SWEIS 1998 YEARBOOK

Comparison of 1998 Data to Projections of the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory

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Los Alamos
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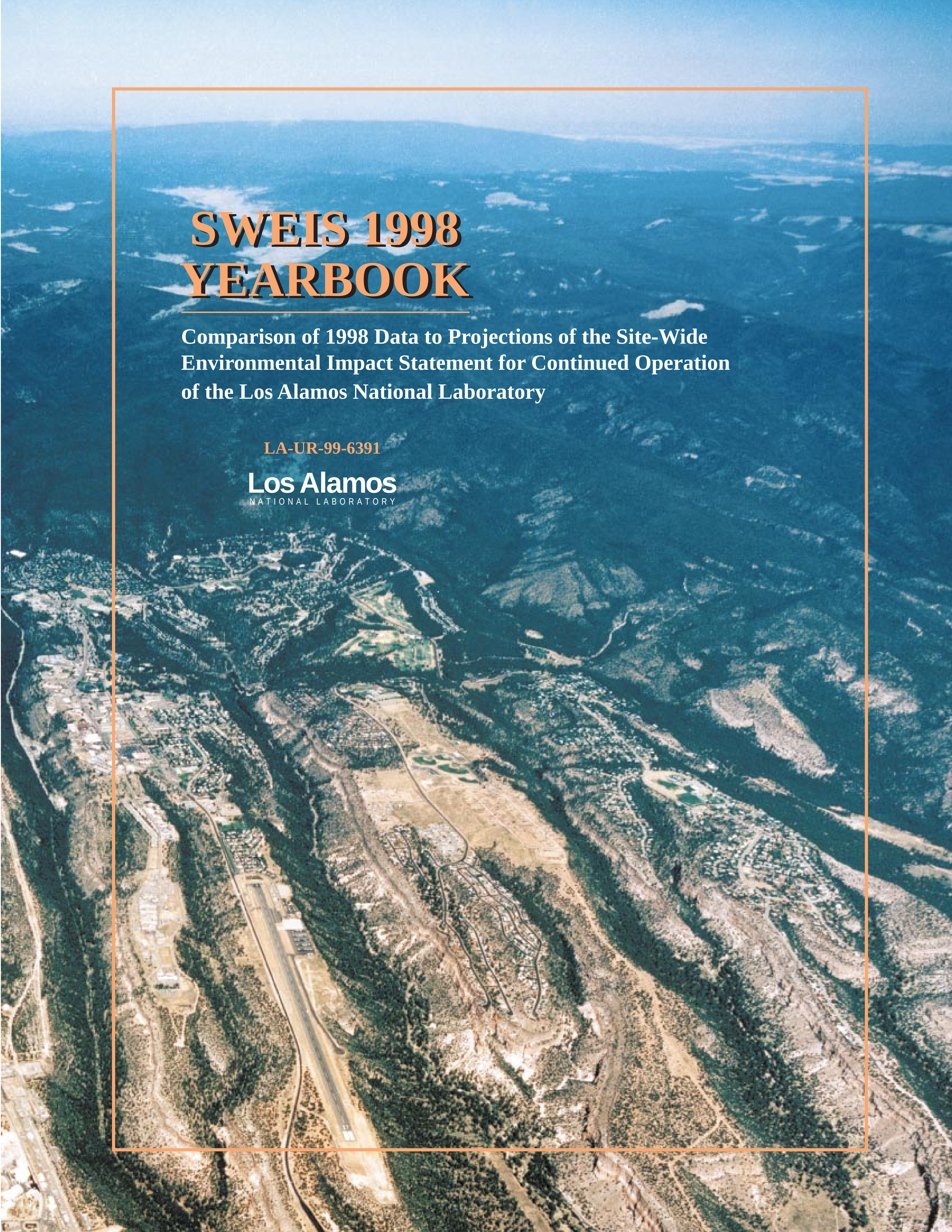

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Title: SWEIS 1998 Yearbook

Comparison of 1998 Data to Projections of the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National laboratory

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A LETTER FROM THE DEPUTY DIRECTOR FOR LABORATORY OPERATIONS

Welcome to the Laboratory's first Annual Yearbook for the Site-Wide Environmental Impact Statement.

As many of you may know, the DOE completed a Site-Wide EIS for LANL in 1999. Now, the Laboratory would like to capitalize on that investment. After discussing this idea with our DOE counterparts, we have decided to produce an annual yearbook that identifies how closely our actual operations are tracking to the projections made in the SWEIS. These data will enable us to better determine what our actual impacts to the local environs are and will provide a mechanism for collecting, evaluating, and organizing information to determine when additional National Environmental Policy Act coverage may be required.

This Yearbook is an innovative approach to capitalizing on the investment in a major NEPA document, the SWEIS for LANL. The Laboratory is looking forward to using the information presented in the Yearbook to manage our facilities and operations so that we assure that we are remaining within the SWEIS environmental envelope. In addition, the Yearbook presents a comprehensive look at the complexity of Laboratory operations and impacts that has not been readily available in the past. As a result, the Yearbook will make information on the Laboratory more accessible to the public and our employees.

As with any new product, we anticipate that changes in content, new methods of presenting information, or revamping of formats will result in an even more useful tool. Please take the opportunity to give us your suggestions.

To the Site-Wide Issues Project Office who brought this idea to fruition, you have our hearty congratulations. To the rest of the Laboratory, who contributed to this effort, and who continue to look for ways to reduce wastes, eliminate emissions, and improve processes, thank you for keeping our Laboratory within the operating envelope projected in the SWEIS.

Richard J. Burick
Deputy Director for Laboratory Operations

PREFACE

In the Record of Decision for the Stockpile Stewardship and Management Programmatic Environmental Impact Statement, the US Department of Energy (DOE) asked the Laboratory to accept several new challenges, including war reserve pit production.

The DOE evaluated the potential environmental impacts of these assignments in the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (DOE/EIS-0238, January 1999). This document, known as the SWEIS, was several years in the making, and represents a sizeable commitment of time, effort, and hard work by Laboratory staff in providing the necessary data and information to DOE. The SWEIS provided the basis for the DOE decisions to implement these new assignments at LANL through the Record of Decision issued in September 1999.

The SWEIS represents a substantial investment, costing about 21 million dollars. This first Annual Yearbook for the SWEIS is an effort to capitalize on that investment. Approximately one-third of this sum was spent at LANL developing, understanding, and then helping the EIS contractor to understand the connection between the work and/or activities at LANL and their environmental impacts. This type of information had been collected in the past in some areas at LANL on a project-by-project basis; the SWEIS filled in where this information did not exist and integrated the information across the Laboratory to provide the critical information needed to project the environmental impacts associated with the proposed actions. We firmly believe, and the SWEIS Annual Yearbooks should bear this out, that it is far more cost effective to maintain this information once it is developed then to start over every time a new NEPA document is required for a major action. In addition, the existence of this type of information will result in lower EIS contractor costs.

Second, DOE is often backed into making very conservative estimates of impacts from operational activities, and we make that claim in discussions with regulators and the public. However, without real data correlated to actual activities, these discussions of conservative estimates come across as hollow. A potential outcome of this approach is the expenditure of hundreds of thousands of dollars to mitigate "impacts" that, in some cases, are merely an artifact of conservative estimates. The use of real data is the only way a DOE decision-maker can make informed decisions about the right investments to mitigate real impacts.

Finally, the Annual Yearbook is a mechanism to provide operational data to neighboring communities. It is imperative that we share what we know (to the extent allowed by laws for protection of sensitive and classified information) with the communities; this is clearly a prerequisite for informed discussions and the establishment of a more trusting and cooperative relationship. Providing clear information regarding the emissions, exposures, etc. associated with the actual activities performed at LANL will, we believe, improve public confidence in DOE and LANL management, provide information that can catalyze discussions about real issues, and enhance our relationship with the communities surrounding LANL.

This is the first time (to my knowledge) that a major facility within the DOE Nuclear Weapons Complex has tracked actual operations data to projections made in an EIS, and we are excited about the practical applications of this innovative process. Not only should it demonstrate to our friends and neighbors that we are operating within the envelope established by the ROD and evaluated in the SWEIS, but we are also proactively taking steps to ensure that this information is readily available to all interested parties.

Corey Cruz
Director, Nuclear Programs Division
DOE/AL
(Formerly Program and Document Manager for the LANL SWEIS)

ACKNOWLEDGMENTS

The concept of an Annual Yearbook was developed soon after the SWEIS Project Office was established and is described in the 1995 Quality Management Plan as “making recommendations regarding the ongoing evaluation of Laboratory operations and the environmental envelope established by the SWEIS process.” Ann Pendergrass (LANL), Connie Soden (DOE/AL), Corey Cruz (DOE/AL), and Doris Garvey (LANL) were the creators of this concept and watched over its development. Their oversight and guidance was critical in moving the concept to reality. Without their involvement, the Yearbook would not have happened.

DOE and Laboratory management provided support and encouragement to the idea. Tom Gunderson (LANL), Mike Baker (LANL), Scott Gibbs (LANL), Denny Erickson (LANL), and John Ordaz (DOE/DP/HQ) played particularly important roles.

The Site-Wide Issues Project Office was the primary preparer of the report. Chief contributors were Doris Garvey, Ken Rea, Chris Del Signore, and Allen Valentine.

Many individuals throughout the Laboratory 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; however, all of these individuals cannot be mentioned here.

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

Pauline McCormick provided administrative support to the Project Office, keeping impeccable records so that information would not be lost.

Julie Johnston, Hector Hinojosa, Meghan Mee, Randy Summers, and Carolyn Hedrick provided editorial support, using text and photographs for a final product.

ACRONYMS

ATW	accelerator transmutation of wastes
BTF	Beryllium Technology Facility
Ci	curie
CMR	Chemical and Metallurgy Research
DARHT	Dual-Axis Radiographic Hydrodynamic Test (facility)
DCG	Derived Concentration Guideline
DOE	Department of Energy
EPA	Environmental Protection Agency
ER	Environmental Restoration (Project)
FTE	full-time equivalent (employee)
GWH	gigawatt-hours
HEWTF	High Explosives Wastewater Treatment Facility
HRL	Health Research Laboratory
JCNNM	Johnson Controls of Northern New Mexico
KW	kilowatt
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LAPP	Los Alamos Power Pool
LEDA	Low-Energy Demonstration Accelerator
LIDAR	light detection and ranging
LIFT	Los Alamos International Facility for Transmutation
linac	linear accelerator
LLW	low-level radioactive waste
LPSS	Long-Pulse Spallation Source
LWC	Lost Workday Cases Rate
m	meter
MEI	maximally exposed individual
MeV	million electron volts
MGY	million gallons per year
MLLW	mixed low-level radioactive waste
MSL	Materials Science Laboratory
MW	megawatt
NEPA	National Environmental Policy Act
NMED	New Mexico Environment Department
NMSF	Nuclear Materials Storage Facility
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PRS	potential release site
PTLA	Protection Technology Los Alamos
rem	roentgen equivalent man
RAMROD	Radioactive Materials Research, Operations, and Demonstration (facility)
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	record of decision

SNM	special nuclear material
SWEIS	Site-Wide Environmental Impact Statement
SSM PEIS	Stockpile Stewardship and Management Programmatic Environmental Impact Statement
TA	technical area
TEDE	total effective dose equivalent
TFF	Target Fabrication Facility
TRI	Total Recordable Incident Rate
TRU	transuranic
TSFF	Tritium Science and Fabrication Facility
TSTA	Tritium System Test Assembly (facility)
TWISP	Transuranic Waste Inspectable Storage Project
UC	University of California
UF/RO	ultrafiltration/reverse osmosis
WCRRF	Waste Characterization, Reduction, and Repackaging Facility
WETF	Weapons Engineering and Tritium Facility
WIPP	Waste Isolation Pilot Plant
WNR	Weapons Neutron Research (facility)

1.0 Introduction

1.1 The SWEIS

In 1999, the US Department of Energy (DOE) published a Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (DOE 1999a). Referred to as the SWEIS, this document provides a comprehensive and detailed projection of operations and environmental impacts at the Los Alamos National Laboratory (LANL) under each of four major operational alternatives for the ten-year period 1996–2005.

The four alternatives, developed in 1995–1996, were as follows:

No Action - a projection over the next ten years of a level of activity for facility operations that would implement current management plans for assigned programs. The projection was based on past operations and future known plans.

Expanded Operations - a projection over the next ten years of operations at a higher level through most of LANL. The projection represents a level that is possible to attain within the 10-year window, given an increased level of funding for programs, consistent with current and newly assigned missions. This alternative represents a "bounding case" in the sense that operations were maximized to the extent that could be supported by potential increased funding levels.

Reduced Operations - a scenario that would minimize the levels of operation, consistent with maintaining the capability to support DOE missions. This alternative would not fully support all mission elements assigned to LANL.

Greener - a scenario that would increase levels of operation in support of nonproliferation, basic science, and materials recovery and stabilization and reduce operations in support of defense and nuclear weapons activities. This alternative would not fully support all mission elements assigned to LANL.

The alternatives are more appropriately described as scenarios, since the operations included in each alternative were developed to represent a best estimate of activities, but were not intended to be a predictor of all future activities. Scenarios of operations were needed to develop the data that were subsequently used to project environmental consequences.

DOE issued a Record of Decision (ROD) in September 1999 (DOE 1999b). The ROD identified the decisions DOE made on the levels of operation for LANL for the foreseeable future. The ROD selected the Expanded Operations Alternative, with the exception that pit manufacturing would only be implemented at a nominal level of 20 pits per year. As a matter of policy, DOE postponed any decision to expand pit manufacturing beyond a nominal level of 20 pits per year in the near future (through the year 2007). DOE stated its intent to further study methods for implementing the production capacity announced in the Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SSM PEIS;

DOE 1996a). The long-term goal is the production of 50 pits per year (up to 80 pits per year using multiple shifts) as announced in the ROD for the SSM PEIS.

The SWEIS for LANL is a comprehensive review of operations, focusing on 15 Key Facilities, under the four different alternative futures. Information is provided on facility descriptions, capabilities, and operational levels. In addition, information was developed on the type and quantity of hazardous and radioactive material anticipated to be used; air, wastewater, and solid waste effluents that could be projected to result from the operations; and resource consumption. These data were developed for each Key Facility for each of the four alternatives.

1.2 Annual Yearbook

To make maximum use of the SWEIS, a National Environmental Policy Act (NEPA) document, DOE and LANL decided to implement a program that makes annual comparisons between SWEIS projections and actual operations. The role of the Yearbook is not to present environmental impacts or environmental consequences, but rather to provide data that could be used to develop an impact analysis in another NEPA document. The Yearbooks will focus on:

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

- the types and levels of operations during calendar year 1998 (Chapter 2). Types of operations are described using the 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 of measurement.

- operations data for the Key Facilities, comparable to data projected in the SWEIS (Chapter 2). Data for each facility includes waste generated, air emissions, liquid effluents, and number of workers.

- site-wide effects of 1998 operations (Chapter 3). These include measures such as number of workers, radiation doses, workplace incidents, utility requirements, air emissions, liquid effluents, and solid wastes. These effects also include changes in the regional aquifer, ecological resources, and other resources for which the DOE has long-term stewardship responsibilities as an owner of federal lands.

Data for the comparison comes 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 Yearbook will be published annually; 1998 is the first edition. It will provide DOE with the information needed to evaluate the adequacy of the SWEIS and will enable DOE to make a decision on when and if a new SWEIS is needed. The Yearbook will also be a guide to facilities and managers at the Laboratory 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 report thus serves as a guide to environmental information collected and reported by the various groups at LANL.

1.3 This Yearbook

The ROD selected the levels of operations, and the SWEIS provided projections for these operations. This report compares data from 1998 to the appropriate SWEIS projections. Hence, this report uses the phrase "SWEIS ROD projections" to convey this concept.

Using the ROD for projections introduces an anomaly, however, since LANL was not yet authorized to operate at the expanded level in 1998. Therefore, the 1998 data and descriptions in this Yearbook cannot be expected to track the Expanded Operations Alternative adopted in the 1999 ROD, but are more reflective of the No Action Alternative. The text makes an additional comparison to the No Action Alternative when appropriate. As discussed more fully below, this Yearbook deals with operations and events in 1998, prior to the SWEIS and the SWEIS ROD. Comparisons of actual operating levels and data with the projected levels and data in the SWEIS and the ROD will be useful in future years; however, the reader should not be misled by such comparisons for 1998. The Yearbook process was established in 1998 to initiate the practice of trending data against the projections in the SWEIS ROD. The main purposes of this initial Yearbook are to establish these processes, including the process of continual improvement, and to provide a forum for annual information on LANL operations to the public and to DOE.

This Yearbook does not present 1998 data for all the parameters discussed in the SWEIS. One of the assumptions made in the development of the Yearbook was that data used for comparison would be data that were already collected at LANL, or data for which only minor additional effort was required to make relevant and comparable. Where these conditions did not prevail, the Yearbook did not attempt to create data. For example, in the case of non-radioactive and hazardous air pollutants reported in the SWEIS, the DOE undertook a detailed analysis of chemical use at LANL and then modeled the potential impacts of that use for non-radioactive and hazardous air pollutants. The Yearbook did not undertake such a similar effort.

In one case, workforce size, the Yearbook established a new index that parallels, but is not the same as, the parameter used in the SWEIS. Estimates of the number of employees associated with each Key Facility were developed by a unique data collection effort for the SWEIS. The Yearbook established a new index, number of University of California (UC) employees, using the current LANL approach to tracking employees. Whereas the total number of employees at a location, including subcontractors, is difficult to ascertain, data are readily available for

UC employees by location. This new index can be duplicated in the future and hence can be used to provide some indication of workforce growth within a facility.

The collection of data on facility operations was 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 of the Yearbook. Therefore, although this required a special effort, the description of current operations and indications in the future of changes in operations was believed to be sufficiently important to warrant an incremental effort.

2.0 Facilities and Operations

The SWEIS noted that the "essence of operations at LANL lies in its various research and development and some fabrication activities, as well as the support activities. These serve as the foundation upon which new assignments and tasks build and rely." The SWEIS continues by acknowledging that "research and development activities are dynamic by their very nature, with the norm being continual change within the limits of facility capabilities, authorizations, and operating procedures" (DOE 1999a, p. 2-1).

LANL has more than 2,000 structures with approximately eight million square feet under roof, spread over an area of 43 square miles. In order to present a logical and comprehensive evaluation of the potential environmental impacts of LANL, the SWEIS developed the Key Facility concept. Fifteen facilities were identified which were both critical to meeting mission assignments and:

- housed operations that have the 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 due to DOE programmatic decisions.

The remainder of LANL was called "Non-Key," not to imply that the facilities were any less important to the accomplishment of critical research and development, but because they did not fit the above criteria (DOE 1999a, p. 2-17).

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% of all potential radiation doses to the public,
- more than 90% of all radioactive liquid waste generated at LANL,
- more than 90% of the radioactive solid waste generated at LANL, and
- more than 99% of all radiation doses to the LANL workforce.

In addition, the Key Facilities comprise 42 of the 48 Category 2 and Category 3 Nuclear Structures at LANL[1].

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[1] DOE Order 5480.23 (DOE 1992a) categorizes nuclear hazards as Category 1, Category 2, or Category 3. Because LANL has no Category 1 nuclear facilities (usually applied to nuclear reactors), definitions are presented for only Categories 2 and 3:
Category 2 Nuclear Hazard – has the potential for significant 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 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 Area Office as of December 1998 (DOE 1998a).

The definition of each Key Facility hinges upon operations[2], 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 Material Sciences Laboratory (MSL), to more than 400 for the Los Alamos Neutron Science Center (LANSCE). Key Facilities can also exist in more than a single TA, as is the case with the High Explosives Processing and High Explosives Testing 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 that have occurred over the past three years (1996–1998), the types and levels of operations that occurred during 1998, and operations data. Each of these three aspects is then given perspective by comparing them to projections made by the ROD. This comparison provides an evaluation of whether or not the data resulting from LANL operations continue to fall within the environmental envelope established by the ROD. It should be noted that construction activities projected by the ROD were for the ten-year period 1996–2005. Therefore, not all projected activities were completed by the end of 1998. In addition, the ROD was not issued until September 1999. Hence, operations and construction were more likely to be characterized by the levels of the No Action Alternative.

