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	16.20	46.29
	Hydrogen Bromide	10035-10-6	kg/yr	4.83	13.80
	Hydrogen Chloride	7647-01-0	kg/yr	151.10	431.72
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	3.89	11.11
	Hydrogen Peroxide	7722-84-1	kg/yr	13.84	39.53
	Hydrogen Sulfide	7783-06-4	kg/yr	0.08	0.23
	Hydroquinone	123-31-9	kg/yr	0.18	0.50
	Isopropyl Alcohol	67-63-0	kg/yr	18.70	53.41
	Isopropyl Ether	108-20-3	kg/yr	0.25	0.72
	Kerosene	8008-20-6	kg/yr	0.28	0.80
	Lead, el.&inorg.compounds, as Pb	7439-92-1	kg/yr	0.03	2.83
	Manganese Dust & Compounds or Fume	7439-96-5	kg/yr	0.09	0.25
	Methyl Alcohol	67-56-1	kg/yr	1.66	4.75
	Methyl Chloride	74-87-3	kg/yr	0.64	1.83
	Methyl Iodide	74-88-4	kg/yr	0.35	1.00
	Methylene Chloride	75-09-2	kg/yr	19.54	55.82
	n,n-Dimethylformamide	68-12-2	kg/yr	0.18	0.52
	Nitric Acid	7697-37-2	kg/yr	561.86	1605.32
	Nitrobenzene	98-95-3	kg/yr	0.21	0.60
	o-Dichlorobenzene	95-50-1	kg/yr	1.14	3.26
	Oxalic Acid	144-62-7	kg/yr	0.18	0.50
	Pentane (all isomers)	109-66-0	kg/yr	0.90	2.57
	Phenylphosphine	638-21-1	kg/yr	0.18	0.50
	Phosphoric Acid	7664-38-2	kg/yr	0.16	0.46
	Phosphorus	7723-14-0	kg/yr	0.08	0.23
	Potassium Hydroxide	1310-58-3	kg/yr	1.93	5.50
	Propane	74-98-6	kg/yr	0.00	1389.20
	Pyridine	110-86-1	kg/yr	0.47	1.35
	Silver (metal dust & soluble comp., as Ag)	7440-22-4	kg/yr	0.37	1.05
	Sulfuric Acid	7664-93-9	kg/yr	13.75	39.29
	Tetrahydrofuran	109-99-9	kg/yr	9.68	27.66
	Toluene	108-88-3	kg/yr	6.07	17.34
	Tributyl Phosphate	126-73-8	kg/yr	0.17	0.49
	Trichloroacetic Acid	76-03-9	kg/yr	0.18	0.50
	1,1,1-Trichloroethane	71-55-6	kg/yr	1.87	5.36
	1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	kg/yr	1.09	3.13
	Triethylamine	121-44-8	kg/yr	0.55	1.58
	VM & P Naphtha	8032-32-4	kg/yr	4.20	12.00
	Yttrium	7440-65-5	kg/yr	0.16	0.46
	Zirconium Compounds, as Zr	7440-67-7	kg/yr	0.01	0.65

Table A-11. Sigma Complex Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
Sigma Complex	Acetone	67-64-1	kg/yr	6.64	18.96
	Acetylene	74-86-2	kg/yr	0.00	1.31
	Aluminum numerous forms	7429-90-5	kg/yr	0.00	0.27
	Antimony and Compounds, as Sb	7440-36-0	kg/yr	0.23	0.67
	Arsenic, el.&inorg.,exc. Arsine, as As	7440-38-2	kg/yr	0.20	0.56
	Beryllium	7440-41-7	kg/yr	3.40	9.72
	Cadmium, el.&compounds, as Cd	7440-43-9	kg/yr	0.60	1.73
	Chromium, Metal &Cr III Compounds, as Cr	7440-47-3	kg/yr	10.30	29.44
	Cobalt, elemental & inorg.comp., as Co	7440-48-4	kg/yr	0.01	0.90
	Copper	7440-50-8	kg/yr	0.02	1.85
	Diethylene Triamine	111-40-0	kg/yr	0.84	2.40
	Ethanol	64-17-5	kg/yr	6.63	18.94
	Hydrogen Chloride	7647-01-0	kg/yr	5.82	16.62
	Hydrogen Fluoride, as F	7664-39-3	kg/yr	0.17	0.49
	Hydrogen Peroxide	7722-84-1	kg/yr	1.23	3.52
	Isopropyl Alcohol	67-63-0	kg/yr	6.60	18.85
	Lead, el.&inorg.compounds, as Pb	7439-92-1	kg/yr	0.03	3.39
	Manganese Dust & Compounds or Fume	7439-96-5	kg/yr	0.25	0.72
	Mercury numerous forms	7439-97-6	kg/yr	0.05	5.44
	Methyl Alcohol	67-56-1	kg/yr	2.22	6.33
	Methylene Chloride	75-09-2	kg/yr	0.23	0.66
	Nickel, metal (dust) or Soluble & Inorganic Comp.	7440-02-0	kg/yr	0.94	2.68
	Nitric Acid	7697-37-2	kg/yr	7.48	21.36
	Platinum Metal	7440-06-4	kg/yr	2.26	6.46
	Propane	74-98-6	kg/yr	0.00	11.08
	Rhodium Metal	7440-16-6	kg/yr	1.30	3.72
	Silver (metal dust & soluble comp., as Ag)	7440-22-4	kg/yr	8.56	24.46
	Sulfuric Acid	7664-93-9	kg/yr	0.32	0.92
	Tellurium & Compounds, as Te	13494-80-9	kg/yr	0.44	1.25
	Yttrium	7440-65-5	kg/yr	0.31	0.89
	Zirconium Compounds, as Zr	7440-67-7	kg/yr	0.05	5.00