This chapter also discusses the "Non-Key Facilities," which include all buildings and structures not part of a Key Facility, or the balance of LANL. Although operations at the Non-Key Facilities do not contribute significantly to environmental risk, the Non-Key Facilities represent a significant fraction of LANL. The Non-Key facilities comprise all or the majority of 30 of LANL's 49 TAs, and approximately 15,500 of LANL's 27,820 acres. The Non-Key Facilities also employ about half the LANL workforce. This category includes such important buildings and operations as the Central Computing Facility, the Atlas Facility, the TA-46 sewage treatment facility, and the Physics Building. Table 2.0-1 identifies and compares the acreage of the 15 Key Facilities and the Non-Key Facilities.

Table 2.0-1. Key and Non-Key Facilities

Facility	Technical Areas	~Size (Acres)
Plutonium Complex	TA-55	93
Tritium Facilities	TA-16 & TA-21	312
Chemical and Metallurgy Research Building (CMR)	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	TAs 08, 09, 11, 22, 28, 37	1115

[2] 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 practical. Examples include modeling (e.g., atmospheric weather patterns) to subatomic investigations (e.g., using the LANSCE linear accelerator [linac]) to collaborative efforts with industry (e.g., fuel cells for automobiles). Production involves the 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. (Con't.)

Facility	Technical Areas	~Size (Acres)
High Explosives Testing	Tas 15, 16, 36, 39, 40	8691
LANSCE	TA-53	751
Health Research Laboratory (HRL)	TA-43	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		12,260
Non-Key Facilities	30 of 49 TAs	15,560
LANL		27,820

Finally, this chapter presents information about the Environmental Restoration (ER) Project. Although not a facility, the ER Project is a significant contributor to waste generation at LANL. As projected by the ROD, the ER Project will contribute 60% of the chemical wastes, 35% of the low-level radioactive waste (LLW), and 75% of the mixed LLW (MLLW) generated at LANL over the ten-year period of 1996–2005. The ER Project will also affect land resources in and around LANL. By cleaning canyons and decommissioning old structures, areas can be made available for LANL activities or for use by the public.

2.1 Plutonium Complex (TA-55)

The Plutonium Complex Key Facility, a 90-acre site, consists of six primary buildings and a number of lesser buildings and structures. As presented in the SWEIS, this Key Facility contains one operational Category 2 nuclear facility (TA-55-4) and one potential Category 2 nuclear facility (TA-55-41), which was undergoing modification to bring it into operational status. In addition, the facility contains two Low Hazard chemical facilities (TA-55-3 and TA-55-5) and one Low Hazard energy source facility (TA-55-7).

2.1.1 Construction and Modifications at the Plutonium Complex

The ROD projected four facility modifications:

- renovation of the Nuclear Material Storage Facility (NMSF; currently not in use);
- construction of a new administrative office building;
- upgrades within Building 55-4 to support continued manufacturing at the existing capacity of 14 pits per year; and
- further upgrades for long-term viability of the facility and to boost production to a nominal capacity of 20 pits per year.

During the period 1996–1998, upgrades to maintain existing capacity were the only modifications undertaken (although design commenced for a new office building). An example of such modifications was the 1996 installation of a new TA-55 Facility Control System with computers and controls located in the operations center. None of the ongoing construction or modifications at the Plutonium Key Facility resulted in modification to the facility hazard categories by the close of calendar year 1998.

2.1.2 Operations at the Plutonium Complex

The ROD identified seven capabilities[3] for this Key Facility. No new capabilities have been added, and none have been deleted. Although capabilities are a mixture of research and production, research was more prominent in 1998. Since the ROD was not signed until 1999, operations were more likely to be at levels at or below those projected for the No Action Alternative. For example, no war reserve pits were manufactured (versus nominally 20 per year projected by the ROD and 14 in the No Action Alternative); no more than 20 pits were disassembled (versus 65 projected by the ROD and 20 for the No Action Alternative); and only 120 curies of neutron sources were processed (versus 5000 curies projected by the ROD and 1000 for the No Action Alternative). Research was conducted in all areas projected by the ROD, including the preparation of 11 kilograms of mixed oxide fuel. For all seven capabilities, activity levels were below those projected by the ROD. Table 2.1.2-1 presents details.

Table 2.1.2-1. Plutonium Complex/Comparison of Operations

Capability	SWEIS ROD[a]	1998 Operations
Plutonium Stabilization	Recover, process, and store the existing plutonium inventory in eight years.	On schedule with focus on highest priority inventory items.
Manufacturing Plutonium Components	Produce nominally 20 war reserve pits/yr. (Requires minor facility modifications.)	There were no war reserve pits produced or accepted by DOE for transfer to the nuclear stockpile.
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.	Consistent with the No Action Alternative, no more than 20 pits were disassembled and no more than 20 pits were examined during 1998.
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 4 years) as part of disposition demonstration activities.	Fewer than 200 pits were disassembled/converted in 1998.
	Process neutron sources up to 5000 curies (Ci)/yr. Process neutron sources other than sealed sources.	Processed sources containing approximately 120 Ci in 1998.
	Process up to 400 kilograms/yr of actinides.[b] Provide support for dynamic experiments. Process 1 to 2 pits/month (up to 12 pits/yr) through tritium separation.	Processed approximately 140 kilograms of actinide material in 1998. Supported dynamic experiments. Processed 10 pits through tritium separation at TA-55.
	Perform decontamination of 28 to 48 uranium components per month.	Decontaminated/converted 24 uranium components in 1998.

[3] 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.

Table 2.1.2-1. (Con't.)

Capability	SWEIS ROD[a]	1998 Operations
Actinide Materials and Science Processing, Research, and Development (Con't.)	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 level. Small quantities of plutonium residues from Rocky Flats were processed.
	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.
	Fabricate and study nuclear fuels used in terrestrial and space reactors. Fabricate and study prototype fuel for lead test assemblies.	Minimal terrestrial and space reactor fuel development occurred in 1998.
	Develop safeguards instrumentation for plutonium assay.	Continued support of safeguards instrumentation development.
	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.	Manufactured approximately 11 kg of mixed oxide fuel in 1998.
Plutonium-238 Research, Development, and Applications	Process, evaluate, and test up to 25 kg/yr plutonium-238. Recycle residues and blend up to 18 kg/yr plutonium-238.	Recovered approximately 0.5 kg and processed approximately 1.5 kg of plutonium-238 in 1998.
Special Nuclear Materials (SNM) Storage, Shipping and Receiving	Store up to 6600 kilograms SNM in NMSF; continue to store working inventory in the vault in Building 55-4; ship and receive as needed to support LANL activities.	NMSF not operational as a storage vault. Building 55-4 vault levels remained approximately constant with 1996 levels.
	Conduct nondestructive assay on SNM at NMSF to identify and verify the content of stored containers.	NMSF not operational as a storage vault and was not used for nondestructive assay.

[a] Includes renovation of NMSF, 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 is not known, so the facility-specific impacts at each facility are 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

Operations data were below those projected by the ROD. For example, radioactive air emissions were less than one percent of projections (0.5 curie in 1998 versus 1000 curies projected) and quantities of transuranic (TRU) and mixed TRU wastes were also less than projected. Chemical waste quantities were the only parameter that exceeded projections (10,900 kilograms in 1998 versus 8400 kilograms projected to be generated). This was the result of the LANL-wide campaign to identify and dispose of chemicals no longer needed or used. 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 Lab-wide) were characterized, collected, and managed. Many items were sent to commercial facilities for treatment and disposal.

Details of operational data are presented in Table 2.1.3-1.

Table 2.1.3-1. Plutonium Complex/Operations Data

Parameter	Units[a]	SWEIS ROD	1998 Operations
Radioactive Air Emissions:			
Plutonium-239 [b]	Ci/yr	2.70×10^{-5}	6.20×10^{-8}
Tritium in Water Vapor	Ci/yr	$7.50 \times 10^{+2}$	4.80×10^{-1}
Tritium as a Gas	Ci/yr	$2.50 \times 10^{+2}$	1.40×10^{0}
NPDES Discharge: [c]			
03A– 181	MGY	14	8.5
Wastes:			
Chemical	kg/yr	8400	10,900
LLW	m^3/yr	754 [d]	242
MLLW	m^3/yr	13 [d]	1.3
TRU	m^3/yr	237 [d]	73
Mixed TRU	m^3/yr	102 [d]	17
Number of Workers	FTEs	1111	526 [e]

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

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

[c] NPDES is National Pollutant Discharge Elimination System.

[d] Includes estimates of waste generated by the facility upgrades associated with pit fabrication.

[e] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include Protection Technology Los Alamos (PTLA), Johnson Controls Northern New Mexico (JCNNM), and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

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

This Key Facility consists of tritium operations conducted at TA-16 and TA-21. Tritium operations are conducted primarily in three buildings: the Weapons Engineering and Tritium Facility (WETF, Building 16-205), the Tritium Systems Test Assembly (TSTA, Building 21-155), and the Tritium Science and Fabrication Facility (TSFF, Building 21-209). Operations involving the removal of tritium from actinide materials 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.

All three primary buildings housing tritium operations (e.g., WETF, TSTA, and TSFF) are Category 2 nuclear facilities. There are no Category 3 nuclear or Moderate Hazard nonnuclear facilities identified as part of this Key Facility.

2.2.1 Construction and Modifications at the Tritium Facilities

No major upgrades were made to the WETF at TA-16 during the period 1996–1998. However, significant remodeling to the adjacent building, TA-16-450, was begun with the goal of extending the WETF tritium processing area into Building 450 (as was projected by the ROD). Building 450 has not yet been connected to WETF, but the connection is anticipated to occur in the year 2000.

A new cooling tower was installed to replace the original TSTA cooling tower at TA-21 (LANL 1999a). This will reduce the amount of tritium released into the LANL liquid radioactive waste system. No other modifications to either TSTA or TSFF were made during the period 1996 to 1998.

In addition, three of the five outfalls were eliminated from the NPDES permit during 1997 and 1998 (DOE 1996b). Flows from Outfall 03A-036 at TA-21 were routed to the RLWTF for treatment with other radioactive liquids; floor drains that previously collected flow (water from washing floors) into 04A-091 at TA-16 have been plugged; and waters from the small sewage plant (Outfall 05S) at TA-21 are now being trucked to the TA-46 sewage facility for treatment.

2.2.2 Operations at the Tritium Facilities

The ROD identified nine capabilities for this Key Facility. No new capabilities have been added, and none have been deleted. Table 2.2.2-1 lists the nine capabilities identified in the SWEIS and presents calendar year 1998 operational data for each of these capabilities. Operations in 1998 were below projections by the ROD and remained within the established environmental envelope. For example, approximately 30 high-pressure gas fill operations were conducted in 1998 (versus 65 fills projected by the ROD), and approximately 25 gas-boost system tests and gas processing operations were performed (versus 35 projected).

Table 2.2.2-1. Tritium Facilities/Comparison of Operations

Capability	SWEIS ROD[a]	1998 Operations
High-Pressure Gas Fills and Processing: WETF	Handling and processing of tritium gas in quantities of up to 100 grams at WETF with no limit on number of operations per year. Capability used approximately 65 times/yr.	Approximately 30 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 at WETF. Capability used approximately 35 times/yr.	Approximately 25 gas boost tests and operations.
Cryogenic Separation: TSTA	Tritium gas purification and processing in quantities up to 200 grams at TSTA. Capability used five to six times/yr.	One cryogenic separation operation.
Diffusion and Membrane Purification: TSTA, TSFF, WETF	Research on tritium movement and penetration through materials. Expect six to eight experiments/month. Capability also used continuously for effluent treatment.	Approximately five to eight experiments/month. Capability not used for continuous effluent treatment.

Table 2.2.2-1. (Con't.)

Capability	SWEIS ROD[a]	1998 Operations
Metallurgical and Material Research: TSTA, TSFF, WETF	Capability involves materials research including metal getter research and application studies. Small quantities of tritium supports 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.
Thin Film Loading: TSFF (WETF by 1998)	Chemical bonding of tritium to metal surfaces. Current application is for tritium loading of neutron tube targets; perform loading operations up to 3000 units/yr.	Approximately 600 units were loaded. Operations occurred at both TSFF and WETF.
Gas Analysis: TSTA, TSFF, WETF	Analytical support to current capabilities. Operations estimated to contribute <5% of LANL's tritium emissions to the environment.	Continues at all three facilities. No changes in facility emissions from this activity.
Calorimetry: TSTA, 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.	Continues at WETF and TSFF. No changes 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. On-site storage could increase by a factor of 10 over 1995 levels, with most of the increase occurring at WETF.	The storage at TSTA and TSFF remained constant. The storage at WETF has increased by approximately 10% over 1995 levels.

[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 ROD. For example, radioactive air emissions totaled approximately 700 curies versus 2500 curies projected by the ROD, and a total of 37 cubic meters of LLW were generated, versus 480 projected. 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	1998 Operations
Radioactive Air Emissions:			
TA– 16/WETF, Tritium as a gas	Ci/yr	3.00×10^{2}	2.3×10^{1}
TA– 16/WETF, Tritium in water vapor	Ci/yr	5.00×10^{2}	2.2×10^{2}
TA– 21/TSTA, Tritium as a gas	Ci/yr	1.00×10^{2}	1.3×10^{1}
TA– 21/TSTA, Tritium in water vapor	Ci/yr	1.00×10^{2}	6.9×10^{1}
TA– 21/TSFF, Tritium as a gas	Ci/yr	6.40×10^{2}	7.3×10^{1}
TA– 21/TSFF, Tritium in water vapor	Ci/yr	8.60×10^{2}	3.1×10^{2}
NPDES Discharge:			
Total Discharges	MGY	0.33	13.7
05S (Sewage Treatment Plant) (TA-21)	MGY	0.00	Eliminated-1998
02A- 129 (TA-21)	MGY	0.11	13.0
03A- 036 (TA-21)	MGY	0.00	Eliminated-1997
03A- 158 (TA-21)	MGY	0.22	0.7
04A- 091 (TA-16)	MGY	0.00	Eliminated-1997

Table 2.2.3-1. (Con't.)

Parameter	Units	SWEIS ROD	1998 Operations
Wastes:			
Chemical	kg/yr	1700	0
LLW	m^3/yr	480	37
MLLW	m^3/yr	3	0
TRU/Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	123	31 [a]

[a] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.3 Chemistry and Metallurgy Research Building (TA-03)

The CMR Building Key Facility serves as a production, research, and support center for actinide chemistry and metallurgy research and analysis, for uranium processing, and for fabrication of weapon components. It consists of the main building (TA-3-29) and a radioactive liquid waste pump house, TA-3-154. The main two-story building has a central corridor and seven wings. With 550,000 square feet of floor space, CMR is the largest building at LANL. It is a Category 2 nuclear facility, primarily because of hot cell activities in Wing 9 and the quantities of nuclear material in the storage vault.

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.

There was activity on only one of these five, the Phase I Upgrades, during the period 1996–1998. By the end of 1998, five of the 11 Phase I Upgrades had been completed. An approximation of complete project status is shown in Table 2.3.1-1.

Table 2.3.1-1. CMR Upgrade Project/Phase I Status/December 1998

% Complete	*	Upgrade
95		1. Continuous air monitors in building wings
100	*	2. Heating, ventilation, and air conditioning blowers
80		3. Wing electrical systems
70	*	4. Power distribution system
90	*	5. Stack monitoring system
100	*	6. Uninterruptible power supply for stack monitors in wings

Table 2.3.1-1. (Con't.)

% Complete	*	Upgrade
90		7. Interim improvements to the duct washdown system
40		8. Improvements to acid vents and drains
100		9. Modify the sanitary sewer system
100		10. Fire hazard analysis
100		11. Engineering assessment and conceptual design

*Indicates progress in 1998.

2.3.2 Operations at the CMR Building

CMR operations were suspended, in response to safety considerations, from September 2, 1997, until April 17, 1998, at which time the DOE authorized resumption of normal operations. This suspension restricted 1998 operational levels to levels well below those projected by the ROD. The eight capabilities for this Key Facility identified in the SWEIS are presented in Table 2.3.2-1. For comparison purposes, levels at which these capabilities were operated during 1998 are also listed.

Table 2.3.2-1. Chemistry and Metallurgy Research Building (TA-03)/Comparison of Operations

Capability	SWEIS ROD[a]	1998 Operations
Analytical Chemistry	Sample analysis in support of a wide range of actinide research and processing activities. Approximately 7000 samples/yr.	Approximately 4000 samples were analyzed.
Uranium Processing	Activities to recover, process, and store LANL highly enriched uranium inventory by 2005. Includes possible recovery of materials resulting from manufacturing operations.	No activity.
Destructive and Nondestructive Analysis	Evaluate 6 to 10 secondaries/yr through destructive/nondestructive analysis and disassembly.	Performed nondestructive analysis on two secondaries.
Nonproliferation Training	Nonproliferation training involving SNM. No additional quantities of SNM, but may work with more types of SNM than in 1995.	No activity. Project inactive.
Actinide Research and Processing [b]	Process up to 5000 Ci/yr plutonium-238/beryllium and americium-241/beryllium neutron sources. Process neutron sources other than sealed sources. Stage up to 1000 plutonium-238/beryllium and americium-241/beryllium sources in Wing 9 floor holes.	Received a few small-quantity sources. Level well below that projected by the SWEIS ROD.
	Introduce research and development effort on spent nuclear fuel related to long-term storage, and analyze components in spent and partially spent fuels.	No activity.

Table 2.3.2-1. (Con't.)

Capability	SWEIS ROD[a]	1998 Operations
Actinide Research and Processing[b] (continued)	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.	Performed microstructural characterization tests on approximately 50 samples. No research and development on pits exposed to high temperatures.
	Analysis of TRU waste disposal related to validation of the Waste Isolation Pilot Plant (WIPP) performance assessment models. TRU waste characterization. Analysis of gas generation such as could occur in TRU waste during transportation to WIPP. Performance Demonstration Program to test nondestructive analysis/nondestructive examination equipment. Demonstrate actinide decontamination technology for soils and materials. Develop actinide precipitation method to reduce mixed wastes in LANL effluents.	No decontamination technology activity. Studies on TRU waste and WIPP performance assessment models ongoing.
Fabrication and Metallography	Produce 1080 targets/yr, each containing approximately 20 grams uranium-235, for the production of molybdenum-99, plus an additional 20 targets/wk for 12 wks. Separate fission products from irradiated targets to provide molybdenum-99. Ability to produce 3000 six-day curies of molybdenum-99/wk. [c]	Coated approximately 300 targets for molybdenum-99.
	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 kg highly enriched uranium per operation. Material recovered and retained in inventory. Up to 1000 kg annual throughput.	No activity.

[a] Includes completion of Phase I and II Upgrades, except for seismic upgrades, modifications for the fabrication of Molybdenum-99 (Mo-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 kg/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 kg/yr.

[c] Mo-99 is a radioactive isotope that decays to form metastable Technicium-99, a radioactive isotope that has broad applications in medical diagnostic procedures. Both isotopes are short-lived, with half-lives (the time in which the quantity of the isotope is reduced by 50 percent) of 66 hours and 6 hours, respectively. These short half-lives make these isotopes both attractive for medical use (minimizes the radiation dose received by the patient) and highly perishable. Production of these isotopes is therefore measured in "six-day curies," the amount of radioactivity remaining after six days of decay, which is the time required to produce and deliver the isotope to hospitals and other medical institutions.

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 ROD. Radioactive air emissions were less than one curie (versus 1645 projected)—principally due to the fact that the processing of irradiated molybdenum-99 targets in the hot cells did not occur in 1998. In addition, less than ten percent of projected LLW were generated. Table 2.3.3-1 provides details of these and other operational data.

Table 2.3.3-1. Chemistry and Metallurgy Research Building (TA-03)/Operations Data

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions:			
Total Actinides	Ci/yr	7.60×10^{-4}	2.62×10^{-5}
Selenium-75	Ci/yr	Not Projected	6.66×10^{-6}
Krypton-85	Ci/yr	1.00×10^{2}	Not measured
Xenon-131m	Ci/yr	4.50×10^{1}	Not measured
Xenon-133	Ci/yr	1.50×10^{3}	Not measured
Tritium Water	Ci/yr	Negligible	Not measured
Tritium Gas	Ci/yr	Negligible	Not measured
NPDES Discharge:			
03A– 021	MGY	0.53	3.2
Wastes:			
Chemical	kg/yr	10,800	3310
LLW[a]	m^3/yr	1820	130
MLLW	m^3/yr	19	4.5
TRU	m^3/yr	28	13
Mixed TRU[a]	m^3/yr	13	16
Number of Workers	FTEs	367	218[b]

[a] Wastes (e.g., 4000 m^3 LLW) from the Phase II CMR Upgrades are included.