Table A-12. Target Fabrication Facility Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
Target Fabrication Facility	Acetic Acid	64-19-7	kg/yr	0.92	2.62
	Acetic Anhydride	108-24-7	kg/yr	0.76	2.16
	Acetone	67-64-1	kg/yr	22.06	63.02
	Acetonitrile	75-05-8	kg/yr	0.27	0.79
	Benzene	71-43-2	kg/yr	0.31	0.88
	Chloroform	67-66-3	kg/yr	3.11	8.90
	Chromium, Metal &Cr III Compounds, as Cr	7440-47-3	kg/yr	0.14	0.40
	Cyclohexane	110-82-7	kg/yr	0.27	0.78
	Dicyclopentadiene	77-73-6	kg/yr	0.09	0.25
	Ethanol	64-17-5	kg/yr	60.92	174.05
	2-Ethoxyethanol (EGEE)	110-80-5	kg/yr	3.90	11.16
	Ethyl Ether	60-29-7	kg/yr	0.98	2.80
	Hexane (other isomers)* or n-Hexane	110-54-3	kg/yr	0.92	2.64
	Hydrogen Bromide	10035-10-6	kg/yr	0.26	0.75
	Hydrogen Chloride	7647-01-0	kg/yr	8.52	24.33
	Isophorone Diisocyanate	4098-71-9	kg/yr	0.09	0.26
	Isopropyl Alcohol	67-63-0	kg/yr	14.43	41.24
	Mercury numerous forms	7439-97-6	kg/yr	0.05	4.54
	Methyl Alcohol	67-56-1	kg/yr	14.13	40.36
	Methyl Ethyl Ketone (MEK)	78-93-3	kg/yr	1.13	3.22
	Methyl Methacrylate	80-62-6	kg/yr	0.33	0.94
	Methyl Silicate	681-84-5	kg/yr	0.18	0.50
	Methylene Chloride	75-09-2	kg/yr	3.71	10.61
	n,n-Dimethyl Acetamide or Dimethyl Acetamide	127-19-5	kg/yr	1.32	3.77
	n,n-Dimethylformamide	68-12-2	kg/yr	5.31	15.18
	n-Amyl Acetate	628-63-7	kg/yr	0.31	0.88
	Nitrobenzene	98-95-3	kg/yr	0.42	1.20
	o-Dichlorobenzene	95-50-1	kg/yr	0.46	1.30
	Pentane (all isomers)	109-66-0	kg/yr	0.44	1.25
	Phosgene	75-44-5	kg/yr	0.12	0.34
	Potassium Hydroxide	1310-58-3	kg/yr	0.88	2.50
	Styrene	100-42-5	kg/yr	0.16	0.45
	Tetrahydrofuran	109-99-9	kg/yr	6.07	17.34
	Triethylamine	121-44-8	kg/yr	0.25	0.73
	VM & P Naphtha	8032-32-4	kg/yr	1.05	3.00

Table A-13. Tritium Operations Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
Tritium Operations	Acetone	67-64-1	kg/yr	1.11	3.16
	Dichlorodifluoromethane	75-71-8	kg/yr	0.17	0.48
	Ethanol	64-17-5	kg/yr	0.65	1.87
	Propane	74-98-6	kg/yr	0.00	24.37
	Sulfuric Acid	7664-93-9	kg/yr	894.56	2555.90

Table A-14. Waste Management Operations Air Emissions

Key Facility	Chemical Name	CAS Number	Units	2003 Estimated Air Emissions	2003 Usage
Waste Management Operations	Arsenic, el.&inorg.,exc. Arsine, as As	7440-38-2	kg/yr	0.20	0.56
	Ethanol	64-17-5	kg/yr	14.50	41.44
	Hydrogen Chloride	7647-01-0	kg/yr	671.26	1917.88
	Hydrogen Peroxide	7722-84-1	kg/yr	410.03	1171.50
	Mercury numerous forms	7439-97-6	kg/yr	0.01	1.36
	Nitric Acid	7697-37-2	kg/yr	5.07	14.50
	Potassium Hydroxide	1310-58-3	kg/yr	0.53	1.51
	Propane	74-98-6	kg/yr	0.00	292.46
	Tin numerous forms	7440-31-5	kg/yr	0.01	0.73
	Uranium (natural) Sol. & Unsol.Comp. as U	7440-61-1	kg/yr	0.67	1.90
	Yttrium	7440-65-5	kg/yr	0.16	0.45

Appendix B: Nuclear Facilities List

Table B-1. Comparison of Nuclear Facilities Lists

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401 Rev. 1 (June 2001)		FWO-OAB 401 Rev. 2 (December 2001)		PS-OAB-401 Rev. 3 (July 2002)	
Section/ Table	**Bldg.**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
2.1		Plutonium Complex											
2.1-1	TA-55-0004	Pu-238 Processing	2	Plutonium Facility	2	TA-55 Plutonium Facility	2	TA-55 Plutonium Facility	2	TA-55 Plutonium Facility	2	TA-55 Plutonium Facility	2
				Pu glovebox line; Pu-238 processing	2	Pu glovebox line; Pu-238 processing	2	Pu glovebox line; Pu-238 processing	2	Pu glovebox line; processing of isotopes of Pu	2	Pu glovebox line; processing of isotopes of Pu	2
2.1-1	TA-55-0041	Nuclear Material Storage	2										
2.2		Tritium Facilities											
2.2-1	TA-16-0205	WETF	2	Weapons Engineering Tritium Facility (WETF)	2	TA-16 Weapons Engineering Tritium Facility (WETF)	2	TA-16 Weapons Engineering Tritium Facility (WETF)	2	TA-16 Weapons Engineering Tritium Facility (WETF)	2	TA-16 Weapons Engineering Tritium Facility (WETF)	2
				Weapons related tritium research	2	Weapons related tritium research	2	Weapons related tritium research	2	Tritium research	2	Tritium research	2
2.2-1	TA-16-0205A	WETF	2										
2.2-1	TA-16-0450	WETF	2										
2.2-1	TA-21-0155	TSTA	2	Tritium System Test Assembly (TSTA)	2	Tritium System Test Assembly (TSTA)	2	Tritium System Test Assembly (TSTA)	2	Tritium System Test Assembly (TSTA)	2	Tritium System Test Assembly (TSTA)	2
				Tritium research; >HC-2 threshold	2	Tritium research; >HC-2 threshold	2	Tritium research	2	Stabilization and Deactivation Activities	2	Stabilization and Deactivation Activities	2
2.2-1	TA-21-0209	TSFF	2	TA-21 Tritium Science and Fabrication Facility (TSFF)	2	TA-21 Tritium Science and Fabrication Facility (TSFF)	2	TA-21 Tritium Science and Fabrication Facility (TSFF)	2	TA-21 Tritium Science and Fabrication Facility (TSFF)	2	TA-21 Tritium Science and Fabrication Facility (TSFF)	2

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401				PS-OAB-401	
								Rev. 1 (June 2001)		Rev. 2 (December 2001)		Rev. 3 (July 2002)	
Section/ Table	Bldg.	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT
				Support for underground testing program >HC-2 threshold; tritium	2	Support for underground testing program >HC-2 threshold; tritium	2	Support for underground testing program (tritium)	2	Stabilization activities and NTTL support		Stabilization activities and NTTL support	2
2.3		Chemistry and Metallurgy Research Building											
2.3-1	TA-03-0019 (Building number should be –0029)	CMR	2	TA-3 Chemistry and Metallurgy Research (CMR) Bldg.	2	TA-3 Chemistry and Metallurgy Research (CMR) Bldg.	2	TA-3 Chemistry and Metallurgy Research (CMR) Bldg.	2	TA-3 Chemistry and Metallurgy Research (CMR) Bldg.	2	TA-3 Chemistry and Metallurgy Research Facility (CMR)	2
2.3-1	TA-03-0029	Radiochemistry Hot Cell		Radiochemistry Hot Cell facility	2	Radiochemistry Hot Cell facility	2	Radiochemistry Hot Cell facility	2				
										Actinide chemistry and metallurgy research and analysis	2	Actinide chemistry and metallurgy research and analysis	2
2.3-1	TA-03-0029	SNM Vault		CMR SNM Vault	2	CMR SNM Vault	2	CMR SNM Vault	2				
2.3-1	TA-03-0029	Nondestructive analysis/ nondestructive examination Waste Assay		CMR NDA/NDE waste assay; inspection of waste drums	2	CMR NDA/NDE waste assay; inspection of waste drums	2	CMR NDA/NDE waste assay; inspection of waste drums	2				
2.3-1	TA-03-0029	IAEA Classroom				Classroom for IAEA inspectors; a.k.a. “School House”	2	Classroom for IAEA inspectors; a.k.a. “School House”	2				