[b] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.4 Pajarito Site (TA-18)

The Pajarito Site Key Facility is located entirely at TA-18. The facility consists of a main building (18-30), three outlying, remote-controlled critical assembly buildings known as kivas (18-23, -32, -116), and a number of additional support buildings, including the hillside vault (18-26). Principal activities are the design and performance of nuclear criticality experiments and detector development in support of emergency response, nonproliferation, and arms control. This Key Facility has five Hazard Category 3 nuclear facilities (the hillside vault for nuclear material storage, two kivas, and two additional research buildings), and one Category 2 nuclear facility (Kiva #2). The Key Facility is dedicated to research and development.

2.4.1 Construction and Modifications at the Pajarito Site

The ROD projected replacement of the portable linear accelerator (linac). However, neither this nor any other major changes to nuclear criticality experimental facilities or other research facilities at TA-18 occurred during the period 1996–1998.

2.4.2. Operations at the Pajarito Site

The SWEIS identified nine capabilities for this Key Facility. No new research capabilities have been added, and none have been deleted. The TA-18 facility experienced a safety-stand down on August 12, 1998, that lasted into April 1999. As a result, only a limited number (54) of criticality experiments were performed during 1998, along with more than 100 subcritical tests. This total of 154 experiments is approximately a factor of seven below the ROD projection of a maximum of 1050 experiments in any given year. In addition, only a slight (~5%) increase in nuclear material stored at TA-18 has occurred, versus the projected increase of 20% over 1994 inventory levels, and there has not been 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

Activities	SWEIS ROD[a]	1998 Operations
Dosimeter Assessment and Calibration	Perform up to 1050 criticality experiments per year.	Performed 54 experiments.
Detector Development	Develop safeguards instrumentation and perform research and development for nuclear materials, LIDAR [b] experiments, and materials processing. Increase nuclear materials inventory by 20%, and replace portable linac.	Same activities as in 1995. Increased nuclear materials inventory by 5%. Did not replace the portable accelerator.
Materials Testing	Perform up to 1050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, LIDAR experiments, and materials processing.	Performed 54 experiments.
Subcritical Measurements	Perform up to 1050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, LIDAR experiments, and materials processing. Increase nuclear materials inventory by 20%.	Performed 54 experiments. Increased nuclear materials inventory by 5%.
Fast-Neutron Spectrum	Perform up to 1050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, LIDAR experiments, and materials processing. Increase nuclear materials inventory by 20%, and increase nuclear weapons components and materials.	Performed 54 experiments. Increased nuclear materials inventory by 5%. Slight increase in nuclear weapons components and materials.
Dynamic Measurements	Perform up to 1050 criticality experiments per year. Develop safeguards instrumentation and perform research and development for nuclear materials, LIDAR experiments, and materials processing. Increase nuclear materials inventory by 20%.	Performed 54 experiments. Increased nuclear materials inventory by 5%.
Skyshine Measurements	Perform up to 1050 criticality experiments per year.	Performed 54 experiments.
Vaporization	Perform up to 1050 criticality experiments per year.	Performed 54 experiments.

Table 2.4.2-1. (Con't.)

Activities	SWEIS ROD[a]	1998 Operations
Irradiation	Perform up to 1050 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 54 experiments. Increased nuclear materials inventory by 5%.

[a] Includes replacement of the portable linac.

[b] Light detection and ranging.

2.4.3 Operations Data for the Pajarito Site

Research activities were well below those projected by the ROD; consequently, operations data were also well below 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 (MEI). The dose estimated to result from 1998 activities was 3 millirem, versus 28.5 millirem per year projected by the ROD. Chemical waste generation exceeded projections (4560 kilograms generated in 1998 versus 4000 projected), but this was the result of the LANL-wide effort to identify and dispose of chemicals no longer needed. Operational data are detailed in Table 2.4.3-1.

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

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions:			
Argon-41 [a]	Ci/yr	1.02×10^{2}	1.8×10^{-1}
External Penetrating Radiation	mrem/yr	28.5 [b]	3
NPDES Discharge	MGY	No outfalls	No Outfalls
Wastes:			
Chemical	kg/yr	4000	4560
LLW	m^3/yr	145	4
MLLW	m^3/yr	1.5	0.3
TRU/Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	95	65 [c]

[a] These values are not stack emissions. The SWEIS ROD projections are from Gaussian plume dispersion modeling. Values are from the first 394-foot (120-meter) radius. Other isotopes (nitrogen-13 and oxygen-15) are not shown due to very short half-lives. Values for 1998 were estimated by using Monte Carlo modeling.

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

[c] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

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 (BTF) (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. This Key Facility has two Category 3 nuclear facilities (03-66 and 03-159).

2.5.1 Construction and Modifications at the Sigma Complex

Significant facility changes for the Sigma Building itself were projected by the ROD. Table 2.5.1-1 below indicates that three of five planned upgrades have been completed.

Table 2.5.1-1. Upgrades Planned for Sigma, Building 03-66

Description	Completed?
Seismic upgrades	No
Roof replacement	Yes [a]
Replacement of graphite collection systems	Yes
Modification of the industrial drain system	Yes
Replacement of electrical components	No

[a] Largely completed in 1998; continued into 1999.

In addition, the BTF was constructed as a new facility located within an existing structure. The facility, formerly known as the Rolling Mill Building, is a concrete frame, two-story building with masonry walls, originally completed in the early 1960s. The facility was completely reconfigured in 1998 through a decontamination and decommissioning project that removed all process equipment and building support systems, including the electrical distribution system and the heating, ventilation, and air conditioning system. Facility layout was changed; new electrical, plumbing, and heating, ventilation, and air conditioning systems were installed; and seismic upgrades were made to meet current requirements. The result is a state-of-the-art beryllium processing facility. The BTF has 16,000 square feet of floor space, of which 13,000 are used for beryllium operations. The remaining 3000 square feet will be used for general metallurgical activities. 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 BTF, and will include energy and weapons-related use of beryllium metal and beryllium oxide. The BTF construction project began in 1997 and was completed in mid-1999.

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 have been deleted. As indicated in Table 2.5.2-1, activity levels for all capabilities were less than levels projected by the ROD.

Table 2.5.2-1. Sigma Complex/Comparison of Operations

Capability	SWEIS ROD[a]	1998 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.

Table 2.5.2-1. (Con't.)

Capability	SWEIS ROD[a]	1998 Operations
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.	Modest increase in research and development. Totals of 255 jobs and 1200 specimens.
	Analyze up to 36 tritium reservoirs/yr.	Total of 36 tritium reservoirs analyzed.
	Develop library of aged non-SNM materials from stockpiled weapons and develop techniques to test and predict changes. Store and characterize up to 2500 non-SNM component samples, including uranium.	Less than 2500 non-SNM component samples, including uranium, stored in library.
Fabrication of Metallic and Ceramic Items	Fabricate stainless steel and beryllium components for about 80 pits/yr.	Fabricated two development pits from existing components.
	Fabricate up to 200 tritium reservoirs per year.	Total of 36 reservoirs fabricated.
	Fabricate components for up to 50 secondaries per year.	Evaluated less than 50 components. Fabricated 10 secondaries.
	Fabricate nonnuclear components for research and development: about 100 major hydrotests and 50 joint test assemblies/yr.	Fabricated components for less than 100 major hydrotests and for less than 50 joint test assemblies.
	Fabricate beryllium targets.	None produced.
	Fabricate targets and other components for accelerator production of tritium research.	One radiofrequency cavity produced.
	Fabricate test storage containers for nuclear materials stabilization.	None produced.
	Fabricate nonnuclear (stainless steel and beryllium) components for up to 20 pit rebuilds/yr.	None produced.

[a] Includes Sigma Building renovation and modifications for BTF.

2.5.3 Operations Data for the Sigma Complex

Levels of research and operations were less than those projected by the ROD; consequently, operations data were also below projections. Waste volumes, except for chemical wastes, radioactive air emissions, and NPDES discharge volumes were all lower than projected by the ROD. Chemical waste volumes exceeded projections as a result of the LANL-wide campaign to identify and dispose of chemicals no longer needed. Table 2.5.3-1 provides details.

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

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions:			
Americium-241	Ci/yr	Not Projected	9.30×10^{-9}
Uranium-234	Ci/yr	6.60×10^{-5}	1.30×10^{-9}
Uranium-238	Ci/yr	1.80×10^{-3}	6.20×10^{-9}

Table 2.5.3-1. (Con't.)

Parameter	Unit	SWEIS ROD	1998 Operations
NPDES Discharge:			
Total Discharges	MGY	7.3	12.7
03A–022	MGY	4.4	12.7
03A–024	MGY	2.9	No Discharge
Wastes:			
Chemical	kg/yr	10,000	22,500
LLW	m^3/yr	960	3
MLLW	m^3/yr	4	0
TRU/ Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	284	110 [a]

[a] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.6 Materials Science Laboratory (TA-03)

The MSL Key Facility is a single laboratory building (03-1698) containing 27 labs, 60 offices, 21 materials research areas, and support rooms. The building, a two-story structure with approximately 55,000 square feet of floor space, was first opened in November 1993. Activities are all related to research and development of materials science. This Key Facility is categorized as a Low Hazard nonnuclear facility.

2.6.1 Construction and Modifications at the MSL

There were no facility modifications during the three-year period 1996–1998. As indicated in the SWEIS, completion of the second floor is under consideration, but has not yet been funded.

2.6.2 Operations at the MSL

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 have been deleted. In 1998, MSL was one of only three LANL facilities that conducted operations at levels approximating those projected by the ROD. (HRL and the Non-Key Facilities were the other two.) This is not surprising since MSL is a new facility that responds to the variability of research and development funding.

There were approximately 105 researchers and support staff at MSL, about 30% more than the 82 projected by the ROD. (The primary measurement of activity for this facility is the number of scientists doing research.) This increase was accomplished by having researchers share offices and labs and reflects the high value placed on the MSL due to its quality lab space. Table 2.6.2-1 compares 1998 operations to projections made by the ROD.

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

Capability	SWEIS ROD[a]	1998 Operations
Materials Processing	Maintain seven research capabilities at 1995 levels: • 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.	Unlike projections, microwave processing was not performed, and materials syntheses/processing was not expanded. The other five capabilities were maintained as projected in the SWEIS ROD.
Mechanical Behavior in Extreme Environment	Maintain two research capabilities at 1995 levels: • 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).	Mechanical testing was maintained as projected, and dynamic testing was expanded as projected. Fabrication and assembly was not performed, however. A new research capability was developed for research into materials failure and fracture.
Advanced Materials Development	Maintain four research capabilities at 1995 levels of research: • New materials • Synthesis and characterization • Ceramics • Superconductors	Three capabilities were maintained as projected in the SWEIS ROD. Synthesis and characterization was not performed, however.
Materials Characterization	Maintain four research capabilities at 1995 levels: • 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.	As projected in the SWEIS ROD, four capabilities were maintained at 1995 levels, and corrosion characterization was expanded to develop surface modification technology. Electron microscopy was also expanded, but plasma source ion implantation was not developed.

[a] Includes completion of the second floor of MSL.

2.6.3 Operations Data for the MSL

The size of the MSL workforce has increased from three years ago, from ~80 workers then to ~105 now, and significantly exceeds the workforce of 82 projected by the ROD. The operational effects of this increased workforce and of increased activity, however, have been smaller than projected. Waste quantities were lower than projected, and radioactive air emissions continue to be negligible. Table 2.6.3-1 provides details.

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

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions	Ci/yr	Negligible	Not measured
NPDES Discharge Volume	MGY	No outfalls	No outfalls
Wastes:			
Chemical	kg/yr	600	244
LLW	m^3/yr	0	0
MLLW	m^3/yr	0	0
TRU/Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	82	57 [a]

[a] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.7 Target Fabrication Facility (TA-35)

The TFF is a two-story building (35-213) containing approximately 48,000 square feet of production areas and 13,000 square feet of offices. Activities are related to weapons production and laser fusion research. This Key Facility is categorized a Low Hazard chemical 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 treatment facility at TA-50.

2.7.1 Construction and Modifications at the Target Fabrication Facility

Process discharges from Outfall 04A-127 have been routed to the sewage facility at TA-46, and the outfall has been eliminated from the NPDES permit (DOE 1996b). There were no other significant facility additions or modifications during the period 1996–1998. 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. No new capabilities have been added, and none have been deleted. The primary measurement of activity for this facility is production of targets for research and testing (laser and physics testing). In 1998, approximately 1200 targets and specialized components were fabricated for testing purposes, which is less than the 6100 targets per year projected by the ROD. As seen in the Table 2.7.2-1, other operations at the TFF were also below levels projected by the ROD.

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

Capability	SWEIS ROD	1998 Operations
Precision Machining and Target Fabrication	Provide targets and specialized components for about 6100 laser and physics tests/yr, including a 20% increase over 1995 levels in high-explosive pulsed-power target operations, and including about 100 high-energy-density physics tests.	Provided targets and specialized components for about 1200 tests. Supported high-explosive pulsed-power tests at 1995 levels. Supported about 25 high-energy-density physics tests.
Polymer Synthesis	Produce polymers for targets and specialized components for about 6100 laser and physics tests/yr, including a 20% increase over 1995 levels in high-explosive pulsed-power target operations, and including about 100 high-energy-density physics tests.	Produced polymers for targets and specialized components for about 600 tests. Supported high-explosive pulsed-power tests at 1995 levels. Supported about 15 high-energy-density physics tests.
Chemical and Physical Vapor Deposition	Coat targets and specialized components for about 6100 laser and physics tests/yr, including a 20% increase over 1995 levels in high-explosive pulsed-power target operations, including about 100 high-energy-density physics tests, and including support for pit rebuild operations at twice 1995 levels.	Coated targets and specialized components for about 600 tests. Supported high-explosives pulsed-power tests at 1995 levels. Supported about 25 high-energy-density physics tests. Provided no support for pit rebuild operations.

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 in 1995 and below levels projected by the ROD. This summary is supported by the current workforce of about 70 (which is the same size as in 1995) and by 1998 waste volumes, which were less than projected. Table 2.7.3-1 details operations data for 1998.

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

Parameter	Units	SWEIS ROD	1998 Operations
Radiological Air Emissions	Ci/yr	Negligible	Not measured
NPDES Discharge:			
04A–127	MGY	0	Eliminated
Wastes:			
Chemical	kg/yr	3800	2830
LLW	m^3/yr	10	0
MLLW	m^3/yr	0.4	0
TRU/Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	98	57 [a]

[a] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.8 Machine Shops (TA-03)

The Machine Shops Key Facility consists of two buildings, the Beryllium Shop (Building 03-39) with about 134,000 square feet of floor space, and the Uranium Shop (Building 03-102) with about 12,500 square feet of floor space. Activities consist of machining and fabrication of various materials in support of major LANL operations, principally those related to the processing and testing of high explosives and weapons components. Building 03-39 is categorized as a Low Hazard chemical facility, due in part to beryllium operations, while Building 03-102 is categorized as a Low Hazard radiological facility, due to uranium operations.

2.8.1 Construction and Modifications at the Machine Shops

There has been only one facility modification over the three-year period 1996–1998. In the center wing of Building 03-39, Room 26 has been put to use as the central weapons information center for the Information and Records Management Group of the Computing, Information, and Communications Division. Room 26 had been empty (DOE 1996c). In the future, beryllium equipment will be moved from Room 16 in the north wing of Building 03-39 to Building 03-141, the BTF (part of the Sigma Key Facility). The move will be conducted in phases and will not likely be completed before the year 2000.

2.8.2 Operations at the Machine Shops

As shown in Table 2.8.2-1, the SWEIS identified three major capabilities at the shops. These same three capabilities continue to be maintained to support customers at LANL. No new capabilities have been added to this Key Facility, and none have been deleted. All activities occurred at levels well below those projected by the ROD and, in fact, were below levels projected for the No Action Alternative. The workload at the Shops is directly linked with high explosives testing and processing operations. Much of the effort of staff for high explosive testing and processing in 1998 was directed to the development and construction of the Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility. This resulted in a significant decrease in high explosive testing and production, and subsequently, a significant reduction in workload for the Shops.

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

Capability	SWEIS ROD	1998 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 far below those projected in the SWEIS ROD.
Fabrication Utilizing Unique Materials	Continue fabrication utilizing unique and unusual materials.	Fabrication with unique materials was conducted at levels far below those projected by the SWEIS ROD.

Table 2.8.2-1. (Con't.)

Capability	SWEIS ROD	1998 Operations
Dimensional Inspection of Fabricated Components	Provide appropriate dimensional inspection of above fabrication activities. Undertake additional types of measurements/inspections.	Dimensional inspection was provided for the above fabrication activities. Additional types of measurements and inspections were not undertaken.

2.8.3 Operations Data for the Machine Shops

Since activities were well below projections by the ROD, so too were operations data. For example, emissions of uranium-238 (3.6×10^{-8} curies in 1998) were only 0.02% of projected radioactive emissions of 1.5×10^{-4} curies per year. Similarly, chemical waste generation was less than 0.1% of projected generation (4400 kilograms generated in 1998, versus 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	1998 Operations
Radioactive Air Emissions:			
Plutonium-238	Ci/yr	Not Projected[a]	2.00×10^{-10}
Thorium-228	Ci/yr	Not Projected	2.30×10^{-9}
Thorium-230	Ci/yr	Not Projected	6.80×10^{-9}
Thorium-232	Ci/yr	Not Projected	1.40×10^{-9}
Uranium-234	Ci/yr	Not Projected	1.70×10^{-5}
Uranium-235	Ci/yr	Not Projected	5.80×10^{-7}
Uranium-238	Ci/yr	1.50×10^{-4}	3.60×10^{-8}
NPDES Discharge	MGY	No outfalls	No outfalls
Wastes:			
Chemical	kg/yr	474,000	4400
LLW	m^3/yr	606	27
MLLW	m^3/yr	0	0.3
TRU/Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	289	83 [b]

[a] The SWEIS ROD did not contain projections for these radioisotopes.

[b] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

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 TAs. Building types consist of production and assembly facilities, analytical laboratories, explosives storage magazines, and a facility for the treatment of contaminated wastewaters. Activities consist primarily of the manufacture and assembly of high explosives components for nuclear weapons and for science-based stockpile stewardship program tests and experiments. Production activities are centered in buildings at TA-16 (with 280,000 square feet under roof), TA-09 (60,000 square feet), and TA-22 (50,000 square feet). TA-28 and TA-37 are magazine storage areas. Environmental and safety tests are performed at TA-11 and TA-09 while TA-08 houses radiography activities. This Key Facility has four Category 2 nuclear buildings in TA-08 (08-22, -23, -24, -70) and no Category 3 nuclear or Moderate Hazard nonnuclear facilities.

2.9.1 Construction and Modifications at High Explosives Processing

Four facility modifications were projected by the ROD for this Key Facility:

- construction of the High Explosives Wastewater Treatment Facility (HEWTF) (completed);
- the modification of 17 outfalls, and their elimination from the NPDES permit (completed);
- relocation of the Weapons Components Testing Facility; and
- the TA-16 steam plant conversion (completed).

The HEWTF, designated as TA-16-1508, became fully operational in 1997. The facility treats process waters via sand filtration (to remove particulate high explosives) and activated carbon (to remove organic compounds and dissolved high explosives). For processing facilities not located at TA-16, wastewaters are trucked to the treatment facility.

For this Key Facility, a total of 19 outfalls were eliminated during 1997 and 1998 from the NPDES permit (i.e., two more than projected by the ROD). The HEWTF enabled the elimination of nine of these. Another seven outfalls (containing no high explosives) were eliminated by routing flows to the sewage facility at TA-46. Only three outfalls from High Explosives Processing remain on the NPDES permit: 03A-130, 05A-055 (the HEWTF), and 05A-097.

Energy-efficient, satellite steam boilers that provide steam for each major TA-16 building or cluster of buildings were placed into service in 1997. This permitted subsequent shutdown of the old, gas-fired, central steam plant for TA-16.

Other facility changes occurred during the period 1996–1998 are described below.

(a) A real time, small component radiography capability was installed in building TA-16-260 in 1998. When this capability becomes fully operational, buildings TA-16-220, -222, -223, -224, -225, and -226 will be vacated (DOE 1997a).