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401				PS-OAB-401	
								Rev. 1 (June 2001)		Rev. 2 (December 2001)		Rev. 3 (July 2002)	
Section/ Table	**Bldg.**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
2.3-1	TA-03-0029	Wing 9 (Enriched Uranium)		Enriched Uranium foundry & machining; operation shutdown; (Wing 9)	2	Enriched Uranium foundry & machining; operation shutdown; (Wing 9)	2	Enriched Uranium foundry & machining; operation shutdown; (Wing 9)	2				
2.4		Pajarito Site											
2.4-1	TA-18	Site Itself		LANL Critical Experiment Facility (LACEF) and Hillside Vault	2	TA-18 LANL Critical Experiment Facility (LACEF) and Hillside Vault	2	TA-18 LANL Critical Experiment Facility (LACEF) and Hillside	2	TA-18 LANL Critical Experiment Facility and Hillside	2	TA-18 LANL Critical Experiment Facility (LACEF)	2
				Critical Experiment Site	2	Critical Experiment Site	2	Critical Experiment Site	2	Critical Experiment Site	2	Critical Experiment Site	2
2.4-1	TA-18-0023	SNM Vault (CASA 1)	2	Category 1 SNM Vault (CASA 1)	2	Category 1 SNM Vault (CASA 1)	2	Category 1 SNM Vault (CASA 1)	2	Category 1 SNM Vault (CASA 1)	2		
2.4-1	TA-18-0026	Hillside Vault	2	Hillside Vault (Pajarito Site); contains SNM>HC-2 threshold	2	Hillside Vault (Pajarito Site); contains SNM>HC-2 threshold	2	Hillside Vault (Pajarito Site); contains SNM>HC-2 threshold	2	Hillside Vault (Pajarito Site); contains SNM>HC-2 threshold	2		
2.4-1	TA-18-0032	SNM Vault (CASA 2)	2	Category 1 SNM Vault (CASA 2)	2	Category 1 SNM Vault (CASA 2)	2	Category 1 SNM Vault (CASA 2)	2	Category 1 SNM Vault (CASA 2)	2		
2.4-1	TA-18-0116	Assembly Building (CASA 3)	2	Assembly Building (CASA 3)	2	Assembly Building (CASA 3)	2	Assembly Building (CASA 3)	2	Assembly Building (CASA 3)	2		
2.4-1	TA-18-0127	Accelerator used for weapons x-ray		Accelerator used for weapons x-ray	2	Accelerator used for weapons x-ray	2	Accelerator used for weapons x-ray	2	Accelerator used for weapons x-ray	2		
2.4-1	TA-18-0129	Calibration Laboratory		Calibration laboratory	2	Calibration laboratory	2	Calibration laboratory	2	Calibration laboratory	2		
2.4-1	TA-18-0247	Sealed Sources		Sealed sources >HC-3 threshold values; not ANSI certified	3	Sealed sources >HC-3 threshold values; not ANSI certified	3						

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401				PS-OAB-401	
								Rev. 1 (June 2001)		Rev. 2 (December 2001)		Rev. 3 (July 2002)	
Section/ Table	**Bldg.**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
2.4-1	TA-18-0258	IAEA Classroom (Trailer)		Trailer classroom for IAEA inspectors; a.k.a. "School House"	2								
2.5		Sigma Complex											
2.5-1	TA-03-0066	44 metric tons of depleted uranium storage	3	Storage of 44 MY DU	3	Storage of 44 MY DU	3						
2.5-1	TA-03-0159	Thorium storage	3	Storage of 239 kg thorium ingots and oxides	3			*		*			
2.6 (NA)		Materials Science Laboratory											
2.7 (NA)		Target Fabrication Facility											
2.8 (NA)		Machine Shops											
2.9		High Explosives Processing											
2.9-1								TA-8 Radiography Facility	2	TA-8 Radiography Facility	2	TA-8 Radiography Facility	2
	TA-08-0022	Radiography facility	2		2	Radiography facility; radiographs of nuclear explosives assemblies and other sources exceed HC-2 threshold values	2						

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401 Rev. 1 (June 2001)		FWO-OAB 401 Rev. 2 (December 2001)		PS-OAB-401 Rev. 3 (July 2002)	
Section/ Table	Bldg.	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT
	TA-08-0023	Radiography facility	2		2	Radiography facility; radiographs of nuclear explosives assemblies and other sources exceed HC-2 threshold values	2	Betatron Building	2	Betatron Building	2	Betatron Building	2
	TA-08-0024	Isotope Building	2										
	TA-08-0070	Experimental Science	2										
	TA-16-0411	Intermediate Device Assembly			2	Intermediate Device Assembly Building	2						
2.10 (NA)		High Explosives Testing											
2.11		Los Alamos Neutron Science Center		TA-53 Nuclear Activities at LANSCE	3	TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE)	3	TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE)	3	TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE)	3	TA-53 Nuclear Activities at Los Alamos Neutron Science Center (LANSCE)	3
2.11-1	TA-53-1L	Manual Lujan Neutron Scattering Center		Manual Lujan Neutron Scattering Center	3	Manual Lujan Neutron Scattering Center	3	Manual Lujan Neutron Scattering Center	3	Lujan Center Neutron Production Target	3	Lujan Center Neutron Production Target	3
	TA-53-3M	Experimental Science	3										
	TA-53-A-6	Accelerator Production of Tritium target beam stop		APT target, isotope production, beam stop	3	APT target, isotope production, beam stop	3	APT target, isotope production, beam stop	3	In-place storage DU and A-6 beam stop	3	In-place storage DU and A-6 beam stop	3
	TA-53-ER1	Actinide scattering experiment		Actinide scattering experiment	3	Actinide scattering experiment	3	TA-53 ERI Actinide scattering experiment	3	TA-53 ERI Actinide scattering experiment	3	Lujan Center ER-1/2 Actinide scattering experiment	3

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401 Rev. 1 (June 2001)		FWO-OAB 401 Rev. 2 (December 2001)		PS-OAB-401 Rev. 3 (July 2002)	
Section/ Table	**Bldg.**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
	TA-53-P3E	Pion Scattering Experiment		Pion Scattering Experiment	3								
										TA-53 Target 4 WNR Neutron Production target [b]	3		
2.12 (NA)		Health Research Laboratory				Biosciences Facilities		Biosciences Facilities		Biosciences Facilities		Biosciences Facilities	
2.13		Radiochemistry Facility											
2.13-1	TA-48-0001	Radiochemistry and Hot Cell	3	TA-48 Radiochemistry and Hot Cell Facility	3	TA-48 Radiochemistry and Hot Cell Facility	3	TA-48 Radiochemistry and Hot Cell Facility	3	TA-48 Radiochemistry and Hot Cell Facility	3	TA-48 Radiochemistry and Hot Cell Facility	3
				Radiochemistry and hot cell facility; multiple small sources >HC-3 threshold values	3	Radiochemistry and hot cell facility; multiple small sources >HC-3 threshold values	3	Radiochemistry and hot cell facility; multiple small sources	3	Radiochemistry and hot cell facility; multiple small sources	3	Radiochemistry and hot cell facility; multiple small sources	3
2.14		Radioactive Liquid WasteTtreatment Facility		Radioactive Liquid WasteTtreatment Facility	3	TA-50 Radioactive Waste Treatment Facility (RLWTF)	3	TA-50 Radioactive Waste Treatment Facility (RLWTF)	3	TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF)	3	TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF)	3
2.14-1	TA-50-0001	Main Treatment Plant	2	Main treatment plant, pretreatment plant, decontamination operation	3	Main treatment plant, pretreatment plant, decontamination operation	3	Main treatment plant, pretreatment plant, decontaminatio n operation	3	Main treatment plant, pretreatment plant, decontamination operation	3	Main treatment plant, pretreatment plant, decontamination operation	3
	TA-50-0002	LLW Tank Farm		Low level liquid influence tanks, treatment effluent tanks, low level sludge tanks	3	Low level liquid influence tanks, treatment effluent tanks, low level sludge tanks	3	Low level liquid influence tanks, treatment effluent tanks, low level sludge tanks	3	Low level liquid influence tanks, treatment effluent tanks, low level sludge tanks	3	Low level liquid influence tanks, treatment effluent tanks, low level sludge tanks	3

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401 Rev. 1 (June 2001)		FWO-OAB 401 Rev. 2 (December 2001)		PS-OAB-401 Rev. 3 (July 2002)	
Section/ Table	**Bldg.**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
	TA-50-0066	Acid and Caustic Tank Farm		Acid and Caustic waste holding tanks	3	Acid and Caustic waste holding tanks	3	Acid and Caustic waste holding tanks	3	Acid and Caustic waste holding tanks	3	Acid and Caustic waste holding tanks	3
	TA-50-0090	Holding Tank		Holding tank	3	Holding tank	3	Holding tank	3	Holding tank	3	Holding tank	3
2.15		Solid Radioactive and Chemical Waste Facilities											
2.15-1	TA-50-0037	RAMROD		Radioactive Materials, Research, Operations, and Demonstration (RAMROD)	2	TA-50 Radioactive Materials, Research, Operations, and Demonstration (RAMROD)	2	TA-50 Radioactive Materials, Research, Operations, and Demonstration (RAMROD)	2	TA-50 Radioactive Materials, Research, Operations, and Demonstration (RAMROD)	2	TA-50 Radioactive Materials, Research, Operations, and Demonstration (RAMROD)	2
				Radioactive materials, research, operations, and demonstration facility	2	Radioactive materials, research, operations, and demonstration facility	2	Radioactive materials, research, operations, and demonstration facility	2	Radioactive materials, research, operations, and demonstration facility	2	Radioactive materials, research, operations, and demonstration facility	2
	TA-50-0069	WCRRF Building	2	TA-50 Waste Characterization, Reduction, and Repackaging Facility (WCRRF)	3	TA-50 Waste Characterization, Reduction, and Repackaging Facility (WCRRF)	2	TA-50 Waste Characterization, reduction, and Repackaging Facility (WCRRF)	2	TA-50 Waste Characterization, Reduction, and Repackaging Facility (WCRRF)	2	TA-50 Waste Characterization, Reduction, and Repackaging Facility (WCRRF)	2
				Waste characterization, reduction, and repackaging facility	3	Waste characterization, reduction, and repackaging facility	3	Waste characterization, reduction, and repackaging facility	3	Waste characterization, reduction, and repackaging facility	3	Waste characterization, reduction, and repackaging facility	3
	TA-50-190			Liquid waste tank	2								

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401				PS-OAB-401	
								Rev. 1 (June 2001)		Rev. 2 (December 2001)		Rev. 3 (July 2002)	
Section/ Table	Bldg.	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT
	TA-50-0069 Outside	Nondestructive Analysis Mobile Activities				NDA mobile activities outside TA-50-69	2	TA-50 External NDA mobile activities outside TA-50-69	2	TA-50 External NDA mobile activities outside TA-50-69	2	TA-50 External NDA mobile activities outside TA-50-69	2
	TA-50-0069 Outside	Drum Storage				Drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69	2	TA-50 External Drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69	2	TA-50 External Drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69	2	TA-50 External Drum staging/storage pad and waste container temperature equilibration activities outside TA-50-69	2
	TA-54-Area G	LLW Waste Storage/ Disposal	2	TA-54 Waste Storage and Disposal Facility	2	TA-54 Waste Storage and Disposal Facility (Area G)	2	TA-54 Waste Storage and Disposal Facility (Area G)	2	TA-54 Waste Storage and Disposal Facility (Area G)	2	TA-54 Waste Storage and Disposal Facility (Area G)	2

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401 Rev. 1 (June 2001)		FWO-OAB 401 Rev. 2 (December 2001)		PS-OAB-401 Rev. 3 (July 2002)	
Section/ Table	Bldg.	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT
				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	2	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	2	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	2	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	2	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. Operations building; TRU waste storage	2
	TA-54	TWISP		Transuranic Waste Inspectable Storage Project (TWISP)	2	TA-54 Transuranic Waste Inspectable Storage Project (TWISP)	2	TA-54 Transuranic Waste Inspectable Storage Project (TWISP)	2	TA-54 Transuranic Waste Inspectable Storage Project (TWISP)	2	TA-54 Transuranic Waste Inspectable Storage Project (TWISP)	2
								Pit 2 Recovery of buried TRU waste (Note: TWISP)	2	Pit 2 Recovery of buried TRU waste (Note: TWISP)	2		

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401				PS-OAB-401	
								Rev. 1 (June 2001)		Rev. 2 (December 2001)		Rev. 3 (July 2002)	
Section/ Table	Bldg.	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT
	TA-54-0002	TRU Storage Dome		Operations building; TRU waste storage	3			Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3	Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3		
	TA-54-0033	TRU Drum Preparation	2					TRU waste storage, fabric dome with TRU waste drum (Note: TWISP)	2	TRU waste storage, fabric dome with TRU waste drum (Note: TWISP)	2	TRU waste storage, fabric dome with TRU waste drum (Note: TWISP)	2
	TA-54-0038	RANT	2	Radioactive Assay Nondestructive Testing (RANT) Facility	3	TA-54 Radioactive Assay Nondestructive Testing (RANT) Facility	3	TA-54 Radioactive Assay Nondestructive Testing (RANT) Facility	3	TA-54 Radioactive Assay Nondestructive Testing (RANT) Facility	3	TA-54 Radioactive Assay Nondestructive Testing (RANT) Facility	3
				Nondestructive assay and examination of waste drums, WIPP certification of TRU waste drums, TRUPACT loading of drums	3	Nondestructive assay and examination of waste drums, WIPP certification of TRU waste drums, TRUPACT loading of drums	3	Nondestructive assay and examination of waste drums, WIPP certification of TRU waste drums, TRUPACT loading of drums	3	Nondestructive assay and examination of waste drums, WIPP certification of TRU waste drums, TRUPACT loading of drums	3	Nondestructive assay and examination of waste drums, WIPP certification of TRU waste drums, TRUPACT loading of drums	3
	TA-54-0048	TRU Storage Dome	2	Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3			Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3	Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3		