(b) The high explosives casting and inert (mock high explosives) processing operations were moved from buildings TA-16-300 and -302 to building TA-16-260. A Joint Nuclear Weapons Training Facility has been set up in Buildings TA-16-300 and -302 (DOE 1996d).

(c) Old casting and storage buildings TA-16-164 and -88 along with six nearby WWII-vintage machining and inspection buildings plus associated support structures have been removed under the Laboratory's Decontamination and Decommissioning program (DOE 1997b).

(d) Planning and modification work at TA-9 began to allow consolidation of high explosives formulation operations previously conducted at TA-16-340 with other TA-9 high explosives operations. Closure of building TA-16-340 will follow in FY2000 (DOE 1999c).

(e) The explosive material storage magazines at TA-28 are used for PTLA support and are no longer required to support high explosives processing operations.

(f) Burn operations at the high explosives-contaminated combustible trash incinerator, structure 16-1409, have ceased. A draft closure plan has been submitted to the State of New Mexico. Following State approval of this plan, the incinerator will be dismantled and decommissioned. This is currently planned for FY2000.

2.9.2 Operations at High Explosives Processing

The ROD identified six capabilities for this Key Facility. No new capabilities have been added, and none have been deleted. Activity levels during 1998, however, were well below those projected. High explosives processing levels projected by the ROD were based on the possibility that LANL would take over high explosives production work being performed at Pantex Plant. DOE has decided, however, to keep high explosives production at Pantex. As a result, projected high explosives processing levels at LANL have not been reached.

As seen in Table 2.9.2-1, high explosives and plastics development and characterization operations increased less than 10% from the projected No Action Alternative levels. Considerable efforts were expended during 1998 in setting up protocols for obtaining stockpile returned materials, developing new test methods, and procuring 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]	1998 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. (Con't.)

Capability	SWEIS ROD[a,b]	1998 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.	Fabricated approximately 950 high explosives parts in support of the weapons program, including high explosives characterization studies, sub-critical experiments, hydro tests, 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.	Eleven major assemblies were provided for hydrodynamic, Nevada Test Site sub-critical, 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.	Fifteen stockpile related safety and mechanical tests were performed during 1998.
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 resulted in the manufacture of 10 product lines in 1998.

[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 ROD are 82,700 pounds of explosives and 2910 pounds of mock explosives. Actual amounts used in 1998 were 8150 pounds of explosives and 3225 pounds of mock explosives.

[b] Includes construction of the HEWTF, the steam plant conversion, relocation of the Weapons Testing Facility, and outfall modifications.

About 8150 pounds of high explosives and 1750 pounds of inert mock high explosives material were used in the fabrication of test components. A total of 3225 pounds of inert mock high explosives was fabricated during 1998, a portion of which was provided to other DOE facilities. The level of high explosives usage was significantly below the ROD projection of 82,700 pounds of high explosives, while the usage of mock high explosives was slightly higher than the projection of 2910 pounds.

At the HEWTF, 58,900 pounds of high explosives contaminated non-combustible materials were flashed, 9032 pounds of high explosives were open air burned, and 56,906 gallons of water were processed. Again, these levels were well below those projected by the ROD.

2.9.3 Operations Data for High Explosives Processing

The details of operations data are provided in Table 2.9.3-1. NPDES discharge volume was 17 million gallons, versus a projection of 12 million gallons. Waste quantities were similar to projections made by the ROD, with the exception of chemical wastes (48,600 kilograms generated during 1998, versus a projection of 13,000 kilograms per year). This increase was a result of the LANL-wide campaign to identify and dispose of chemicals no longer used or needed. This Legacy Materials Cleanup Project, completed in September 1998, required facilities, including the High Explosives Processing Key Facility, to locate and inventory all materials for which a use could no longer be identified. All such materials (more than 22,000 items Lab-wide) were then characterized, collected, and managed. Many items were sent to commercial facilities for treatment and disposal.

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	1998 Operations
Radioactive Air Emissions:			
Uranium-238	Ci/yr	9.96×10^{-7}	[a]
Uranium-235	Ci/yr	1.89×10^{-8}	[a]
Uranium-234	Ci/yr	3.71×10^{-7}	[a]
NPDES Discharge:			
Number of outfalls	----	22	4
Total Discharges	MGY	12.4	17.1
02A–007 (TA-16)	MGY	7.4	Eliminated-1998
03A–130 (TA-11)	MGY	0.04	0.1
04A–070 (TA-16)	MGY	0.0	Eliminated-1997
04A–083 (TA-16)	MGY	0.0	Eliminated-1997
04A–092 (TA-16)	MGY	0.0	Eliminated-1998
04A–115 (TA-08)	MGY	0.0	Eliminated-1997
04A–157 (TA-16)	MGY	0.0	Eliminated-1997
05A–053 (TA-16)	MGY	0.0	Eliminated-1998
05A–054[b] (TA-16)	MGY	3.6	6.3
05A–055 (TA-16)	MGY	0.13	8.9
05A–056 (TA-16)	MGY	0.0	Eliminated-1998
05A–066 (TA-09)	MGY	0.74	Eliminated-1998
05A–067 (TA-09)	MGY	0.33	Eliminated-1998
05A–068 (TA-09)	MGY	0.06	Eliminated-1998
05A–069 (TA-11)	MGY	0.01	Eliminated-1998
05A–071 (TA-16)	MGY	0.04	Eliminated-1998
05A–072 (TA-16)	MGY	0.0	Eliminated-1997
05A–096 (TA-11)	MGY	0.01	Eliminated-1998
05A–097 (TA-11)	MGY	0.01	1.8
06A–073 (TA-16)	MGY	0.0	Eliminated-1998
06A–074 (TA-08)	MGY	0.0	Eliminated-1997
06A–075 (TA-08)	MGY	0.0	Eliminated-1998
Wastes:			
Chemical	kg/yr	13,000	48,600
LLW	m^3/yr	16	6
MLLW	m^3/yr	0.2	0
TRU/Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	335	201 [c]

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

[b] Outfall 05A-054 had discharges only part of the year. Process flows were routed to the HEWTF, and this outfall was then eliminated from the NPDES permit.

[c] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

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

The High Explosives Testing Key Facility is located in all or parts of five TAs, comprises about one-third of the land area occupied by LANL, and has 13 associated firing sites. All firing sites are in remote locations and/or within canyons. Major buildings are located at TA-15, and include the DARHT facility (Building TA-15-312), PHERMEX (TA-15-184), and the TA-15-306 firing site supporting the Ector Multi-diagnostic Hydrodynamic Test Facility. Building types consist of preparation and assembly facilities, bunkers, analytical laboratories, explosives storage magazines, and offices. Activities consist primarily of testing high explosives components for nuclear weapons. This Key Facility has no Category 2 or Category 3 nuclear buildings and no Moderate Hazard nonnuclear facilities.

2.10.1 Construction and Modifications at High Explosives Testing

Construction of the DARHT building (TA-15-312) continued. Construction began in 1992–1994, but was interrupted for two years pending resolution of a lawsuit. Construction resumed in 1996, has continued through the present, and is estimated to be completed in 2002. Installation and checkout of the accelerator and its associated control and diagnostics systems began in 1999. Operations may begin in 2000. The DARHT cooling tower became operational in July 1998.

DARHT was the only facility construction or modification projected by the ROD. Other facility changes have occurred over the past three years, however, as described below:

- The Hydrodynamic Test Operations Control building (TA-15-484) was constructed and became operational in the spring of 1999 (LANL 1996).

- The Access Control Building (TA-15-446) became operational in 1998 (DOE 1993).

- The Ector Multi-diagnostic Hydrotest accelerator was taken out of service. (The Ector firing site TA-15-306 will remain an active firing site, however.)

In addition, 12 of 14 outfalls were eliminated from the NPDES permit during 1997 and 1998. Process changes included the installation of equipment to filter and recycle water, plugging of drains from floors and idle equipment, and routing some waters (that do not contain high explosives) to the sewage plant at TA-46.

2.10.2 Operations at High Explosives Testing

The ROD identified seven capabilities for this Key Facility. None of these have been deleted, and no new capabilities have been introduced. Levels of research were below those predicted by the ROD and, for some capabilities, below research levels of prior years. Table 2.10.2-1 identifies the operational capabilities discussed in the SWEIS and presents 1998 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

121 kilograms were expended in 1998, versus approximately 3900 kilograms projected by the 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]	1998 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 6900 lb/yr (over all activities).	Hydrodynamic tests were conducted in 1998 at a level far below those projected in the SWEIS (see Table 2.10.3-1).
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 far below those projected in the SWEIS (see Table 2.10.3-1).
Explosives Research and Testing	Conduct high explosives tests to characterize explosive materials.	Explosives research and testing were conducted at a level far below those projected in the SWEIS (see Table 2.10.3-1).
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 far below those projected in the SWEIS (see Table 2.10.3-1).
High-Explosives Pulsed-Power Experiments	Conduct experiments and development tests.	Experiments were conducted at a level far below those projected in the SWEIS (see Table 2.10.3-1).
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 far below those projected in the SWEIS (see Table 2.10.3-1).
Other Explosives Testing	Develop advanced high explosives or weapons evaluation techniques.	Other explosives testing were conducted at a level far below those projected in the SWEIS (see Table 2.10.3-1).

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

2.10.3 Operations Data for High Explosives Testing

Much of the effort of staff for high explosives processing and testing in 1998 was directed to the development and construction of DARHT. This resulted in a significant decrease in high explosives testing and production operations from historical levels. As a result, and as presented in Table 2.10.3-1, operations data indicate that materials used and the effects of research during 1998 were considerably less than projections made by the ROD. For example, only 444 kilograms of chemical waste were generated in 1998 versus a projected 35,300 kilograms per year. In addition, no radioactive wastes (LLW, MLLW, TRU wastes, or mixed TRU wastes) were generated in 1998.

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	1998 Operations
Radioactive Air Emissions:			
Depleted Uranium	Ci/yr	1.5×10^{-1} [a]	[b]
Chemical Usage: [c]			
Aluminum [d]	kg/yr	45,450	624
Beryllium	kg/yr	90	1
Copper [d]	kg/yr	45,630	14
Depleted Uranium	kg/yr	3930	121
Lead	kg/yr	240	2
Tantalum	kg/yr	300	5
Tungsten	kg/yr	300	0
NPDES Discharge:			
Number of outfalls	----	14	4
Total Discharges	MGY	3.6	1.9
03A–028 (TA-15)	MGY	2.2	0.5
03A–185 (TA-15)	MGY	0.73	1.2
04A–101 (TA-40)	MGY	0.0	Eliminated-1997
04A–139 (TA-15)	MGY	None	Eliminated-1997
04A–141 (TA-39)	MGY	0.0	Eliminated-1997
04A–143 (TA-15)	MGY	0.018	Eliminated-1997
04A–156 (TA-39)	MGY	0.0	Eliminated-1997
06A–079 [e] (TA-40)	MGY	0.54	0.1
06A–080 (TA-40)	MGY	0.03	Eliminated-1998
06A–081 (TA-40)	MGY	0.03	Eliminated-1998
06A–082 (TA-40)	MGY	0.0	Eliminated-1998
06A–099 (TA-40)	MGY	0.0	Eliminated-1997
06A–100 [e] (TA-40)	MGY	0.04	0.1
06A–123 (TA-15)	MGY	0.0	Eliminated-1998
Wastes:			
Chemical	kg/yr	35,300	444
LLW	m^3/yr	940	0
MLLW	m^3/yr	0.9	0
TRU/Mixed TRU [f]	m^3/yr	0.2	0
Number of Workers	FTEs	619	93 [g]

[a] The isotopic composition of depleted uranium is approximately 99.7% uranium-238, approximately 0.3% uranium-235, and approximately 0.002% 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, consistent with the SWEIS Expanded Operations Alternative description (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 that are evaluated in the DARHT EIS (DOE 1995).

[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 06A-079 and 06A-100 had discharges only part of the year. Process flows were routed to the HEWTF, and these outfalls were then eliminated from the NPDES permit.

[f] TRU waste (steel) will be generated as a result of DARHT's Phased Containment Option (see DARHT EIS [DOE 1995]).

[g] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

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 53-03, which houses the linac itself has approximately 315,000 square feet under roof. Activities consist of neutron science research, the development of accelerators and diagnostic instruments, and the production of medical radioisotopes. The majority of the LANSCE Key Facility is composed of the 800-MeV linac, a Proton Storage Ring, and three experimental areas: the Manuel Lujan Neutron Scattering Center, the Weapons Neutron Research (WNR) facility, and Areas A/B/C. Area C is the location of proton radiography experiments for the Stockpile Stewardship Program. Area A, formerly used for materials irradiation experiments and isotope production, is currently inactive, and a new isotope production facility will be constructed in the near future. Construction of a second accelerator, the Low-Energy Demonstration Accelerator (LEDA), began in 1997. LEDA is currently in the commissioning phase.

This Key Facility has two Category 3 nuclear activities, experiments using neutron scattering by actinides in Experimental Areas ER-1 and ER-2 (Buildings 53-07 and 53-30) and the 1L neutron production target in Building 53-07. Basis of Interim Operations documents form the authorization bases for these nuclear activities. A Draft Safety Assessment Document, currently being revised, forms the authorization basis for the LANSCE accelerator; and the LEDA Safety Assessment Document has been approved by DOE. There are no Category 2 nuclear facilities and no Moderate Hazard nonnuclear facilities at TA-53. (Note: When approved by DOE, the authorization basis for the explosives operations, i.e., proton radiography in Experimental Area C and resonance neutron spectroscopy in the Blue Room at the WNR facility, is likely to be Moderate Hazard. Similarly, the new isotope production facility, when constructed, is likely to be classified as Moderate Hazard.)

2.11.1 Construction and Modifications at LANSCE

Significant facility changes and expansion were projected by the ROD to occur at LANSCE by December 2005. Table 2.11.1-1 below indicates that one project was completed during the three-year period 1996–1998, and that two others have been started.

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

Description	SWEIS Ref.	Completed?
Eliminate NPDES outfall 03A-145 from the Orange Box Bldg.	2-88-R	Yes (a)
Closure of two former sanitary lagoons	2-88-R	No (b)
LEDA to become operational in late 1998	2-89-R	Started (c)
Short-Pulse Spallation Source enhancements	2-90-L	Started (d)
One-MW target/blanket	2-91-L	No
New 100-MeV Isotope Production Facility	2-92-L	No (e)
Long-Pulse Spallation Source (LPSS), including decontamination and renovation of Area A	3-25-L	No
Dynamic Experiment Lab	3-25-R	No (f)
Los Alamos International Facility for Transmutation (LIFT)	3-25-R	No
Exotic Isotope Production Facility	3-27-L	No
Decontamination and renovation of Area A-East	3-27-L	No

[a] Outfall 03A-145 was associated with a small swamp cooler for the Orange Box Conference and Office Building (53-06). There was no flow from the outfall. Outfalls 03A-146 and 03A-125 were also eliminated from the NPDES permit in 1997 and 1998, respectively. Although no flows are expected because the cooling units have been or are scheduled to be removed, discharge piping for all three outfalls have been tied in to the sanitary sewer instead and have thus been routed to the sewage plant at TA-46.

[b] The two former sanitary lagoons have been removed from the list of areas to undergo Resource Conservation and Recovery Act closure. Instead, cleanup will be performed as a Corrective Action. The ER Project has recently started this cleanup, with some sampling conducted during 1998.

[c] LEDA started high-power conditioning of the radio-frequency quadrupole power supply in November 1998. It has been designed for a maximum energy of 12 MeV, not the 40 MeV projected by the ROD. The first trickle of proton beam was produced in March 1999. Design power levels have not yet been achieved.

[d] Part of the Short-Pulse Spallation Source upgrades have been performed. Upon completion, the project will upgrade the Proton Storage Ring to 200 µamps and 30 hertz (vs. 70 µamps and 20 hertz); will upgrade Experimental Area ER-1 to 160 KW (vs. 55 KW at present); and will add 5–7 neutron-scattering instruments at the Lujan Center. Through the end of 1998, the Proton Storage Ring upgrade had been completed. New instruments will be installed beginning in 1999.

[e] Preparations began in the spring of 1999 for construction of the new 100-MeV Isotope Production Facility.

[f] The Stockpile Stewardship Program is currently using Experimental Area C, Building 53-03P, 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 not yet materialized.

In addition to these projected construction activities, a new warehouse was erected at the east end of the mesa. The warehouse is used to store equipment and other materials formerly placed outdoors and has improved the appearance of the grounds at TA-53 (DOE 1998b).

2.11.2 Operations at LANSCE

The SWEIS identified seven capabilities for the LANSCE Key Facility. No new capabilities have been added, and none have been deleted. The primary indicator of activity for this facility is production of the 800-MeV LANSCE proton beam. In 1998, H^+ beam was generated for 1335 hours at an average current of 740 microamps, which was less than the 6400 hours at 1250 microamps projected by the ROD, and less than the 5100 hours at 1000 microamps projected for the No Action Alternative. Since the ROD was not signed until 1999, operations were more likely to be at levels at or below those projected for the No Action Alternative. In turn, the reduced beam time meant that those activities reliant upon the 800-MeV beam also were conducted at lower levels. These activities include the production of medical isotopes (12 targets irradiated versus 50 projected), experiments using neutrons, and fewer weapons-related experiments using either protons or neutrons. In addition, there were no experiments conducted for transmutation of wastes. Table 2.11.2-1 provides details.

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

Capability	SWEIS ROD [a]	1998 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 (6400 hrs). Positive ion current 1250 microampere and negative ion current of 200 microampere.	Positive ion beam for 1335 hours at an average current of 740 microampere. Negative ion beam delivered, at varying currents, to Areas A, B, C, WNR facility, and Lujan Center for up to 1127 hours.

Table 2.11.2-1. (Con't.)

Capability	SWEIS ROD[a]	1998 Operations
Accelerator Beam Delivery, Maintenance, and Development (Con't.)	Reconfigure beam delivery and support equipment to support new facilities, upgrades, and experiments. [a]	Completed the upgrade to H(-) injectors to the Proton Storage Ring in the fall of 1998.
	Commission/operate/maintain LEDA for 10 to 15 yrs; operate up to approximately 6600 hrs/yr.	Started conditioning the radio-frequency quadrupole power supply in November 1998. No beam was generated in 1998.
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 conducted, per projections of the SWEIS ROD.
	Increased power demand for LANSCE linac and LEDA radio-frequency operation.	Started conditioning the radio-frequency quadrupole power supply for LEDA in November 1998.
Neutron Research and Technology [b]	Conduct 1000 to 2000 experiments/yr using Manuel Lujan Center, WNR facility, and LPSS. Establish LPSS in Area A (requires modification).	A far fewer number of experiments, since the linac operated only 1135 hours. LPSS was not constructed.
	Conduct accelerator production of tritium target neutronics experiment for six months.	Accelerator production of tritium target neutronics experiments were begun in Experimental Area C in 1997 and were completed in 1998.
	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 kg 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 and/or depleted uranium. • No shock wave experiments.
	Provide support for static stockpile surveillance technology research and development.	Support was not provided for surveillance research and development.
Accelerator Transmutation of Wastes (ATW) [c]	Conduct lead target tests for two yrs at Area A beam stop.	No tests.
	Implement LIFT (Establish one-megawatt, then five-megawatt ATW target/blanket experiment areas) adjacent to Area A.	Neither the target/blanket experiment nor LIFT were constructed.
	Conduct five-megawatt experiments for 10 months/yr for four yrs using about three kg of actinides.	No experiments.

Table 2.11.2-1. (Con't.)

Capability	SWEIS ROD[a]	1998 Operations
Subatomic Physics Research	Conduct 5 to 10 physics experiments/yr at Manuel Lujan Center, WNR facility, and LPSS.	From 5 to 10 experiments were conducted in 1998.
	Continue neutrino experiment through Fiscal Year 1997.	The neutrino experiment, extended one year, concluded in September 1998.
	Conduct proton radiography experiments, including contained experiments with high explosives.	Experiments were conducted, including contained experiments with high explosives.
Medical Isotope Production	Irradiate up to approximately 50 targets/yr for medical isotope production.	Production began in November 1998. Twelve targets were irradiated.
	Added production of exotic, neutron-rich, and neutron-deficient isotopes (requires modification of an existing target area).	No production of neutron-rich/deficient isotopes.
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 was conducted.

[a] Includes the completion of proton and neutron radiography facilities, the LEDA, the isotope production facility relocation, the Short-Pulsed Spallation Source enhancement, and the LPSS.