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401 Rev. 1 (June 2001)		FWO-OAB 401 Rev. 2 (December 2001)		PS-OAB-401 Rev. 3 (July 2002)	
Section/ Table	**Bldg.**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
	TA-54-0049	TRU Storage Dome	2	Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3			Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3	Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3		
	TA-54-0144	Shed	2										
	TA-54-0145	Shed	2										
	TA-54-0146	Shed	2										
	TA-54-0153	TRU Storage Dome	2	Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3			Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3	Radioactive and chemical waste storage; fabric dome with TRU waste drum storage	3		
	TA-54-0177	Shed	2										
	TA-54-0226	Temporary Retrieval Dome	2	TRU waste placement (incidental to remediation)	2	TRU waste placement (incidental to remediation)	2						
	TA-54-0229	Tension Support Dome	2	TRU waste placement (incidental to remediation)	2	TRU waste placement (incidental to remediation)	2						
	TA-54-0230	Tension Support Dome	2	TRU waste placement (incidental to remediation)	2	TRU waste placement (incidental to remediation)	2						
	TA-54-0231	Tension Support Dome	2	TRU waste placement (incidental to remediation)	2	TRU waste placement (incidental to remediation)	2						

SWEIS ROD				**DOE 1998**		**DOE 2000**		**FWO-OAB 401**				**PS-OAB-401**	
								Rev. 1 (June 2001)		**Rev. 2 (December 2001)**		**Rev. 3 (July 2002)**	
Section/ Table	**Bldg.**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
	TA-54-0232	Tension Support Dome	2	TRU waste placement (incidental to remediation)	2	TRU waste placement (incidental to remediation)	2						
	TA-54-0283	Tension Support Dome	2										
	TA-54-Pad1	Storage Pad		TRU waste remediation project	2	TRU waste remediation project	2						
	TA-54-Pad2	Storage Pad	2	TRU waste remediation project	2	TRU waste remediation project	2			Recovery of buried TRU waste (Note: TWISP)	2	Recovery of buried TRU waste (Note: TWISP)	2
	TA-54-Pad3	Storage Pad	2										
	TA-54-Pad4	TRU Storage	2	TRU waste remediation project	2	TRU waste remediation project	2						
2.16		Non-Key Facilities											
2.16-1	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-33 High Pressure Tritium Facility	2	TA-33 High Pressure Tritium Facility	2	TA-33 High Pressure Tritium Facility [c]	2		
						Former tritium research facility	2	Former tritium research facility	2	Former tritium research facility	2		
	TA-35-0002	Nuclear Safeguards Research Facility	3	Multi-tenant office and laboratory facility with numerous non-ANSI certified Uranium Sources >HC-2 threshold values	3								

SWEIS ROD				DOE 1998		DOE 2000		FWO-OAB 401 Rev. 1 (June 2001)		FWO-OAB 401 Rev. 2 (December 2001)		PS-OAB-401 Rev. 3 (July 2002)	
Section/ Table	**Bldg.**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
	TA-35-0027	Nuclear Safeguards Research Facility	3	Safeguard assay instruction and related research; Am-241 exceeding HC-2 threshold quantities	3								
2.17 (NA)		Environmental Restoration Project											
		(Note: on-site transportation was evaluated under 4.10.3.1 as part of the Affected Environment)						Site Wide Transportation	TBD	Site Wide Transportation	TBD	Site Wide Transportation	TBD
												Laboratory nuclear materials transportation that is not DOT certified is now included in the scope of 10CFR830	TBD

[a] TA-03-0159 removed from list 4/00.
[b] WNR Facility Target 4 downgraded to below Category 3 and removed from Nuclear Facilities List in July 2002.
[c] TA-33-86, High Pressure Tritium Facility, removed from Nuclear Facilities List in March 2002.

Appendix C: Radiological Facility List

Table C-1. Radiological Facility List

SWEIS ROD				FWO-OAB-403, Rev. 0		PS-OAB-403, Rev. 1	
SWEIS Yearbook	Building	Description	HAZ CAT	Description	HAZ CAT	Description	HAZ CAT
2.1		Plutonium Complex [a,b]					
2.2		Tritium Facilities [a,b]					
2.3		Chemistry and Metallurgy Research Building [a,b]					
2.4		Pajarito Site [a,b]					
2.5		Sigma Complex [b]					
2.5	TA-3-35	Press Building	L/RAD	Sigma Press Building	RAD	Sigma Press Building	RAD
2.5	TA-3-66	Sigma Building	NHC 3	Sigma Building	RAD	Sigma Building	RAD
2.5	TA-3-159	Thorium Storage	NHC 3	Sigma Thorium Storage	RAD	Sigma Thorium Storage	RAD
2.6		Materials Science Laboratory					
2.6	TA-3-1698	Materials Science Lab	L/CHEM	Material Science Lab	RAD	Material Science Lab	RAD
2.7		Target Fabrication Facility [a]					
2.8		Machine Shops					
2.8	TA-3-102	Tech Shops Addition	L/RAD	Tech Shop Add	RAD	Tech Shop Add	RAD
2.9		High Explosives Processing [b]					
2.9	TA-8-22	X-Ray Facility	NHC 2	X ray Facility [c]	RAD	X ray Facility [c]	RAD
2.9	TA-8-70	Nondestructive Testing	NHC 2	Nondestructive Testing	RAD	Nondestructive Testing	RAD
2.9	TA-8-120		NA	Radiography [c]	RAD	Radiography [c]	RAD
2.9	TA-11-30	Vibration Test Building	L/ENS	Vibration Test [c]	RAD	Vibration Test [c]	RAD
2.9	TA-16-88	Casting Rest House	L/CHEM	RAM Machine Shop	RAD	RAM Machine Shop	RAD
2.9	TA-16-202					Laboratory	RAD
2.9	TA-16-207		NA	Component Testing [c]	RAD	Component Testing [c]	RAD
2.9	TA-16-300		NA	Component Storage [c]	RAD	Component Storage [c]	RAD
2.9	TA-16-301	Rest House	L/ENS	Component Storage [c]	RAD	Component Storage [c]	RAD
2.9	TA-16-302	Process Building	L/ENS	Component Storage Training [b]	RAD	Component Storage Training [b]	RAD
2.9	TA-16-332		NA	Component Storage	RAD	Component Storage	RAD
2.9	TA-16-410	Assembly Building	L/ENS	Assembly Building	RAD	Assembly Building	RAD
2.9	TA-16-411	Rest House	NHC 2	Assembly Building [c]	RAD	Assembly Building [c]	RAD
2.9	TA-16-413	Rest House	L/ENS	Component Storage [c]	RAD		
2.9	TA-16-415	Rest House	L/ENS	Component Storage [c]	RAD		
2.9	TA-37-10	Magazine	L/ENS	Storage Magazine [c]	RAD	Storage Magazine [c]	RAD
2.9	TA-37-14	Magazine	L/ENS	Storage Magazine [c]	RAD	Storage Magazine [c]	RAD
2.9	TA-37-16					Storage Magazine	RAD
2.9	TA-37-22	Magazine	L/ENS	Storage Magazine [c]	RAD		

SWEIS ROD				FWO-OAB-403, Rev. 0		PS-OAB-403, Rev. 1	
SWEIS Yearbook	**Building**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**	**Description**	**HAZ CAT**
2.9	TA-37-24	Magazine	L/ENS	Storage Magazine [c]	RAD	Storage Magazine [c]	RAD
2.9	TA-37-25	Magazine	L/ENS	Storage Magazine [c]	RAD	Storage Magazine [c]	RAD
2.10		High Explosives Testing					
2.10	TA-15-R183		NA	Vault	RAD	Vault	RAD
2.11		Los Alamos Neutron Science Center [b]					
2.11	TA-53-945		NA	RLW Treatment Facility	RAD	RLW Treatment Facility	RAD
2.11	TA-53-954		NA	RLW Basins	RAD	RLW Basins	RAD
2.12		Biosciences Facilities [a]					
2.12	TA-43-1	Health Research Laboratory	L/RAD and CHEM			Bio Lab	RAD
2.13		Radiochemistry Facility [a,b]					
2.14		Radioactive Liquid Waste Treatment Facility [a,b]					
2.15		Solid Radioactive and Chemical Waste Facilities [a,b]					
2.15	TA-54-412		NA			DVRS	RAD
2.16		Non-Key Facilities [b]					
2.16	TA-2-1	Omega West Reactor	L/RAD	Omega Reactor [d]	RAD	Omega Reactor [d]	RAD
2.16	TA-3-16					Ion Exchange	RAD
2.16	TA-3-34	Cryogenics Bldg B	L/CHEM	Cryogenics Bldg B	RAD	Cryogenics Bldg B	RAD
2.16	TA-3-40	Physics Bldg	NHC 3	Physics Bldg (HP)	RAD	Physics Bldg (HP)	RAD
2.16	TA-3-169		NA			Warehouse	RAD
2.16	3-1819		NA			Experiment Mat'l Lab	RAD
2.16	TA-33-86	High Pressure Tritium	NHC 3			High Pressure Tritium	RAD
2.16	TA-21-5	Laboratory Building	L/RAD	Lab Bldg [d]	RAD	Lab Bldg [d]	RAD
2.16	TA-21-150	Molecular Chemistry Building	L/RAD	Molecular Chemical [d]	RAD		
2.16	TA-35-2	Nuclear Safeguards Research	NHC 3	Nuclear Safeguards Research	RAD	Nuclear Safeguards Research	RAD
2.16	TA-35-27	Nuclear Safeguards Lab	NHC 3	Nuclear Safeguards Lab	RAD	Nuclear Safeguards Lab	RAD
2.16	TA-35-125	Laser Building	L/RAD				
2.16	TA-36-1		NA			Laboratory and offices	RAD
2.16	TA-36-214		NA			Central HP Calibration Facility	RAD
2.16	TA-41-1	Underground Vault	L/RAD	Undergound Vault [c]	RAD	Underground Vault [c]	RAD
2.16	TA-41-4	Laboratory Building	M/RAD	Laboratory [c]	RAD		
2.17		Environmental Restoration Project [a]					

[a] No radiological facilities identified in September 2001.
[b] Refer to Appendix B Nuclear Facilities List.
[c] Could contain radiological material on an interim basis.
[d] Scheduled for decommissioning and demolition.

Appendix D: "Qualitative Assessment of Wildfire-Induced Radiological Risk at the Los Alamos National Laboratory Interim Internal Status Report – 2003"

LA-UR-03-7237

January 2004

Title

Qualitative Assessment of Wildfire-Induced Radiological Risk at the Los Alamos National Laboratory Interim Internal Status Report - 2003

Prepared by

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Contents

Qualitative Assessment of Wildfire-Induced Radiological Risk at the Los Alamos National Laboratory

Interim Internal Status Report – 2003

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Abstract

A new site-wide wildfire accident analysis is needed for the Los Alamos National Laboratory in 2004 as required by the Department of Energy every five years. Sufficient changes have occurred in the parameters originally analyzed in 1999 that they potentially alter the risk calculations of a radiological release resulting from wildfire. This potential change might compromise the National Environmental Policy Act (NEPA) baseline to which many NEPA reviews are compared. For example, one of the new domes used for the Transuranic Waste Inspectable Storage Project at Technical Area 54 has twice the capacity of the domes used in the 1999 analysis. An analysis using the larger capacity dome would likely result in a larger radiological source term and dose portion of the risk equation. Also, the tritium inventory at the Weapons Engineering Tritium Facility (WETF) is expected to increase, but the vulnerability of WETF buildings to wildfire has been reduced. Lastly, the likelihood or chance of a wildfire accident scenario resulting in a radiological release needs to be carried inside the Laboratory boundary to the point of release at Laboratory buildings. The required five-year update of the Site-Wide Environmental Impact Statement is the most appropriate outlet for such an analysis.

Introduction

This assessment was completed as a component of the Cerro Grande Fire Recovery Project. The purpose of this assessment is to evaluate the need, as required by the Department of Energy (DOE), to update the site-wide wildfire accident analysis that was reported in the 1999 Site-Wide Environmental Impact Statement (SWEIS) for the Los Alamos National Laboratory (LANL or the Laboratory). The evaluation was accomplished by qualitatively assessing how much, if any, the key accident parameters have changed since the 1999 analysis. The key contributors to the human radiological exposure assessed in the SWEIS were

- building sources (inventories) of radiological materials and
- soil and vegetation sources of radiological materials.

The key components of the likelihood or chance of occurrence of a site-wide wildfire were

- factors resulting in a wildfire advancing to the LANL boundary,
- fuels providing a pathway across the Laboratory, and
- the combustibility of key nuclear facilities at the Laboratory, which is partly dependent on fuel loads adjacent to those facilities.

The current states of these risk-contributing parameters were compared with the values used in the SWEIS in order to recommend whether or not a quantitative analysis, as done in 1999, was needed in fiscal year 2004, as required by the DOE five years after the completion of the SWEIS.

Background

A wildfire resulting in the exposure of humans to airborne radiation was one of several operational site-wide accident scenarios analyzed and reported in the 1999 SWEIS for LANL (DOE 1999). The health impact of the wildfire accident was 0.34 latent cancer fatalities esulting from an estimated population dose of 675 person-rem. The dose to the maximally exposed individual (MEI) member of the public was <25 rem, and the estimated frequency of occurrence was approximately once every 10 years, or “likely.” While the estimated radiological dose consequence of a wildfire accident was small, the high frequency of occurrence resulted in a risk (product of the frequency and consequence) that was surpassed by only one other postulated accident in the SWEIS.