[b] Numbers of neutron experiments represent plausible levels of activity. Bounding conditions for the consequences of operations are primarily determined by i) length and power of beam operation and ii) maintenance and construction activities.

[c] Formerly, Accelerator-Driven Transmutation Technology.

H(+) = proton (positively charged hydrogen ion), H(-) = negatively charged hydrogen ion

2.11.3 Operations Data for LANSCE

Since levels of operations were less than those projected by the ROD, most operations data were also less than projected. Radioactive air emissions are a key parameter since LANSCE emissions account for more than 95% of the total LANL off-site dose. Emissions in 1998 totaled 7875 curies, about 86% of total LANL radioactive air emissions. The 1998 total exceeded projections of the ROD (4185 curies), but were less than both historical emissions and the ten-year average of 16,800 curies per year projected by the ROD. Actual emissions exceeded projections for the year 1998 because the SWEIS had assumed that the LPSS was under construction and that the linac was idle in 1998.

Waste generation (except chemical wastes), NPDES discharge volumes, and utility consumption were also all below projected quantities. Table 2.11.3-1 provides details. Chemical waste volumes of 55,300 kilograms exceeded projections of 16,600 kilograms per year. As at other Key Facilities, this was the result of a LANL-wide campaign to identify and dispose of chemicals no longer needed or used.

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

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions:			
Argon-41	Ci/yr	7.44×10^{1}	1.52×10^{2}
Arsenic-73	Ci/yr	Not Projected[a]	1.26×10^{-4}
Beryllium-7	Ci/yr	Not Projected[a]	1.16×10^{-4}
Bromine-76	Ci/yr	Not Projected[a]	3.65×10^{-2}
Bromine-77	Ci/yr	Not Projected[a]	3.55×10^{-2}
Bromine-82	Ci/yr	Not Projected[a]	7.71×10^{-3}
Carbon-10	Ci/yr	2.65×10^{0}	1.87×10^{2}
Carbon-11	Ci/yr	2.96×10^{3}	3.38×10^{3}
Chlorine-39	Ci/yr	Not Projected[a]	3.25×10^{0}
Mercury-197	Ci/yr	Not Projected[a]	6.12×10^{-3}
Nitrogen-13	Ci/yr	5.35×10^{2}	1.28×10^{3}
Nitrogen-16	Ci/yr	2.85×10^{-2}	1.50×10^{2}
Oxygen-14	Ci/yr	6.61×10^{0}	5.87×10^{1}
Oxygen-15	Ci/yr	6.06×10^{2}	2.66×10^{3}
Potassium-40	Ci/yr	Not Projected[a]	7.62×10^{-5}
Scandium-44M	Ci/yr	Not Projected[a]	5.81×10^{-7}
Sodium-24	Ci/yr	Not Projected[a]	1.82×10^{-4}
Tritium as Water	Ci/yr	Not Projected[a]	3.79×10^{0}
Vanadium-48	Ci/yr	Not Projected[a]	5.29×10^{-6}
LEDA Projections (8-yr average):			
Oxygen-19	Ci/yr	2.16×10^{-3}	Not measured
Sulfur-37	Ci/yr	1.81×10^{-3}	Not measured
Chlorine-39	Ci/yr	4.70×10^{-4}	Not measured
Chlorine-40	Ci/yr	2.19×10^{-3}	Not measured
Krypton-83m	Ci/yr	2.21×10^{-3}	Not measured
Others	Ci/yr	1.11×10^{-3}	Not measured
NPDES Discharge:			
Total Discharges	MGY	81.8	53.4
03A–047	MGY	7.1	13.5
03A–048	MGY	23.4	19.1
03A–049	MGY	11.3	20.1
03A–113	MGY	39.8	0.7
03A–125	MGY	0.18	Eliminated-1998
03A–145	MGY	0.0	Eliminated-1998
03A-146	MGY	Not Projected[b]	Eliminated-1997
Wastes:			
Chemical	kg/y	16,600	55,300
LLW	m^3/yr	1085 [c]	16
MLLW	m^3/yr	1	0.4
TRU/Mixed TRU	m^3/yr	0	0
Utilities:			
Electric Power	Megawatts	63	25
Electricity	Gigawatt-hours	437	65
Water	MGY	265	90
Number of Workers	FTEs	856	547 [d]

[a] The SWEIS ROD did not contain projections for these radioisotopes.

[b] This outfall was not listed in the SWEIS.

[c] LLW volumes include decommissioning and renovation of Experimental Area A (Building 53-03M) due to the LPSS project.

[d] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.12 Health Research Laboratory (TA-43)

The HRL Key Facility includes the main HRL (Building 43-01) and 13 support buildings. Research focuses on the effects of different types of radiation and chemicals on cells and cellular components. There are several Low Hazard nonnuclear buildings within this Key Facility, but no Moderate Hazard nonnuclear facilities and no nuclear facilities.

2.12.1 Construction and Modifications at HRL

A two-story, 4500-square-foot wing was dedicated and opened at Building 43-01 in June 1997. The wing has laboratories on the first floor and offices on the second and is primarily used for cytometry research. Although this facility modification was not forecast by the ROD, a NEPA review was conducted, resulting in a Categorical Exclusion for the expansion project (LANL 1995).

In addition to the new wing, process waters from cooling of a laser were routed in 1998 to the County sewage treatment facility in Bayo Canyon. As a result, there were no discharges from this Outfall 03A-040 in 1998, and it will likely be eliminated from the NPDES permit. As projected by the ROD, the outfall still exists, but is used only for the discharge of storm waters from the roofs and parking lots. Finally, the animal colony was downsized substantially in 1996 and 1997 and should be eliminated entirely in 1999.

2.12.2 Operations at HRL

The SWEIS identified eight capabilities for the HRL Key Facility. No new capabilities have been added, but neurobiology research has been deleted. (This research capability still exists at LANL; it has simply been relocated to the Physics Building at TA-03 [Building 03-40]). In 1998, HRL was one of only three LANL facilities that conducted operations at levels approximating those projected by the ROD. (MSL and the Non-Key Facilities were the other two.) This is not surprising since HRL responds to the variability of research and development funding.

There were approximately 250 researchers and support staff at HRL, the same number as projected by the ROD. (The primary measurement of activity for this facility is the number of scientists doing research.) Levels of research were greater than they were in 1995 for all capabilities, and two areas of research exceeded ROD projections. Primary reasons for this growth include the human genome project, the study of environmental effects, and research into structural cell biology. Table 2.12.2-1 compares 1998 operations to projections made by the ROD for each of the research capabilities at HRL.

Table 2.12.2-1. Health Research Laboratory (TA-43)/Comparison of Operations

Capability	SWEIS ROD	1998 Operations
Genomic Studies (LS-3) [a]	Conduct research utilizing molecular and biochemical techniques to analyze the genes of animals, particularly humans. Develop strategies at current levels to analyze the nucleotide sequence of individual genes, especially those associated with genetic disorders, and to map genes and/or genetic diseases to locations on individual chromosomes. Part of this work is to map each nucleotide, in sequence, of each gene in all 46 chromosomes of the human genome. (50 FTEs [b])	Activities increased ~10% above 1995 levels to 43 FTEs, but were below projections made by the SWEIS ROD.
Cell Biology (LS-4)	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. (35 FTEs)	Activities increased ~15% above 1995 levels to 29 FTEs, but were below projections made by the SWEIS ROD.
Cytometry (LS-5)	Conduct research utilizing laser imaging systems to analyze the structures and functions of subcellular systems. (40 FTEs)	Activities increased 10% above 1995 levels to 33 FTEs, but were below projections by the SWEIS ROD.
DNA Damage and Repair (LS-6)	Research using isolated cells to investigate DNA repair mechanisms. (35 FTEs)	Activities increased ~30% above 1995 levels to 32 FTEs, but remained below projections by the SWEIS ROD.
Environmental Effects (LS-7)	Research identifies specific changes that occur in DNA and proteins in certain microorganisms after events in the environment. (25 FTEs)	Activities increased 50% above 1995 levels to 30 FTEs and have exceeded projections by the SWEIS ROD.
Structural Cell Biology (LS-8)	Conduct research utilizing chemical and crystallographic techniques to isolate and characterize the properties and three-dimensional shapes of DNA and protein molecules. (15 FTEs)	Activities increased 130% above 1995 levels to 23 FTEs and have exceeded projections by the SWEIS ROD.
Neurobiology (P-21)	Conduct research using magnetic fields produced in active areas of the brain to map human brain locations associated with certain sensory and cognitive functions. Instrumentation is sensitive magnetic detection devices. (9 FTEs)	Activities relocated to another LANL facility. (No FTEs)
In-Vivo Monitoring (ESH-4)	Perform 3000 whole-body scans/yr as a service as part of the LANL personnel monitoring program, which supports operations with radioactive materials conducted elsewhere at LANL. (5 FTEs)	Conducted 1068 whole-body scans and 1737 other counts (detector studies, quality assurance measurements, etc.). (5 FTEs)

[a] Indicates Groups within the former Life Sciences Division (re-named the Bioscience Division in 1999) except for P-21 (Biophysics Group) and ESH-4 (Health Physics Measurements Group).

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

2.12.3 Operations Data for HRL

Research levels have increased significantly in most areas at the HRL Key Facility, largely due to growth in the human genome project. Despite the relocation of one of its eight capabilities, HRL was home to approximately 250 employees by the end of 1998, a 35%

increase from staffing levels in 1995. Two of the remaining seven capabilities currently have activity levels greater than those projected by the ROD, and the other five are conducted at levels somewhat lower than projected by the ROD. Construction of a new wing in 1997 was necessary to accommodate some of the additional research.

As seen in Table 2.12.3-1, however, the effects of this increased workforce and of increased activity have been smaller than projected. The generation of all types of waste (chemical, biological, LLW, and MLLW) have actually decreased from historical levels and were smaller than projections.

Table 2.12.3-1. Health Research Laboratory (TA-43)/Operations Data

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions	Ci/yr	Not estimated	Not measured
NPDES Discharge: [a]			
03A–040	MGY	2.5 [b]	No discharge [c]
Wastes:			
Chemical	kg/yr	13,000	2370
Biomedical Waste	kg/yr	280 [d]	<60
LLW	m^3/yr	34	3
MLLW	m^3/yr	3.4	0
TRU/Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	250	82 [e]

[a] Outfall 03A–040 consisted of one process outfall and nine storm drains.

[b] Storm water only.

[c] Process flows were routed in 1998 to the Bayo Canyon sewage plant operated by the County.

[d] Animal colony and the associated waste. The animal colony was downsized substantially in the 1996 to 1997 period; waste in 1997 (calendar) was 75 kg.

[e] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

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, the production of medical radioisotopes, and support services to other LANL organizations, primarily through radiological and chemical analysis of samples. TA-48 contains five major research buildings: the Radiochemistry Laboratory (Building 48-01), the Isotope Separator Facility (48-08), the Diagnostic Instrumentation and Development Building (48-28), the Advanced Radiochemical Diagnostics Building (48-45), and the Analytical Facility (48-107). The Radiochemistry Laboratory (48-01) is a candidate Category 3 nuclear facility, for which a draft Basis of Interim Operations has been submitted to DOE. There are no other nuclear facilities and no Moderate or Low Hazard nonnuclear buildings within this Key Facility.

2.13.1 Construction and Modifications at the Radiochemistry Facility

Although no facility changes were projected through 2005 by the ROD, approximately 3500 square feet of additional laboratory space were installed in Building 48-01, Room 346. The room was formerly used as a storage area for miscellaneous items, but has been converted into a chemistry lab with fume hoods and laboratory instruments and hardware such as small furnaces. The laboratory is being used by Chemical and Environmental Research and Development Group personnel relocated from TA-21 to TA-48. The modification, which took place in 1996, underwent NEPA review and received a categorical exclusion (DOE 1997c).

Another modification at TA-48 included an upgrade to the ventilation systems and the remodeling of the chemistry lab in Building 48-01, Room 430. The modification underwent NEPA review and received a categorical exclusion (DOE 1998c). In addition, four of the facility's five outfalls were eliminated from the NPDES permit during 1997 and 1998. Outfalls 04A-016 and 04A-152 had received waters from the cooling of lasers and a magnet that have been removed from service. Discharges from Outfall 04A-131 have been routed to the RLWTF at TA-50 for treatment along with other radioactive liquids, and waters from Outfall 04A-153 have been routed to the sewage plant at TA-46. The elimination of outfalls was evaluated through an environmental assessment (DOE 1996b), and subsequent Finding of No Significant Impact.

2.13.2 Operations at the Radiochemistry Facility

The SWEIS identified ten capabilities for the Radiochemistry Key Facility. No new capabilities have been added, and none have been deleted. The primary measure of activity for this Key Facility is the number of personnel conducting research activities. In 1998, approximately 170 chemists and scientists were employed, far below the 250 projected by the ROD. As seen in Table 2.13.2-1, only thee of the ten capabilities were active at levels projected by the ROD: radionuclide transport studies, actinide and TRU chemistry, and sample counting.

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

Capability	SWEIS ROD	1998 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])	Increased level of operations, approximately twice 1995 levels. (32 FTEs)
Environmental Remediation Support	Background contamination characterization pilot studies. Performance assessments, soil remediation research and development, and field support. (34 FTEs)	Decreased level of operations, approximately half 1995 levels. (9 FTEs)
Ultra-Low-Level Measurements	Isotope separation and mass spectrometry. (30 FTEs)	Slightly increased level of operations, approximately the same as in 1995. (15 FTEs)

Table 2.13.2-1. (Con't.)

Capability	SWEIS ROD	1998 Operations
Nuclear/Radiochemistry	Radiochemical operations involving quantities of alpha-, beta-, and gamma-emitting radionuclides for nonweapons and weapons work. (44 FTEs)	Slightly increased level of operations, approximately the same as 1995 levels. (40 FTEs)
Isotope Production	Target preparation. High-level beta/gamma chemistry and target processing to recover isotopes for medical and industrial application. (15 FTEs)	Slightly increased level of operations, approximately the same as in 1995. (12 FTEs)
Actinide/Transuranic Chemistry	Radiochemical operations involving significant quantities of alpha-emitting radionuclides. (12 FTEs)	Increased operations, approximately twice 1995 levels. (14 FTEs)
Data Analysis	Re-examination of archive data and measurement of nuclear process parameters of interest to weapons radiochemists. (10 FTEs)	Slight increase from 1995 to six FTEs, 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—total for both activities)	Slight decrease from levels in 1995 to 32 FTEs, 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)	Decreased level of operations from 1995, and about 1/3 of those projected by the SWEIS ROD. (7 FTEs)
Sample Counting	Measurement of the quantity of radioactivity in samples using alpha-, beta-, and gamma-ray counting systems. (5 FTEs)	Approximately the same as SWEIS ROD. (6 FTEs)

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

2.13.3 Operations Data for the Radiochemistry Facility

The overall level of activity at the Radiochemistry Facility was below that projected by the ROD. Three of the ten capabilities at this Key Facility were conducted at levels projected by the ROD; the others were at or below activity levels of 1995. As a result, operations data were also below those projected by the ROD, as shown in Table 2.13.3-1.

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

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions:			
Mixed Fission Products	Ci/yr	1.4×10^{-4}	None detected
Plutonium-239	Ci/yr	1.1×10^{-5}	None detected
Uranium-234	Ci/yr	Not Projected[a]	1.35×10^{-7}
Uranium-235	Ci/yr	4.4×10^{-7}	5.00×10^{-9}
Mixed Activation Products	Ci/yr	3.1×10^{-6}	None detected
Arsenic-72	Ci/yr	1.1×10^{-4}	None detected
Arsenic-73	Ci/yr	1.9×10^{-4}	None detected
Arsenic-74	Ci/yr	4.0×10^{-5}	9.46×10^{-7}
Beryllium-7	Ci/yr	1.5×10^{-5}	None detected
Bromine-77	Ci/yr	8.5×10^{-4}	8.68×10^{-5}
Germanium-68	Ci/yr	1.7×10^{-5}	None detected
Gallium-68	Ci/yr	1.7×10^{-5}	None detected
Rubidium-86	Ci/yr	2.8×10^{-7}	None detected
Selenium-75	Ci/yr	3.4×10^{-4}	2.41×10^{-5}
NPDES Discharge:			
Total Discharges	MGY	4.1	No Discharge
03A-045	MGY	0.87	No Discharge
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	3300	1990
LLW	m^3/yr	270	89
MLLW	m^3/yr	3.8	1.0
TRU[b]	m^3/yr	0	0.2
Mixed TRU[b]	m^3/yr	0	0
Number of Workers	FTEs	248	129[c]

[a] The SWEIS ROD did not contain projections for this radioisotope.

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

[c] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.14 Radioactive Liquid Waste Treatment Facility (TA-50)

The RLWTF is located at TA-50 and consists of the treatment facility (Building 50-01), support buildings, and liquid and chemical storage tanks. The primary activity is the treatment of liquid wastes generated at other LANL facilities, but decontamination of equipment and waste items is also performed. There are four Category 3 nuclear structures at this Key Facility – the RLWTF itself (Building 50-01), the tank farm and pumping station (50-02), the acid and caustic solution tank farm (50-66), and a 100,000-gallon influent holding tank (50-90). There are no other nuclear facilities and no Moderate Hazard nonnuclear buildings within this Key Facility.

2.14.1 Construction and Modifications at the RLWTF

As projected by the ROD, three facility modifications have occurred since 1995. Four above-ground storage tanks were installed and placed into service in 1997. Upon installation of the above-ground storage tanks, use of the influent underground storage tanks was to have stopped. It has been decided, however, to use both the new above-ground storage tanks and all but one of the underground storage tanks. (One underground storage tank has been removed from service and is being used as a secondary containment vessel instead.)

The new UF/RO (ultrafiltration and reverse osmosis) process was installed in 1998 and became operational 03/22/99. The main treatment process of precipitation, clarification, and filtration continues to be used as a pretreatment step ahead of the UF/RO process. Similarly, nitrate reduction equipment was installed in 1998 and became operational on 03/15/99. Unlike the SWEIS description, however, the treatment is via chemical reduction, not via biological process. (Zinc electroplating is used to convert nitrate ion to NO_2 gas.) The process treats only small batches of high-nitrate radioactive liquid waste. The liquids are trucked from the points of generation at CMR, TA-48, and TA-59 to the RLWTF and then processed through nitrate reduction in batches. The treatment has thus far been successful in reducing nitrate effluent concentrations below the New Mexico Environment Department (NMED) effluent limits for nitrates and nitrogen.

2.14.2 Operations at the RLWTF

The SWEIS identified five capabilities for the RLWTF Key Facility. No new capabilities have been added, and none have been deleted. The primary measurement of activity for this facility is the volume of radioactive liquid waste processed through the main treatment equipment. In 1998, this volume was 23 million liters of treated radioactive liquid waste discharged to Mortandad Canyon, which is less than the discharge volume of 35 million liters per year projected by the ROD. As seen in Table 2.14.2-1, other operations at the RLWTF were also below levels projected by the ROD.

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

Capability	SWEIS ROD [a]	1998 Operations
Waste Characterization Packaging, Labeling	Support, certify, and audit generator characterization programs. Maintain waste acceptance criteria for radioactive liquid waste treatment facilities.	As projected. 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. Pretreat 80,000 liters/yr of radioactive liquid waste from TA-55 in Room 60. Solidify, characterize, and package 3 m^3/yr of TRU waste sludge in Room 60.	Pretreated 370,000 liters at TA-21. Pretreated 39,000 liters in Room 60. No TRU waste/sludge treated. Solidification campaigns were conducted, however, in November 1997 (5 m^3) and in May 1999 (5 m^3).

Table 2.14.2-1. (Con't.)

Capability	SWEIS ROD[a]	1998 Operations
Radioactive Liquid Waste Treatment	Install UF/RO equipment in 1997. Install equipment for nitrate reduction in 1999. Treat 35 million liters/yr of radioactive liquid waste. Dewater, characterize, and package 10 m^3/yr of LLW sludge. Solidify, characterize, and package 32 m^3/yr of TRU waste sludge.	UF/RO equipment installed 1998, and operational in March 1999. Nitrate reduction equipment installed 1998; operational March 1999. Treated 23 million liters of radioactive liquid waste. De-watered 28 cubic meters of LLW sludge. No TRU waste/sludge was solidified. (TRU sludge will be generated by the new UF/RO process, but was not generated by the former main treatment process.)
Decontamination Operations	Decontaminate LANL personnel respirators for reuse (approximately 700/month). Decontaminate air-proportional probes for reuse (approximately 300/month). Decontaminate vehicles and portable instruments for reuse (as required). Decontaminate precious metals for resale (acid bath). Decontaminate scrap metals for resale (sand blast). Decontaminate 200 m^3 of lead for reuse (grit blast).	Decontaminated 500 personnel respirators per month. Decontaminated 250 faces and 200 bodies per month (air-proportional probes). Decontaminated two vehicles in 1998, and eight portable instruments per month. Decontamination of precious metals started in 1998 via decon of platinum from TRU waste to LLW. Decontaminated 11 cubic meters of scrap metals. Decontaminated one cubic meter of lead.