The wildfire accident analysis assumed multiple source releases including radiological inventories from buildings, suspended soils with environmental (very low) levels of contamination, and ash from burnt vegetation (this ash also had very low levels of contamination). Since the analysis in 1999, radiological inventories in buildings have changed, the vulnerability of buildings to ignition by wildfire has changed as a result of tree thinning, more-accurate and more-comprehensive data have been compiled on concentrations of radionuclides in vegetation, vegetation fuel loads have changed, and the frequency of occurrence has possibly changed. In this manuscript the results of qualitatively assessing the change in some of these factors are reported, and recommendations for further analysis are made based on these results.

General Scenario Description

Following the Cerro Grande Fire of 2000, the LANL site and surrounding vicinity are still considered forested areas with high fuel loading in some areas (canyons) and moderate to low fuel loads in areas that have been thinned. Wildfires in the region that includes expansive areas of forest are still common. While the Cerro Grande Fire of 2000 reduced some of the pathways by which fires originating on neighboring lands to the south and west could encroach on LANL, encroachment from Bandelier National Monument lands (Frijoles Canyon), San Ildefonso tribal lands, and parts of unburned Santa Fe National Forest still pose a wildfire risk for the Laboratory. Untreated canyons (e.g., Los Alamos, Pajarito) and beetle-killed trees within LANL pose a fire risk as well. While reductions in fuel loads on LANL have occurred as a result of the Cerro Grande Fire and tree thinning on mesa tops, extensive tree death from drought and an insect epidemic may have countered some of the beneficial effects of the reduced fuel loads. Also, heavy fuel loads remain in canyons. Planned “defensible space” thinning, which includes clear-cutting up to 50 feet around buildings with radiological inventories, is also generally assessed. All totaled, these factors were considered to qualitatively estimate the likelihood of experiencing a radiological exposure event resulting from wildfire.

Wildfire Frequency

A new analysis is needed in 2004 that will consider and quantify the full extent of the scenario culminating in the release of radiological materials. The probability component of the risk equation reported in the 1999 SWEIS only considered the advancement of a large wildfire to the LANL boundary, and then assumed, with no analysis, that the fire necessarily continued on a path through LANL, reaching and igniting LANL buildings, and causing a radiological release.

The frequency of a large fire encroaching on LANL (1 in 10 years) was estimated in 1999 as the joint probability of ignition in the adjacent forests, high to extreme fire danger, failure to promptly extinguish the fire, and fire-favorable weather. The frequency estimate for ignition in the adjacent forests was based on a 21-year period (1976–1996) and it probably has not changed appreciably in the seven years that have passed. Fire ignitions have continued to occur in adjacent forests. Periods of high to extreme fire danger have continued to occur frequently during the summer months, and fire-favorable conditions have continued as well. The estimated likelihood of a fire reaching a LANL boundary did not include the likelihood of a fire advancing across LANL to encroach on buildings containing (appreciable amounts of) radiological materials, the likelihood of buildings igniting, and the likelihood of a release occurring once buildings are assumed to ignite. The likelihood of a fire encroaching on a rad-containing building is dependent on, among other factors, fuel load and continuity of fuel leading up to the space surrounding the buildings. The likelihood of a nuclear facility igniting is dependent on the joint probability of fuel load indices for fuel adjacent to buildings, slope on which the adjacent fuel loads exist, and the combustibility of buildings. This factor was quantified in 1999 and has been updated recently. The likelihood of a release would be related to the damage ratio (likelihood that the material at risk [MAR] was actually impacted by the accident) and the leakpath factor (likelihood that confinement, if any, is breached). While the probability of a large fire encroaching on LANL remains moderate to high, depending on location, probably still on the order of once per 10 years (0.1/yr) or more frequent, the probability of a LANL facility containing a radiological inventory being ignited by a wildfire and releasing some or all of the inventory has been reduced somewhat by the "defensible space" thinning and by the reductions in fuel by the Cerro Grande Fire.

As mentioned above, the likelihood of a nuclear facility igniting was quantified in 1999 and has been updated recently (LANL/FWO 2003). The fuel hazard, slope hazard, and structure hazard of many facilities throughout LANL were quantified and integrated to estimate the wildfire risk of each building. The ratings were "None," "Very Low," "Low," "Moderate," "High," and "Extreme." The SWEIS analysis assumed that buildings with a "Moderate," "High," or "Extreme" wildfire vulnerability burned and released their entire content of radiological inventories. A reduction in the wildfire vulnerability of key buildings through reductions in the fuel load around the building could substantially reduce the likelihood of the building igniting and could also reduce the release of radiological materials by lowering the intensity of fire. Since

1999, however, the wildfire vulnerability of only two (Buildings 229 and 230) of several key storage domes at the Transuranic Waste Inspectable Storage Project (TWISP) at Technical Area (TA) 54 has been lowered from High to Moderate. The Weapons Engineering Tritium Facility (WETF) wildfire vulnerability has been reduced from Moderate to Very Low.

Since the probability estimate for the SWEIS stopped at the LANL boundary, there is no value for the probability of the fire advancing across the Laboratory to nuclear facilities, igniting buildings, and causing a release. Without this value, an assessment of how this probability might have changed cannot be made. One can conservatively estimate that there's a 50% chance that the three factors just mentioned occur, then interact this probability value (0.5) with the assumed probability for a wildfire reaching the Laboratory boundary (0.1). This results in a conservative estimate of the probability for a release to occur resulting from a wildfire and resulting in radiological exposures of 0.05. This interprets to a 5 in 100 year chance of occurrence, which is about equal to once in 20 years, or 5×10^{-2}/yr. This estimate is in agreement with the draft Documented Safety Analysis for Area G. The fact that the Cerro Grande Fire did not result in the ignition of a LANL nuclear facility is evidence that thinning works and preventative maintenance will keep key facilities safer from wildfire than in the past.

Dose Consequence and Radiological Risk

A new quantitative analysis of dose consequence and population health impact is needed in 2004 because the current capacity for radiological materials at a key facility is double the value used in the 1999 analysis. Particular buildings, mostly storage domes, at the TA-54 TWISP were associated with the large majority (~59%) of radiological dose reported in the 1999 SWEIS. The capacity of a new dome (Bldg. 375) at TA-54 can hold approximately twice the radiological inventory than the value used in the 1999 analysis. Although the 1999 analysis was conservative, this change may result in the case where the SWEIS analysis no longer bounds the current condition.

The wildfire accident analysis of 1999 estimated the radiological dose to the MEI at several locations resulting from releases from three main sources—buildings with radiological inventories that were entirely released, suspended soil that had environmental (very low) levels of contamination, and suspended ash from burnt vegetation that also had very low levels of contamination. The estimated MEI dose was <25 rem, with the highest contribution of 22 rem from TA-54 structures. The highest MEI dose from burning vegetation and suspended soil was

0.21 mrem from EF Site with uranium isotopes as the source. For comparison, Kraig et al. (2001) published an estimated inhalation dose from the Cerro Grande Fire to the MEI as based on air monitoring data during the fire. They estimated a dose of 0.2 mrem with the majority (99.85%) contributed by natural sources of radiation. Although differences exist between the factors involved in the two different estimates, the estimate of 0.2 mrem based on actual measurements is comparable to the sum of soil- and vegetation-contributed dose in the SWEIS—0.21 mrem. Other estimates of very low radiation doses resulting from burning large volumes of conifer tree materials have been made (Gonzales et al. 2001). Below are discussions of changes that have occurred in the three main sources of radiation in the SWEIS estimate.