[a] Includes installation of UF/RO and nitrate reduction processes in Building 50-01 and installation of above-ground tanks for the collection of influent radioactive liquid waste.

2.14.3 Operations Data for the RLWTF

Since levels of operation were less than projected by the ROD, the effects of operations were also lower than projected. Radioactive air emissions continued to be negligible (less than one microcurie). NPDES discharge volume was 6.1 million gallons, versus a projected 9.3 million gallons. Waste quantities were all less than projected. Table 2.14.3-1 provides details.

In 1998, liquid effluents from the RLWTF did not meet DOE's discharge criteria (derived concentration guidelines, or DCGs) for water quality for americium-241 and plutonium-238. Additionally, the effluent exceeded DCGs for plutonium-239 for all months except February, March, October, and November. In order to improve effluent quality, the treatment process was upgraded in 1999 to include UF/RO. Other process upgrades are also under consideration.

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

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions:			
Americium-241	Ci/yr	Negligible	6.5×10^{-9}
Plutonium-238	Ci/yr	Negligible	1.4×10^{-8}
Thorium-230	Ci/yr	Negligible	7.7×10^{-8}
Uranium-234	Ci/yr	Negligible	1.8×10^{-7}

Table 2.14.3-1. (Con't.)

Parameter	Units	SWEIS ROD	1998 Operations
NPDES Discharge Process:			
Outfall 051	MGY	9.3	6.1
Wastes: [a]			
Chemical	kg/yr	2,200	747
LLW	m^3/yr	160	120
MLLW[b]	m^3/yr	0	0
TRU	m^3/yr	30	1
Mixed TRU [b]	m^3/yr	0	1
Number of Workers	FTEs	110	55 [c]

[a] Secondary wastes are generated during the treatment of radioactive liquid waste and as a result of decontamination operations. Examples include decontamination acid bath solutions and rinse waters, high-efficiency particulate air filters, personnel protective clothing and equipment, and sludges from the pretreatment and main radioactive liquid waste treatment processes.

[b] Resource Conservation and Recovery Act-listed hazardous chemicals were not projected to be used in RLWTF, and secondary mixed wastes were therefore not projected to be generated.

[c] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

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

The Solid Radioactive and Chemical Waste Key Facility is located at TAs 50 and 54. Activities are all related to the management (packaging, characterization, receipt, transport, storage, and disposal) of radioactive and chemical wastes generated at other LANL facilities. There are eight Category 2 nuclear buildings within this Key Facility: the Radioactive Materials Research Operations and Demonstration Facility (Building 50-37); the liquid waste tank (Structure 50-190) at the Waste Characterization Reduction and Repackaging Facility (WCRRF); and six fabric domes at TA-54 for the storage of retrieved TRU wastes (Domes 226, 229–232, and 375). There are also six Category 3 nuclear buildings within this Key Facility: the Radioactive Assay and Nondestructive Test Facility (Building 54-38); WCRRF itself (Building 50-69); and four fabric domes for the storage of TRU wastes (Domes 54-048, -049, -153, and -283). In addition, the LLW disposal cells, shafts, and trenches are listed as a Category 2 "facility." There are no Moderate Hazard nonnuclear buildings within this Key Facility.

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

As projected by the ROD, four additional fabric domes have been constructed for the storage of TRU waste retrieved from earth-covered pads. These are domes 54-226, -231, -232, and -375. Dome 226 was formerly used as an enclosure for retrieval operations. However, it has been determined that retrieval operations can be safely performed in the open because retrieved (previously buried) drums and crates are in good physical condition, and there is no leakage of the radioactive wastes during retrieval operations. Dome 226 has accordingly been converted to and used as one of the six storage domes required for the Transuranic Waste Inspectable Storage Project (TWISP).

During the three-year period 1996–1998, there have also been a number of facility changes not forecast by the ROD: (a) In the Drum Preparation Facility, Building 54-33, two automated and enclosed drum washers have been installed in lieu of a steam cleaning operation for retrieved drums. As a result, the water sedimentation pits and collection tanks at 54-33 have not been used. (b) Modular containment, for the size reduction of gloveboxes and other large waste items, has been removed from the general treatment bay of the Drum Preparation Facility. Instead, the bay is used for the storage of washed and unwashed drums of TRU wastes. (c) The small compactor has been removed from the Compactor Facility, Building 54-281, which now houses just the 200-ton compactor. (d) The Maintenance Shop, Building 54-02, has been converted into a counting laboratory and is now used for the nondestructive assay of waste packages to verify radionuclide content and to survey waste items as part of the "Green is Clean" waste program. This program confirms the absence of radioactivity in waste items, thereby allowing disposal of the items as municipal solid waste. In the past, many such "suspect rad" packages were disposed at Area G as LLW.

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 have been deleted. The primary measurements of activity for this facility are the volumes of newly generated chemical, low-level, and TRU wastes to be managed, and the volumes of legacy TRU waste and MLLW in storage. A comparison of the year 1998 to projections made by the ROD can be summarized as follows:

Chemical wastes: A total of 1767 metric tons were shipped for off-site treatment and/or disposal, versus an average quantity of 3250 metric tons per year projected by the ROD.

LLW: A total of 1807 cubic meters were placed into disposal cells and shafts at Area G, versus an average volume of 12,230 cubic meters per year projected by the ROD. No new disposal cells were constructed, and disposal operations did not expand into either Zone 4 or Zone 6 at TA-54.

MLLW: A total of 136 cubic meters (72 newly generated and 64 legacy) were shipped for off-site treatment and/or disposal, versus an average volume of 632 cubic meters per year projected by the ROD. Over the three-year period 1996–1998, the inventory of mixed waste in storage (i.e., awaiting treatment and disposal) has decreased from 760 to 336 cubic meters. The ROD projected that the inventory of legacy mixed wastes would be reduced to zero by 2006.

TRU wastes: No shipments were made to the WIPP in 1998, and the 142 cubic meters of newly generated TRU wastes were added to storage. Over the three-year period 1996–1998, an additional 1950 cubic meters have also been added to storage due to successes of the TWISP. (The ROD projects that TWISP would retrieve all 4700 cubic meters from underground pads by December 2004.)

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

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

Capability	SWEIS ROD[a]	1998 Operations
Waste Characterization, Packaging, and Labeling	Support, certify, and audit generator characterization programs. Maintain waste acceptance criteria for LANL waste management facilities. Characterize 760 m^3 of legacy MLLW. Characterize 9010 m^3 of legacy TRU waste. Verify characterization data at the Radioactive Assay and Nondestructive Test Facility for unopened containers of LLW and TRU waste. Maintain waste acceptance criteria for off-site treatment, storage, and disposal facilities. Overpack and bulk waste as required. Perform coring and visual inspection of a percentage of TRU waste packages. Ventilate 16,700 drums of TRU waste retrieved during TWISP. Maintain current version of WIPP waste acceptance criteria and liaison with WIPP operations.	Activities were as projected in the SWEIS ROD with the following differences: • Characterized 136m^3 of legacy MLLW in 1998. • Characterized 21m^3 of legacy TRU waste during 1996–1998. • Verified characterization data at Radioactive Assay and Nondestructive Test Facility for TRU wastes, but not for LLW. • Two drums were cored and inspected. • Ventilated 4816 drums during 1996–1998.
Compaction	Compact up to 25,400 m^3 of LLW.	94 m^3 compacted into 35 m^3 LLW.
Size Reduction	Size reduce 2900 m^3 of TRU waste at WCRRF and the Drum Preparation Facility.	Size reduction was not performed in 1998.
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.	No shipments to WIPP.
	Over the next 10 years: • Ship 32,000 metric tons of chemical wastes and 3640 m^3 of MLLW for off-site land disposal restrictions, treatment, and disposal. • Ship no LLW for off-site disposal. • Ship 9010 m^3 of legacy TRU waste to WIPP. • Ship 5460 m^3 of operational and environmental restoration TRU waste to WIPP. • Ship no environmental restoration soils for off-site solidification and disposal.	Shipments in 1998: • 1767 metric tons of chemical wastes and 136 m^3 of MLLW for off-site treatment and disposal. • No LLW for off-site disposal. • No legacy TRU waste shipped to WIPP. • No operational or environmental restoration TRU wastes shipped to WIPP. • No environmental restoration soils for solidification and disposal.
	Annually receive, on average, 5 m^3 of LLW and TRU waste from off-site locations in 5 to 10 shipments.	No waste receipts from off-site locations.

Table 2.15.2-1. (Con't.)

Capability	SWEIS ROD[a]	1998 Operations
Waste Storage	Stage chemical and mixed wastes prior to shipment for off-site treatment, storage, and disposal.	Chemical and mixed wastes staged prior to shipment.
	Store legacy TRU waste and MLLW.	Legacy TRU waste and MLLW stored.
	Store LLW uranium chips until sufficient quantities have accumulated for stabilization.	LLW uranium chips are no longer generated.
Waste Retrieval	Begin retrieval operations in 1997.	Retrieval begun in 1997.
	Retrieve 4700 m^3 of TRU waste from Pads 1, 2, 4 by 2004.	Retrieved 1951 m^3 through 1998 (Pad 1).
Other Waste Processing	Demonstrate treatment (e.g., electrochemical) of MLLW liquids.	No activity.
	Land farm oil-contaminated soils at Area J.	No oil-contaminated soils were land-farmed.
	Stabilize 870 m^3 of uranium chips.	No uranium chips stabilized. Waste stream was treated by generator prior to transfer to Area G.
	Provide special-case treatment for 1030 m^3 of TRU waste.	None.
	Solidify 2850 m^3 of MLLW (environmental restoration soils) for disposal at Area G.	No environmental restoration soils solidified.
Disposal	Over next 10 years: Dispose 420 m^3 of LLW in shafts at Area G. Dispose 115,000 m^3 of LLW in disposal cells at Area G. (Requires expansion of on-site LLW disposal operations beyond existing Area G footprint.) Dispose 100 m^3/yr administratively controlled industrial solid wastes in pits at Area J. Dispose nonradioactive classified wastes in shafts at Area J.	During 1998: Five m^3 of LLW were disposed in shafts at Area G. 1807 m^3 of LLW disposed in cells. (Area G not expanded.) 55 m^3 solid wastes disposed in pits at Area J. One cubic meter of classified solid wastes disposed in shafts at Area J.

[a] Includes the construction of four new storage domes for the TWISP.

2.15.3 Operations Data for the Solid Radioactive and Chemical Waste Facility

Levels of operation in 1998 were less than projected by the ROD, and so were air emissions and secondary wastes. Table 2.15.3-1 provides details.

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

Parameter	Units	SWEIS ROD	1998 Operations
Radioactive Air Emissions: [a]			
Tritium	Ci/yr	6.09×10^{1}	No data [b]
Americium-241	Ci/yr	6.60×10^{-7}	No data [b]
Plutonium-238	Ci/yr	4.80×10^{-6}	1.30×10^{-9}
Plutonium-239	Ci/yr	6.80×10^{-7}	No data [b]

Table 2.15.3-1. (Con't.)

Parameter	Units	SWEIS ROD	1998 Operations
Uranium-234	Ci/yr	8.00×10^{-6}	1.14×10^{-8}
Uranium-235	Ci/yr	4.10×10^{-7}	No data [b]
Uranium-238	Ci/yr	4.00×10^{-6}	No data [b]
Thorium-230	Ci/yr	Not projected [c]	3.10×10^{-10}
NPDES Discharge	MGY	No outfalls	No outfalls
Wastes: [d]			
Chemical	kg/yr	920	327
LLW	m^3/yr	174	368
MLLW	m^3/yr	4	0
TRU	m^3/yr	27	21
Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	225	60 [e]

[a] Data for 1998 are for stacks monitored at WCRRF and the Radioactive Materials Research, Operations, and Demonstration (RAMROD) facility at TA-50.

[b] No stacks require monitoring at TA-54. All non-point sources at TA-54 are measured using ambient monitoring.

[c] The SWEIS does not contain projections for this radioisotope.

[d] 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.

[e] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.16 Non-Key Facilities

The balance, and majority, of LANL buildings are referred to in the SWEIS as the Non-Key Facilities. These facilities house operations that do not have the potential to cause significant environmental impacts. The SWEIS projected that operations at the Non-Key Facilities would remain constant across alternatives. Hence, levels of operations projected by the ROD were the same as levels projected for the No Action Alternative.

These buildings and structures are located in 30 of LANL's 49 TAs and comprise approximately 15,500 of the LANL's 27,820 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, page 2-2).

There are five Category 3 nuclear facilities among the Non-Key Facilities:

- Calibration Building (TA-03, Building 130)
- Physics Building (TA-03, Building 40)
- High-Pressure Tritium Facility (TA-33, Building 86)
- Nuclear Safeguards Research Building (TA-35, Building 02)
- Nuclear Safeguards Laboratory (TA-35, Building 27)

Four of these buildings hold only sealed radioactive sources. The High-Pressure Tritium Facility is in safe shutdown mode awaiting decontamination and decommissioning.

2.16.1 Construction and Modifications at the Non-Key Facilities

During the three-year period 1996–1998, only one significant change was made to Non-Key Facilities. This was the design and construction of the Atlas facility in parts of five buildings at TA-35:

- 35-124/125, Experimental Area, Control Room, and Coordination Center
- 35-126, Mechanical Services Building
- 35-294, Power Supply Building
- 35-301, Generator Building

Through 1998, $37 million had been spent. Another $6 million, budgeted for 1999, will complete the facility. Atlas will be used 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 secondary components of nuclear weapons. The facility will require about 5 MWH of electrical energy annually (1% to 2% of total LANL consumption); will have a peak electrical demand of 12 megawatts (about 12% of total LANL demand); and will employ about 15 people. 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 ten microseconds. Each experiment will require extensive preparation of the experimental assembly and diagnostic instrumentation (DOE 1996e).

In addition, 10 of 28 outfalls from the Non-Key Facilities were eliminated from the NPDES permit during 1997 and 1998. Waters from eight of these have been routed to the sewage plant at TA-46; discharges from the other two were eliminated.

Although these are the only significant facility changes during the past three years, many other plans are afoot, including plans for a Nonproliferation and International Security Center at TA-03 (DOE 1999d), the lease of land at TA-03 to Los Alamos County for the development of a research park (DOE 1997d), and the construction of a Strategic Computing Center at TA-03 to house the world's fastest computer (DOE 1998d).

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, pp. 2-2 through 2-9) as shown in Table 2.16.2-1 below:

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.

Table 2.16.2-1. (Con't.)

Capability	Examples
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. 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 components (groundwater, air, surface waters).

The eighth category, environmental restoration is discussed in Section 2.17. During 1998, no new capabilities were added to the Non-Key Facilities, and none of the above seven were deleted.

In 1998, workforce size increased appreciably for the Non-Key Facilities and accounted for about all of the 1415 new workers at LANL since 1995. This increase is because of the fact that activities at the Non-Key Facilities consist largely of research and development, services, and administration. An increase in research and development reflects the ebb and flow that is typical of funds and interest in research. In turn, increased research requires more scientists, more support services, and a higher level of administration.

2.16.3 Operations Data for the Non-Key Facilities

Even though the Non-Key Facilities occupy more than half of LANL and employ about half the workforce, activities in these facilities contribute less than 10% of most operational effects. For example, radioactive air emissions from stacks at the Non-Key Facilities, 566 curies in 1998, comprised only 7% of all radioactive air emissions. Similarly, the 36 cubic meters of LLW constituted only 4% of the LANL total LLW volume. Table 2.16.3-1 presents details.

Chemical wastes and MLLW were the only parameters to exceed projections made by the ROD. This was the result of a LANL-wide campaign to identify and dispose of chemicals no longer used or needed. 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 then characterized, collected, and managed. Many items were sent to commercial facilities for treatment and disposal.

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

Parameter	Units	SWEIS ROD	1998
Radioactive Air Emissions [a]			
Tritium	Ci/y	$9.1 \times 10^{+2}$	$5.66 \times 10^{+2}$
Plutonium	Ci/y	3.3×10^{-6}	No data
Uranium	Ci/y	1.8×10^{-4}	No data
NPDES Discharge	MGY	142	95
Wastes:			
Chemical	kg/yr	651,000	1,465,000
LLW	m^3/yr	520	36
MLLW	m^3/yr	30	55
TRU/Mixed TRU	m^3/yr	0	0
Number of Workers	FTEs	6579	4547 [b]

[a] Stack emissions from previously active facilities (TA-33, TA-21, and TA-41); these were not projected as continuing emissions in the future. Does not include nonpoint sources.

[b] The number of employees for 1998 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1998 operations is routinely collected information and represents only UC employees. (University employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year.) Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (See Section 4.6, Socioeconomics.) is not appropriate.

2.17 Environmental Restoration Project

Although not a facility, the ER Project is a contributor to LANL's environmental effluents. For example, the ROD projected that the Project would contribute 60% of the chemical wastes, 35% of the LLW, and 75% of the MLLW generated at LANL over the ten years 1996–2005. The Project will also affect land resources in and around LANL. By cleaning canyons and decommissioning old structures, areas can be made available for LANL activities or for use by the public.

The ER Project at LANL was established by DOE in 1989 to characterize and remediate sites that were known or suspected to be contaminated because of historical operations, and that either were or still are under DOE control. Within three years, the Project had reviewed existing historical records and interviewed long-time employees, which resulted in the identification of approximately 2120 "potential release sites" (PRSs). LANL's PRSs are diverse; they include canyons, outfalls, drain lines, firing sites, industrial sites, and historically-used material disposal areas. By 1994, detailed work plans had been developed, and the Project had moved into the next phases, site characterization and cleanup.

As of September 1998, LANL was in some phase of characterization of more than 1100 PRSs, or slightly more than half of those identified. The ER Project had remediated 120 sites, and recommended 586 sites to NMED for no further action (LANL 1999b, p. 2).

2.17.1 Operations of the ER Project

During 1998, LANL was successful in having NMED remove another 99 PRSs from its Hazardous Waste Facility Permit, bringing the total removed since 1989 to 102 of 2120 PRSs.

Prior to 1998, the ER Project had been successful in having only three PRSs removed from LANL's Hazardous Waste Facility Permit by NMED.

2.17.2 Operations Data for the ER Project

Waste quantities during 1998 were below quantities projected in the SWEIS, as shown in Table 2.17.2-1 below.

Table 2.17.2-1. ER Project/Operations Data

Waste Type	Units	SWEIS ROD	1998 Operations
Chemical	kgs/yr	2,000,000	144,000
LLW	m^3/yr	4260	726
MLLW	m^3/yr	548	9
TRU	m^3/yr	11	0
Mixed TRU	m^3/yr	0	0

Cleanup activities also generated solid wastes, which were disposed at the County landfill.

3.0 Site-Wide 1998 Operations Data

The SWEIS for LANL discussed the potential direct, indirect, and cumulative environmental impacts, or changes, that could result from each of the alternatives analyzed. The environmental impacts were described and discussed across the various aspects of the affected environment or resource areas that were likely to change at a site-wide level. In addition, the SWEIS developed extensive accident scenarios. The consequences were identified in terms of impacts to human health, air quality, water quality and quantity, and ecological resources. The SWEIS concluded that there were very few differences in the site-wide environmental impacts among the alternatives analyzed. The SWEIS impact analysis was based in large measure on the projections of operational data for the Key Facilities.

The role of the Yearbook is not to present environmental impacts or environmental consequences. The Yearbook's role is to provide data that could be used to develop an impact analysis. In this chapter, the Yearbook summarizes operational data at the site-wide level. In some cases, the Yearbook does include impacts for very specific areas—worker doses and doses from radioactive air emissions. These impact assessments are routinely undertaken by LANL, using standard methodologies that duplicate those used in the SWEIS; hence, they have been included for the sake of providing the base for future trend analysis.