Building Sources. In the SWEIS estimate, the dose from the release of radionuclides from buildings largely dominated the total dose from all sources. Buildings in six TAs (TA-03, -16, -21, -43, -48, and -54) contributed the majority of the radiological dose from the postulated fire and of the six, one—TA-54—contributed the majority (~59%) of the dose (individual and population). The WETF contributed another 28% of the total population dose. Particular buildings (storage domes) at TA-54 for the TWISP were associated with the large majority of radiological dose. Given that the TWISP and WETF dominated the dose contribution, this evaluation concentrates on assessing the gross change, if any, in MAR at these two facilities. A total of 4,041 ^{239}Pu plutonium-equivalent curies (PE-Ci) of combustible transuranic (TRU) waste and 7,854 PE-Ci of noncombustible TRU waste were used in the SWEIS consequence analysis. This was derived from assuming that the total TWISP TRU waste inventory was split evenly between six domes. The current TRU waste inventory at TWISP is contained in 11 domes. Split evenly, the MAR comparable to the SWEIS values are 3,117 ^{239}Pu PE-Ci of combustible TRU waste and 8,883 PE-Ci of noncombustible TRU waste (LANL/FWO-SWO 2003). Considering both MAR changes—the increase (1,029 PE-Ci) in noncombustible TRU waste and the decrease (924 PE-Ci) in combustible TRU waste—there is a net reduction in the “weighted initial source term” (0.16 PE-Ci; pg. G-191) of approximately 19% (-0.03 PE-Ci) and there is no change in the wind-caused “resuspension source term” (0.74 PE-Ci; pg. G-192). However, one of the new domes (TA-54-375) is approximately double the size of the other 10 domes. If a new analysis were to conservatively assume that this, the largest dome, was the one involved in a site-wide wildfire, the estimated doses and health impact could double those in the SWEIS. Even so, the new dose would be in agreement with estimates proposed in the draft Documented Safety Analysis for Area G.

A total of 1.36 kg of tritium gas (^{3}H) at the WETF was used in the consequence analysis in the SWEIS. The WETF Technical Safety Requirements currently restrict the tritium inventory at WETF to 1.4 kg of ^{3}H (LANL 2002), thus the MAR assumed for the WETF in the SWEIS analysis remains unchanged. However, pending the completion of some requirements for containers holding ^{3}H, the administrative limit will be increased to 2 kg (Tingey 2003). Therefore, the five-year update of the SWEIS in 2004 should use 2 kg as the MAR.

Vegetation and Soil Sources. Suspended ash from vegetation and suspended soil contributed about 7% (~50 person-rem) of the total population radiological dose reported in the SWEIS. Concentrations of radionuclides in vegetation at LANL were largely unavailable when the SWEIS analyses were performed in the late 1990s. Given plant/soil uptake coefficients for some radionuclides in the published literature, concentrations of radionuclides in plants were largely based on concentrations in soil. Since the SWEIS, data have been compiled on concentrations of radionuclides in vegetation at LANL (Gonzales et al. 2003). If comparisons can be made between data used in the SWEIS with other, more recent, data on concentrations of radionuclides in plants, perspective can be gained on the change in vegetation as a radiation source term for wildfire. One concentration used in the SWEIS was 320 μg uranium per g of dry vegetation (μg/g-dry) collected in 1975 (Miera et al. 1980), which was from a sample collected where uranium concentrations in surface soils were 20 to 3,500 times background levels. This compares to <u>maximum</u> concentrations of 0.65 μg/g-dry in the bark of shrubs that were rooted in TRU waste material (Wenzel et al. 1987), 0.073[12] μg/g-dry in understory vegetation collected at one of 12 LANL Environmental Surveillance Program onsite locations in 1998 (Gonzales et al. 2000), 0.066[13] μg/g-dry in overstory vegetation at one of the same 12 locations and same year, 0.05[2] μg/g-dry in pine needles from the TA-16 WETF facility in 1985 (Fresquez and Ennis 1995), 0.72[2] μg/g-dry in overstory vegetation at the Dual-Axis Radiographic Hydronamic Test Facility in 2002 (Nyhan et al. 2003); and 1.5[14] μg/g-dry in piñon tree bark at a firing site in 2001 (Gonzales et al. 2003). Other than for total uranium, the SWEIS does not identify the concentrations used in source term calculations. Ignoring the other radionuclides, and based on the comparison of the total uranium concentration assumed in the SWEIS with other, more

[12] Computed using ash/dry weight ratio of 0.1 from Fresquez and Ferenbaugh (1999).
[13] Computed using ash/dry weight ratio of 0.08 from Fresquez and Ferenbaugh (1999).
[14] Computed by converting radioisotopic data to uranium mass data and using ash/dry weight ratio of 0.029 for bark from Gonzales et al. (2003).

recent, data on concentrations of total uranium in plants, the source term from vegetation used in the SWEIS is still bounding of any that would be calculated using other, more recent, concentration data. Thus, the predicted MEI dose from vegetation and soil in a site-wide fire remains less than one mrem. Although the Cerro Grande Fire burned only about 7,500 acres of forest within LANL, the estimated inhalation dose based on measurements by Kraig et al. (2001) supports our contention that vegetation (and soil) contributes very little radiation dose.

Conclusions

A new wildfire quantitative accident analysis (as described in a proposal by Gonzales et al. 2002) is needed at LANL to update the risk terms as required by DOE every five years. A slight reduction in the vulnerability of key buildings to wildfire as well as other factors leading up to a release of radiological materials from a wildfire resulted in an estimated chance of occurrence of about once in 20 years. The overwhelmingly dominant source of radiological risk from a wildfire at LANL in 1999 was building inventories of radiological materials, particularly inventories of the TWISP at TA-54 and the WETF. Given the same assumption—that it is credible to use a per-dome average inventory of radiological materials for the TWISP in the dose consequence estimates—the analysis in the SWEIS still bounds the current condition. However, a more conservative analysis would be to use the time-averaged inventory of Building 375, a new dome with about twice the capacity of other domes. An analysis using the Building 375 inventory should be conducted as part of the five-year update of the SWEIS. Also, the tritium inventory at the WETF is expected to increase, so the five-year update of the SWEIS in 2004 should use 2 kg as the MAR. Radiological inventories of only two facilities were surveyed for this assessment—inventories may have changed at other facilities and this should be assessed. Changes in fuel loads have possibly changed the pathways of potential fires and, with this, whether or not the continuity of fuels can still support postulated scenarios. The general public’s sensitivity to the subject of wildfires at LANL requires that accurate (quantitative) assessments are current. Furthermore, there are other types of risk, beyond radiological, associated with wildfire that take important information from wildfire accident analyses. As such, a scope and plan for a more thorough (quantitative) analysis of wildfire accidents at LANL have been developed.

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