This chapter of the Yearbook compares actual operating data to projected effects for about half of the parameters discussed in the SWEIS. These include effluent, workforce, regional, and long-term environmental effects. Some of the parameters used for comparison had to be 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 in the SWEIS resulted only from the expenditure of considerable special effort, and such extra costs were avoided when preparing the Yearbook.

- Effluents include releases to the air, discharges of waters, and disposal of solid wastes. Effluents are discussed in the first three sections below.

- Workforce and regional consequences are another aspect of LANL operations. Workforce accidents, injuries, and radiation exposures are examined in Section 3.5 and compared to projections of the ROD. Utilities are discussed in Section 3.4. Section 3.6 closes the set of regional effects by examining the size and make up of the LANL workforce.

- Long-term impacts to the environment form the third category of consequences. As a federal agency with ownership of a sizable land area, the DOE has stewardship responsibilities for the local and regional environment. These responsibilities require the monitoring and care for groundwater, cultural resources, ecological resources, and the land itself, and are discussed in Sections 3.7 through 3.10. The results of monitoring performed during 1996–1998 by LANL are reported and compared to the ROD.

3.1 Air Emissions

Radioactive airborne emissions from point sources (i.e., stacks) during 1998 totaled approximately 8690 curies, less than half of the ten-year average of 21,700 curies projected by the ROD. The two largest contributors were LANSCE and the Tritium Facilities. LANSCE stack emissions totaled 7875 curies and accounted for about 86% of the LANL total, but were less than half of the projected ten-year average of about 16,800 curies for LANSCE. Stack emissions from the Tritium Facilities were about 710 curies, about one-third of the projected ten-year average of about 2000 curies per year for this Key Facility. Non-point sources of radioactive air emissions are present at LANSCE, Area G, TA-18, and other locations around the Laboratory. Non-point emissions, however, are small compared to stack emissions. For example, non-point air emissions from LANSCE were less than 500 curies. Additional detail about radioactive air emissions is provided in Chapter 4 of the 1998 Environmental Surveillance Report (LANL 1999c).

The calculated dose to the MEI by the air pathway for 1998 was 1.72 millirem, including contributions from stack emissions and non-point sources such as Area G and the firing sites. The calculated MEI dose attributable to LANSCE was 1.39 millirem. These values are less than one-third of the 5.44 millirem projected by the ROD, and are well below the Environmental Protection Agency (EPA) emission standard of 10 mrem/yr. Firing site operations in 1998 were also significantly less than projected by the ROD. The expenditure of depleted uranium in high explosive tests was about 120 kg, about the same as during the last several years, but only about four percent of the more than 3000 kilograms per year projected by the ROD. Usage of non-radioactive materials in these tests was also well below the amounts projected. Therefore, estimated air concentrations for 1998 were less than projected by the ROD.

LANL, in comparison to industrial sources and power plants, is a relatively small source of non-radioactive air pollutants. As such, the Laboratory is required to estimate emissions, rather than perform actual stack sampling. Calculated emissions for criteria pollutants during 1998 (LANL 1999c) were less than amounts assumed for the ROD as shown in Table 3.1-1 below.

Table 3.1-1. Emissions of Criteria Pollutants

Pollutants	Units	SWEIS ROD	1998
Carbon monoxide	tons/year	58	23
Nitrogen oxides	tons/year	201	85
Particulate matter	tons/year	11	3.9
Sulfur oxides	tons/year	0.98	0.35

Since the analysis of ROD emissions of criteria pollutants indicated no adverse air quality impacts, this same conclusion can be drawn for 1998 emissions.

3.2 Liquid Effluents

Effluent flow through NPDES outfalls totaled an estimated 212 million gallons in 1998, versus 278 million gallons projected by the ROD. This flow can be examined by watershed (Table 3.2-1) and by facility (Table 3.2-2) to understand differences from projections.

Table 3.2-1. NPDES Discharges by Watershed

Watershed	# Outfalls (SWEIS ROD)	# Outfalls [a] (1998)	Discharge [b] (SWEIS ROD)	Discharge [a,b] (1998)
Cañada del Buey	3	3	6.4	0.0
Guaje	7	7	0.7	1.2
Los Alamos	8	9	44.8	69.7
Mortandad	7	9	37.4	51.4
Pajarito	11	13	2.6	2.8
Pueblo	1	1	1.0	0.7
Sandia	8	9	170.7	67.1
Water	10	15	14.2	18.7
Totals	55	66	278.0	212.0

[a] Includes outfalls that were eliminated during 1998, some of which had flow.

[b] Millions of gallons

The number of outfalls listed in the NPDES permit had decreased from 88 at the end of 1996 to 66 at the end of 1997. Even more substantial reductions occurred during 1998, and the number of permitted outfalls had decreased to just 36 by the end of December. Most of the reductions during both 1997 and 1998 were from the High Explosives Processing Key Facility (six eliminated in 1997, and 13 eliminated in 1998) and High Explosives Testing Key Facility (five eliminated in 1997, and seven eliminated in 1998). Outfall reductions for both High Explosives Key Facilities largely resulted from re-directing some flows, such as cooling tower discharge waters, to the sewage plant at TA-46, and from the routing of high explosives-contaminated flows through the HEWTF, which has but a single outfall. The HEWTF began treatment operations in 1997.

Table 3.2-2 compares NPDES discharges by facility. The Non-Key Facilities and LANSCE had the largest differences between 1998 discharges and discharges projected by the ROD. At LANSCE, discharges were lower than projected primarily because LEDA had not yet commenced operations. For the Non-Key Facilities, discharges from the TA-3 power plant were appreciably lower, 48.7 million gallons discharged in 1998 versus a projected discharge of 114 million gallons.

Treated waters released from LANL outfalls rarely leave the site. An indicator of this is provided by stream gage measurements near downstream site boundaries in seven watersheds. Of the seven, three watersheds (Sandia, Mortandad, and Water) showed no offsite flow in 1998. Three others had minimal flow, all attributed to storm waters: Los Alamos with 2.9 million gallons, Cañada del Buey with 1.3 million gallons, and Pajarito with two million gallons. Pueblo showed 152 million gallons flowing offsite, but virtually all of that is attributable to discharge from the Los Alamos County sanitary sewage treatment plant.

Table 3.2-2. NPDES Discharges by Facility

Facility [a]	# Outfalls (SWEIS ROD)	# Outfalls [b] (1998)	Discharge [c] (SWEIS ROD)	Discharge [b,c] (1998)
Plutonium Complex	1	1	14.0	8.5
Tritium Facility	2	3	0.3	13.7
CMR Building	1	1	0.5	3.1
Sigma Complex	2	2	7.3	12.7
High Explosives Processing	11	16	12.4	17.1
High Explosives Testing	7	9	3.6	1.8
LANSCE	5	6	81.8	53.4
HRL	1	1	2.5	0.0
Radiochemistry Facility	2	3	4.1	0.0
RLWTF	1	1	9.3	6.1
Non-Key Facilities	22	23	142.1	95.2
Totals	55	66	278.0	212.0

[a] No outfalls for Pajarito Site, MSL, TFF, Shops, and the Solid Radioactive and Chemical Waste Facility.

[b] Includes 30 outfalls that were eliminated during 1998, some of which had flow for part of the year.

[c] Millions of gallons

LANL now has three principal water treatment facilities—the sewage plant at TA-46, the RLWTF at TA-50, and the HEWTF at TA-16. The sewage treatment plant at TA-46 processed 122 million gallons of treated wastewater and sewage during 1998 and generated 29 dry tons of sewage sludge. From TA-46, treated liquid effluent is pumped to the TA-3 power plant. At the power plant, effluent is either used to provide make up water for the cooling towers or is discharged directly into Sandia Canyon if not needed for the cooling tower. For 1998 the reported total discharge from the power plant into Sandia Canyon was 48.7 million gallons.

The RLWTF, Building 50-01, discharges into Mortandad Canyon. Process modifications projected by the ROD were installed during 1997 and 1998, but did not become operational until March of 1999. These modifications are designed to achieve compliance with more stringent NMED effluent limits for nitrates, fluoride, other NPDES permit limits, and DOE DCGs for radioactive constituents released to the environment. During 1998, 6.1 million gallons of treated radioactive liquid waters were released to Mortandad Canyon, versus 9.3 million gallons projected by the ROD.

The new HEWTF, Building 16-1508, became fully operational in 1997. This new facility treats process waters via sand filtration (to remove particulate high explosives) and activated carbon (to remove organic compounds including dissolved high explosives). Startup of this facility enabled the modification and elimination of more than a dozen high explosives outfalls from LANL's NPDES permit during 1997 and 1998.

Effluent quality was similar to that of recent years. Details on all non-compliance situations are provided in the 1998 Environmental Surveillance Report (LANL 1999c, p. 30).

3.3 Solid Radioactive and Chemical Wastes

LANL generates radioactive and chemical wastes as a result of research, operations, maintenance, construction, and environmental restoration activities. These wastes are categorized as one of five types. The management of each type has different regulatory requirements. Waste generators can be assigned to one of three categories—Key Facilities, Non-Key Facilities, and the ER Project.

Comparisons of 1998 waste quantities to projections made by the ROD are made in the following paragraphs on the basis of waste type, generator category, or both. No distinction has been made between routine wastes (such as those generated from ongoing operations) and non-routine wastes (such as those generated from the decontamination and decommissioning of buildings). A summary of this comparison appears in Table 3.3-1 below.

Table 3.3-1. LANL Waste Types and Generation

Waste Type	Units	SWEIS ROD	1998	% of SWEIS ROD	Reasons for Differences
Chemical	10^3 kg/yr	3250	1767	55	ER
LLW	m^3/yr	12,200	1807	15	ER, LPSS, Pits
MLLW	m^3/yr	632	72	11	ER
TRU	m^3/yr	333	108	32	Pits
Mixed TRU	m^3/yr	115	34	30	Pits

In 1998, waste volumes were lower than those projected by the ROD. There are three primary reasons for these departures. First, the ER Project generated significantly smaller quantities of chemical wastes, LLW, and MLLW in 1998 than projected by the ROD. Next, pit manufacturing did not begin in 1998. (The ROD was not approved in 1998 and these activities were not yet begun at LANL.) This resulted in reduced volumes of radioactive (low-level, TRU, and mixed TRU) wastes. Finally, the LPSS was not constructed. This large project, forecast for LANSCE, would have required a major decommissioning effort at Building 53-03M and would have generated large volumes of LLW.

3.3.1 Chemical Wastes

Chemical waste generation in 1998 was less than 60% of waste volumes projected by the ROD. Examination of the generator categories (See Table 3.3.1-1.) sheds some light on the differences.

Table 3.3.1-1. Chemical Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD	1998
Key Facilities	10^3 kg/yr	600	158
Non-Key Facilities	10^3 kg/yr	650	1465
ER Project	10^3 kg/yr	2000	144
LANL		3250	1767

As can be seen in Table 3.3.1-1, cleanup efforts of the ER Project generated less than 10% of projected chemical waste quantities and account for almost all of the difference between the SWEIS projection and the total LANL quantity in 1998.

One of the Key Facilities also had substantial departures from projections. The Machine Shops generated less than 1% of the projected waste quantity for the Expanded Alternative (474,000 kilograms projected versus 4400 actual), and less than 3% of the projected waste quantity for the No Action Alternative (142,000 kilograms projected versus 4400 actual). Decreased waste generation at the Shops was a combination of waste minimization efforts coupled with a much lower workload than projected in the SWEIS for either the No Action or the Expanded Alternatives. The workload at the Shops is directly linked with high explosives testing and processing operations. Much of the effort of the staff for high explosive testing and processing in 1998 was directed to the development and construction of DAHRT. This resulted in a significant decrease in high explosive testing and production operations, and subsequently a significant reduction in the workload for the shops.

At the Non-Key Facilities, chemical waste quantities exceeded projections because of a LANL-wide campaign to identify and dispose of chemicals no longer used or needed. 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. Many items were sent to commercial facilities for treatment and disposal.

3.3.2 Low-Level Radioactive Wastes

LLW generation in 1998 was less than 15% of waste volumes projected by the ROD. As can be seen in Table 3.3.2-1, cleanup efforts of the ER Project generated only about 15% of projected LLW volumes. Key Facilities account for most of the departure from projections, however. Large differences occurred at the CMR Building (1820 cubic meters projected versus 130 actual), LANSCE (1085 cubic meters projected versus 16 actual), the Sigma Complex (960 cubic meters projected versus three actual), and High Explosive Testing (940 cubic meters projected versus zero actual). LANSCE generated lower volumes than projected because decommissioning and renovation of Experimental Area A did not occur. Low workloads accounted for low waste volumes at the CMR Building, the Sigma Complex, and High Explosives Testing. These lower workloads in 1998 were to be expected because the ROD was not signed in 1998 and therefore, war reserve pit production had not begun at LANL. In addition, the High Explosive Testing activities were directed to the development and construction of DAHRT.

Table 3.3.2-1. LLW Generators and Quantities

Waste Generator	Units	SWEIS ROD	1998
Key Facilities	m^3/yr	7450	1045
Non-Key Facilities	m^3/yr	520	36
ER Project	m^3/yr	4260	726
LANL		12,230	1807

3.3.3 Mixed Low-Level Radioactive Wastes

Generation in 1998 was less than 15% of waste volumes projected by the ROD. Table 3.3.3-1 examines these wastes by generator categories.

Table 3.3.3-1. MLLW Generators and Quantities

Waste Generator	Units	SWEIS ROD	1998
Key Facilities	m^3/yr	54	8
Non-Key Facilities	m^3/yr	30	55
ER Project	m^3/yr	548	9
LANL		632	72

As can be seen in the table, small waste quantities from the ER Project account for nearly all the difference between SWEIS projections and 1998 actual generation of MLLW.

3.3.4 Transuranic Wastes

Generation in 1998 was about one-third of waste volumes projected by the ROD. As projected in the SWEIS, TRU wastes are expected to be generated in five facilities (the Plutonium Facility Complex, the CMR Building, the High Explosive Testing Facilities, the RLWTF, and the Solid Radioactive and Chemical Waste Facility) and by the ER Project. Table 3.3.4-1 examines these wastes by generator categories.

Table 3.3.4-1. Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD	1998
Key Facilities	m^3/yr	322	108
Non-Key Facilities	m^3/yr	0	0
ER Project	m^3/yr	11	0
LANL		333	108

The departure from projection is almost entirely accounted for in three of the Key Facilities – the Plutonium Complex (237 cubic meters projected versus 73 actual), the CMR Building (28 cubic meters projected versus 13 actual), and the RLWTF (30 cubic meters projected versus one actual). Differences at the CMR Building and the Plutonium Complex existed because the manufacture of war reserve pits had not begun. (The SWEIS ROD was not signed in 1998.) Differences at the RLWTF arose because the new treatment process had not been installed in 1998.

3.3.5 Mixed Transuranic Wastes

Generation in 1998 was about one-third of waste volumes projected by the ROD. As projected in the SWEIS, mixed TRU wastes are expected to be generated at only two facilities: the Plutonium Facility Complex and the CMR Building. Table 3.3.5-1 examines these wastes by generator categories.

Table 3.3.5-1. Mixed Transuranic Waste Generators and Quantities

Waste Generator	Units	SWEIS ROD	1998
Key Facilities	m^3/yr	115	34
Non-Key Facilities	m^3/yr	0	0
ER Project	m^3/yr	0	0
LANL		115	34

As with TRU waste generation, these two facilities—the Plutonium Facility Complex and the CMR Building—produced less mixed TRU waste than projected. Again, the departure from projection was expected because the manufacture of war reserve pits had not begun. (The ROD was not signed in 1998.)

3.4 Utilities

Ownership and distribution of utility services continue to be split between DOE and Los Alamos County. DOE owns and distributes most utility services to LANL facilities, and the County provides these services to the communities of White Rock and Los Alamos.

3.4.1 Gas

There have not been changes in ownership of the gas system since publication of the SWEIS. Table 3.4.1-1 presents gas usage by LANL on a fiscal year basis from 1991 to 1998. Approximately 90% of the gas used by LANL continued to be used for heating (both steam and hot air). The remainder was used for electrical production. The electrical generation was used to fill the difference between peak loads and the electric contractual import rights.

As shown in Table 3.4.1-1, the total gas consumption from fiscal years 1995 through 1998 was less than the base year of 1994 used in the analyses presented in the SWEIS. In addition, as shown in Table 3.4.1-2, the TA-16 steam production plant was shut down in 1997 when the new heating systems for TA-16 became fully operational. Under the expanded alternative, gas consumption was projected to be 1,840,000 decatherms annually. Therefore, gas consumption remains within the projections made by the SWEIS.

Table 3.4.1-1. Gas Consumption (decatherms[a]) at LANL/Fiscal Years 1991 to 1998

Fiscal Year	Total LANL Consumption	Total Used for Electric Production	Total Used for Heat Production	Total Steam Production for Heating
1991	1,480,789	64,891	1,415,898	803,168
1992	1,833,318	447,427	1,385,891	744,300
1993	1,843,936	411,822	1,432,113	1,192,803
1994	1,682,180	242,792	1,439,388	1,094,812
1995	1,520,358	111,908	1,408,450	967,587
1996	1,358,505	11,405	1,347,100	Table 3.4.1-2
1997	1,444,385	96,091	1,348,294	Table 3.4.1-2
1998	1,362,070	128,480	1,233,590	Table 3.4.1-2

[a] A decatherm is equivalent to 1000-1100 cubic feet of natural gas.

Table 3.4.1-2. Steam Production at LANL/Fiscal Years 1996 to 1998

Fiscal Year	TA-3 Steam Production (klb[a])	TA-16 Steam Production (klb)	TA-21 Steam Production (klb)	Total Steam Production (klb)
1996	451,363	196,396	54,033	701,792
1997	413,684	47,487[b]	50,382	464,066
1998	377,883	[b]	37,359	415,242

[a] klb: Thousands of pounds

[b] Steam production at the TA-16 central steam plant ceased in February 1997 when new heating systems became operational.

3.4.2 Electricity

LANL is supplied with electrical power through a cooperative arrangement with Los Alamos County, known as the Los Alamos Power Pool (LAPP), which was established in 1985. The DOE Albuquerque Operations Office 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. The capacity rating of LAPP resources, less losses, is 113 megawatts (MW) and 95.7 MW (summer and winter seasons, respectively). The transmission import capacity is contractually limited to 95 MW and 73 MW (summer and winter seasons, respectively).

The ability to accept additional power into the LAPP 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 the power demands on the northern New Mexico regional power system. Several proposals for bringing additional power into the region have been considered. A recent one, the Public Service Company of New Mexico proposal for a 345-kV power line called the Ojo Line Extension Project, has been abandoned. Other power line corridor locations remain under consideration, but it is uncertain when any new regional power lines would be constructed and become serviceable. An additional limitation is the contractual rights held by the LAPP for importing power from the regional transmission network.

Table 3.4.2-1 shows peak demand and Table 3.4.2-2 shows annual use of electricity for fiscal years 1991 to 1998. LANL's electrical use peaked during fiscal year 1997 when operations at LANSCE demanded large quantities of power. However, peak coincident demand from operations at LANSCE during 1997 was well below the historic values shown in the SWEIS. The Expanded Alternative projected peak demand to be 113,000 kilowatts with 63,000 kilowatts being used by LANSCE and about 50,000 kilowatts being used by the rest of the Laboratory. In addition, this alternative projected annual use to be 782,000 megawatts with 437,000 megawatts being used by LANSCE and about 345,000 megawatts being used by the rest of the Laboratory. Actual use has fallen below these values, and the projected periods of brownouts have not occurred.

Table 3.4.2-1. Electric Peak Coincident Demand/Fiscal Years 1991 to 1998

Fiscal Year	LANL Base	LANSCE	LANL Total	County Total	Pool Total
1991	43,452	32,325	75,777	11,471	84,248
1992	39,637	33,707	73,344	12,426	85,770
1993	40,845	26,689	67,534	12,836	80,370
1994	38,354	27,617	65,971	11,381	77,352
1995	41,736	24,066	65,802	14,122	79,924
1996	41,799	20,799	62,598	13,160	75,758
1997	37,807	24,846	62,653	13,661	76,314
1998	39,064	24,773	63,837	13,268	77,105

All figures in kilowatts.

Table 3.4.2-2. Electric Consumption/Fiscal Years 1991 to 1998

Fiscal Year	LANL Base	LANSCE	LANL Total	County	Pool Total
1991	282,994	89,219	372,213	86,873	459,086
1992	279,208	102,579	381,787	87,709	469,496
1993	277,005	89,889	366,894	89,826	456,720
1994	272,518	79,950	352,468	92,065	444,533
1995	276,292	95,853	372,145	93,546	465,691
1996	277,829	90,956	368,785	93,985	462,770
1997	258,841	138,844	397,715	96,271	493,986
1998	262,570	64,735	327,305	97,600	424,905

All figures in megawatt-hours.

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 5541.3 acre-feet/year or about 1806 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 contracted annual right obtained in 1976 to 1200 acre-feet/year of San Juan-Chama Transmountain Diversion Project water. The lease agreement is effective for three years, although the County can exercise an option to buy sooner than three years. DOE expects to convey 70% of the water rights to Los Alamos County and lease the remaining 30% to them. The San Juan-Chama rights will be transferred in their entirety to the County. The agreement between DOE and the County does not preclude provision of additional waters in excess of the 30% agreement, if available. However, the agreement also states that should the County be unable to provide water to its customers, the County shall be entitled to reduce water services to DOE in an amount equal to the water deficit.

The DOE and LANL recognize the need to adhere to the provisions of the lease agreement. However, it is important to make a distinction between water rights and water use. For example, in 1997, LANL used 38% of the total water used, and Los Alamos County used the remaining 62%, for the 100% total. However, this water use did not use 100% of the water rights. LANL used only 27% of the water rights, while Los Alamos County used 44% of the water rights, leaving 29% of the water rights unused. That unused portion of water rights is available for sale, according to the agreement. The future development of the County could, however, increase the County's water use. Thus, the Laboratory is neither guaranteed 1662 acre-feet/year nor necessarily limited to 1662 acre-feet/year.

In addition, it is also important to understand how the Laboratory water use has been determined. Up to the October 1998 transfer of the water production system to the County, the Laboratory was responsible for water production. Water usage by the County was metered. The Laboratory water usage was estimated by subtracting the county usage from the known well production. Until the transfer, users such as Bandelier National Monument and others were included in the Laboratory total, as were losses in the supply system, such as would occur from the purging of wells.

Metering of LANL's actual water usage began in October 1998 when Los Alamos County took over the water production system. Meters are planned to be added at selected facilities/equipment and trunk lines to begin to determine specific use at LANL.

Table 3.4.3-1 shows water consumption in thousands of gallons for calendar years 1992 to 1998. Under the expanded alternative, water use for LANL was projected to be 759 million gallons per year with 265 million gallons being used by LANSCE and 494 million gallons being used by the rest of the Laboratory. Actual use by LANL in 1998 was about 300 million gallons less than the projected consumption.

Table 3.4.3-1. Water Consumption (thousands of gallons)

Calendar Year	LANL	Los Alamos County	Total
1992	547,535	982,132	1,529,667
1993	467,880	999,863	1,467,743
1994	524,791	913,430	1,438,221
1995	337,188	1,022,126	1,359,314
1996	340,481	1,035,244	1,375,725
1997	488,252	800,019	1,288,271
1998	461,350	Not Available[a]	Not Available[a]

[a] *In October 1998, Los Alamos County acquired the water supply system and LANL no longer collects this information.*

As a result of the lease, LANL no longer maintains records for total water consumption or usage by Los Alamos County. The County now bills LANL for water, and all future water use records maintained by LANL will be based on those billings. Along with this transfer, Los Alamos County accepted responsibility for all chlorinating stations, and the County now operates these stations. The distribution system remaining under LANL control, and being used to supply water to LANL facilities, now consists of a series of reservoir storage tanks, pipelines, and fire pumps. The LANL system is gravity fed with fire pumps for high-demand situations.

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. Few other major construction projects have been undertaken, and 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

Occupational injury and illness rates for workers at LANL declined during calendar year 1998 as shown in Table 3.5.1-1. These rates correlate to 402 reportable injuries and illnesses during the year, versus 507 projected by the ROD.

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

Calendar Year	UC Workers Only		LANL (all workers)	
	TRI[a]	LWC[b]	TRI	LWC
1996	4.53	2.88	5.88	3.86
1997	4.41	2.66	5.55	3.45
1998	2.90	1.30	3.35	1.77

[a] TRI: Total Recordable Incident rate, number per 200,000 hours worked

[b] LWC: Lost Workday Cases, number of cases per 200,000 hours worked

3.5.2 Ionizing Radiation and Worker Exposures

Occupational radiation exposures for workers at LANL during calendar year 1998 are summarized in Table 3.5.2-1. The collective Total Effective Dose Equivalent, or TEDE, for the LANL workforce during 1998 was 161 person-rem, considerably lower than the workforce dose of 704 person-rem projected for the ROD. In addition, both the number of workers with a measurable dose and their collective dose (1839 workers with a collective TEDE of 161 person-rem) were below the average workforce doses for 1993–1995 (2141 workers with an annual TEDE of 208 person-rem).

Table 3.5.2-1. Radiological Exposure to LANL Workers

Parameter	Units	Value for 1998
Collective TEDE (external + internal)	person-rem	161
Number of workers with non-zero dose	number	1839
Average non-zero dose	millirem	87.4

Of the 161 person-rem collective TEDE, external radiation and tritium exposure accounted for 158 person-rem. The remainder is from internal exposure. It is not possible to identify a single reason for the decrease in collective TEDE in 1998 from the levels of 1993–1995. Rather, the decrease is an aggregation of several reasons, the more important of which include

- Work and Workload: Changes in workload and types of work have resulted in a decreased collective TEDE. The SWEIS used the 1993–1995 time frame as its base. For example, at that time the radionuclide power source for the Cassini spacecraft was being constructed at TA-55. 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. In addition, because the ROD in 1998 was not signed, the implementation of war reserve pit manufacture had not begun at LANL. This also contributed to lower doses than projected in the SWEIS.

- As Low As Reasonably Achievable Program: Improvements from this 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 the Laboratory.

- Improved personnel dosimeter: An improved personnel dosimeter was introduced on a Laboratory-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.)

- Internal dose: Finally, the TEDE in 1998 was also lower because the 1998 internal collective dose was lower than that of previous years.

Collective TEDEs for Key Facilities In general, TEDEs by Key Facility or TA are difficult to determine because these data are collected at the Group level, and members of many groups and/or organizations receive doses at several locations. The fraction of a group's collective TEDE coming from a specific Key Facility or TA can only be estimated. For example, personnel from the Health Physics Operations Group and JCNNM are distributed over the entire Laboratory, and these two organizations account for a significant fraction of the total LANL collective TEDE. Nevertheless, because the Groups working at TA-55 and TA-18 are relatively well defined, an estimate was made of the 1998 collective TEDE for the Plutonium Complex (105 person-rem) and the Pajarito Site (0.8 person-rem) Key Facilities. The estimate for TA-55 demonstrates that approximately two-thirds of the total Laboratory TEDE is a result of operations at the Plutonium Complex.

3.6 Socioeconomics

The LANL-affiliated workforce continues to include UC employees and subcontractors. As shown in Table 3.6-1, there has been a steady growth in number of employees for each of the major employers associated with LANL in the three calendar years from 1996 to 1998. The 12,008 employees at the end of calendar year 1998 represent 657 more employees than were anticipated under the ROD, which projected a workforce of 11,351 based on the 10,593 employees identified for the index year (employment as of March 1996) in the SWEIS.

This increase in employees is mostly associated with the Non-Key Facilities at LANL. Only three of the Key Facilities operated during 1998 at levels approximating those projected by the ROD—the MSL, the HRL, and the Non-Key Facilities. This is not surprising since the Non-Key Facilities were assumed to be constant because they operate to support the ebb and flow of research and development at LANL. Such fluctuations did not lend themselves to specific projections in any of the alternatives of the SWEIS. More importantly, the Non-Key Facilities were not a major contributor to the parameters that could lead to potential environmental impacts. Both the MSL and the HRL are close to the characteristics of the Non-Key Facilities, responding to the variability of research and development funding.

Table 3.6-1. LANL-Affiliated Work Force

Calendar Year	UC Employees	Technical Contractor	Non-Technical Contractor	JCNNM	PTLA	Total
SWEIS	8119	780	[a]	1312	382	10,593
CY 1996	8256	877	269	1358	395	11,155
CY 1997	8503	911	328	1330	424	11,496
CY 1998	8945	950	271	1393	449	12,008

[a] Data were not presented for non-technical contractors or consultants

This increase in employees has had a positive economic impact on northern New Mexico. DOE publishes 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 residential distribution of the new employees (e.g., the total 1415 additional employees through 1998) reflects the housing market dynamics of three counties. As seen in Table 3.6-2, approximately 90% of the UC employees continue to reside in the three counties of Los Alamos, Rio Arriba, and Santa Fe. Table 3.6-2 also shows that Los Alamos County received a 4% increase in UC employee residents, Rio Arriba County received a 12% increase, and Santa Fe County received a 17% increase.

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	4632	1296	1443	382	7753	366	8119
CY 1996	4539	1274	1524	422	7759	497	8256
CY 1997	4666	1323	1599	436	8024	479	8503
CY 1998	4831	1454	1688	469	8442	503	8945

[a] Includes both Regular and Temporary employees, including students who may not be at the Laboratory for much of the year.

Laboratory records contain the TA and building number of each employee's office. This information does not necessarily indicate where the employee actually performs his or her work; but rather, indicates where this employee gets mail and officially reports to duty. However, for purposes of tracking the dynamics of changes in employment across Key Facilities, this information provides a useful index. Table 3.6-3 identifies 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.

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, JCNNM, and other subcontractor personnel. The new index (shown in Table 3.6-3) is based on routinely collected information and only represents UC employees. UC employees include both Regular and Temporary employees, including students who may not be at the Laboratory much of the year. 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.

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

Key Facility	CY 1996	CY 1997	CY 1998
Plutonium Complex	463	478	526
Tritium Facilities	37	33	31
CMR	206	207	218
Pajarito Site	57	60	65
Sigma Complex	96	104	110
MSL	50	55	57
Target Fabrication	55	55	57
Machine Shops	73	77	83
High Explosive Testing	85	90	93
High Explosive Processing	184	197	201
LANSCE	494	523	547
HRL	78	77	82
Radiochemistry Laboratory	113	125	129
Waste Management – Radioactive Liquid Waste	47	48	55
Waste Management – Radioactive Solid and Chemical Waste	40	46	60
Rest of LANL	4144	4325	4547
Total Employees	6222	6500	6861

[a] Includes both Regular and Temporary employees, including students who may not be at the Laboratory for much of the year.

3.7 Land Resources

Land resources (i.e., undeveloped and developed lands) at LANL and the surrounding area remained essentially unchanged from 1996 through 1998. The ROD had not been signed, and major land breaking construction projects were not undertaken. All of the construction projects that were undertaken were done within existing facilities. The SWEIS projected a habitat reduction of 41 acres under the Expanded Alternative due to the expansion of Area G. In 1998, LANL was still operating under the No Action Alternative, and this expansion was not undertaken.

In 1998, the only major construction project outside of existing facilities at LANL was DAHRT. The actual habitat loss and ground breaking activities associated with this project happened during construction start-up in 1992 and 1993 when the land was cleared of vegetation and the "footprint" of this facility was established.

3.8 Groundwater

As projected by the ROD, water levels in wells penetrating into the regional aquifer continue to decline in response to pumping, typically by a couple of feet each year. In areas where pumping is reduced, water levels show some recovery. No unexplained changes in patterns have occurred in the 1995–1998 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977.

Analysis of samples from the production wells showed that water quality continued to meet drinking water standards and continued to indicate no problematic trends. Water quality measurements for test wells, however, continue to show the presence of contamination from the Laboratory at the top of the regional aquifer, but at concentrations mostly below drinking water standards. In 1998, drilling of the characterization well R-25 at TA-16 revealed the presence of high explosives constituents at concentrations that are above the EPA Health Advisory guidance values for drinking water. Although the extent of high explosives constituents in the regional aquifer is presently unknown, no high explosives constituents have been found in water supply wells. Nitrate concentrations in TW-1 in Pueblo Canyon have been near the EPA maximum contaminant level since 1980. The source of the nitrate might be infiltration of sewage effluent in Pueblo Canyon, or it might be residual nitrates from the now-decommissioned TA-45 RLWTF that discharged into upper Pueblo Canyon until 1964.

Work underway as part of the Hydrogeologic Workplan provided new information on the regional aquifer and details of hydrogeologic conditions. By the end of 1998, three new wells had been drilled into the regional aquifer. Two were located near the eastern boundary of the Laboratory in Los Alamos Canyon (R-9) and Sandia Canyon (R-12). These two wells encountered several intermediate-depth perched zones of varying hydrologic and chemical quality. Both wells show that minor contamination has infiltrated from the surface into the perched zones and the uppermost regional aquifer.

The third well (R-25) was located near the western boundary in TA-16. This well encountered a thick perched zone at an elevation several hundred feet above the top of the regional aquifer. This perched zone was anticipated due to results of an earlier well drilled nearby. Based on preliminary findings in R-25, high explosives contaminants were found throughout the perched zone and also several hundred feet into the regional aquifer. The source of these contaminants is probably the discharge of high explosives wastewater at TA-16 since the late 1940s.

None of the contaminants found in these new test wells exceed current drinking water standards. However, the uranium concentration in one perched zone in well R-9 is greater than the proposed EPA drinking water maximum concentration level, and TNT and RDX concentrations in well R-25 are greater than EPA Health Advisory values. Following the discovery of high explosives in well R-25, the nearest water supply wells were sampled and no high explosives contamination was detected (LANL 1999d).

These and other findings from the Hydrogeologic Workplan are adding to the understanding of the hydrologic setting at Los Alamos. Findings include (a) recognition of more perched zones above the regional aquifer than previously discovered; (b) confirmation that there is significant groundwater recharge along the flank of the Jemez Mountains; (c) recognition that there may be more groundwater recharge from canyon bottom alluvial groundwater than previously believed, and (d) the finding of Laboratory contaminants in perched zones and the regional aquifer at predicted locations where wells had not previously been drilled. These findings extend the areas that have been investigated by drilling, rather than change the picture of the hydrological system. Work continues under the Hydrogeologic Workplan to increase understanding of the hydrogeologic conditions and to ensure the safety of the drinking water supply.

3.9 Cultural Resources

The LANL site has a significant quantity and diversity of archaeological sites. Approximately 60% of LANL lands have been surveyed for archaeological sites and approximately 1600 sites have been identified in this process. 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 communities as traditional cultural properties.

The SWEIS reported 3668 inventoried resources. These resources included 1295 prehistoric resources (BC 4000–1600 AD), 87 historic homesteading and commercial resources (1600–1942 AD), 2232 World War II-Late Cold War era buildings and facilities (1943–1989 AD), and 54 areas within LANL identified by consulting communities (Native American pueblos, tribes, and local Hispanic communities) as having traditional cultural properties. Over the past three years, 1996–1998, LANL surveys have identified an additional 71 archaeological sites (Table 3.9-1). All of these resources continue to be protected. No excavation of sites at TA-54 (as projected by the ROD) or at any other part of LANL has occurred. The following paragraphs provide details.

Table 3.9-1 Acreage Surveyed, Cultural Resource Sites Recorded, and Cultural Resource Sites Eligible for the National Register of Historic Places at LANL through FY98[a]

Fiscal Year	Total Acreage Surveyed	Total Acreage Surveyed to Date	Total Archaeological Sites Recorded to Date (Cumulative)	Number of Eligible & Potentially Eligible NRHP[b] Sites	Number of Notifications to Indian Tribes
LANL SWEIS	Not reported	Not reported	3668	1092	23
1996	403	15,730	3693	1061	9
1997	287	16,017	3705	1186	11
1998	1920	17,937	3739	1245	10

[a] Source: The Secretary of Interior's Report to Congress on Federal Archaeological Activities. Information on LANL from DOE/Los Alamos Area Office, and LANL Cultural Resources Management Team.
[b] NRHP is National Register of Historic Places

The Laboratory and the National Park Service continued a long-term monitoring program at the prehistoric pueblo of Nake'muu. This is the only pueblo within LANL that has standing walls. The pueblo's architecture has been mapped, photographed, and drawn to provide a baseline for comparison. This information is monitored on an annual basis, with continual assessments made of site condition, rate of deterioration, and possible sources of impact (e.g., vibrations from high explosives testing). An increased frequency in explosive testing at

LANL presents a potential for shrapnel impacts and vibration damage to this sensitive cultural resource. Nake'muu will continue to be monitored for all types of deterioration or destruction, including monitoring the effects of explosives vibrations on the pueblo's walls.

3.10 Ecological Resources

The historic presence of LANL, with its highly restricted access and other unique land use practices, continues to support a rich diversity of natural resources within northern New Mexico.

No significant adverse impacts to biological resources, ecological processes, or biodiversity, including threatened and endangered species, are projected by the ROD. Data collected for 1998 support this projection. These data are reported in the Environmental Surveillance Report (LANL 1999c).

3.10.1 Threatened and Endangered Species Habitat Management Plan

The Threatened and Endangered Species Habitat Management Plan was completed in August 1998 and submitted to the US Fish and Wildlife Service for concurrence. The plan will be used in project reviews to determine potential impact to Federally listed threatened and endangered species including the Mexican spotted owl, southwestern willow flycatcher, American peregrine falcon, and bald eagle.

In 1998, the Laboratory completed several contaminant studies and preliminary risk assessments of the Mexican spotted owl, American peregrine falcon, bald eagle, and southwestern willow flycatcher (LANL 1997a, b, c; 1998a, b, c). Study results indicate no appreciable impact to the owl, eagle, or flycatcher from environmental contaminants, and a small potential for impact to the falcon. The source of the potential impact is not known without additional information. The assessments recommended two field studies.

3.10.2 Biological Assessments

DOE prepared a biological assessment on the SWEIS and submitted this assessment to the US Fish and Wildlife Service on May 29, 1998, for their concurrence. The biological assessment concluded that implementing the Expanded Operations Alternative, including expansion of Area G and enhancement of pit manufacturing, "May Affect" but would "Not Likely Adversely Affect" threatened and endangered species at LANL. The US Fish and Wildlife Service did not concur with DOE's position, and requested additional analyses, information, and continued consultation. In response to the Service's concerns, work was initiated on an amended biological assessment. Studies of organic contaminants in fish in the Rio Grande and organic contaminants in the peregrine food chain were also undertaken.

Four additional biological resource documents (biological assessments, biological evaluations, and other compliance documents) were prepared in 1998 and submitted to the US Fish and Wildlife Service for concurrence. Findings of concurrence on the potential for impact to threatened and endangered species were received on three of these. (A finding of concurrence allows LANL to proceed with a project, which includes performing mitigation actions identified in the document.) The three documents that received concurrence were:

Hydrodynamic Test Operations Control This biological assessment documents the potential impacts to seven Federally cited threatened and endangered species (six bird and one mammal) from the construction of DARHT (LANL 1997d). The assessment contains site-specific mitigating actions that require the Laboratory to conduct surveys prior to construction activities during the breeding season and to limit direct impacts on habitat. DOE received concurrence on this biological assessment from the US Fish and Wildlife Service on February 11, 1998.

Applied Research Optics and Electronics Laboratory This biological assessment reports on the evaluation of potential impacts to seven Federally listed species (six bird and one mammal) from the construction of the Applied Research Optics and Electronic Laboratory facility (LANL 1998d). The assessment includes site-specific mitigation actions to conduct surveys prior to construction activities during the breeding season and to limit direct impacts on habitats. DOE received concurrence on this biological assessment from the US Fish and Wildlife Service on August 20, 1998.

Monitoring Wells This assessment evaluates and documents the potential impacts to four bird species from the proposed construction of 84 new groundwater monitoring wells on DOE property (LANL 1998e). DOE received concurrence on this biological assessment from the US Fish and Wildlife Service on May 8, 1998. Mitigation actions include the requirement to conduct surveys prior to construction activities during the breeding season and to limit direct impacts on habitats.

A floodplain and wetland assessment was conducted to address potential impacts associated with the proposed conveyance and transfer of ten tracts of DOE-owned land (LANL 1998f). Floodplains and/or wetlands were found to exist on six of the ten tracts. This report assesses the potential impacts from possible urbanization associated with the potential conveyance and transfer of these tracts to the public or another Federal agency. The report also recommends mitigation actions that would protect these resources.

During 1998, the Laboratory also reviewed approximately 400 proposed activities and projects for potential impact on biological resources including Federal or State listed threatened and endangered species. These reviews evaluate the amount of previous development or disturbance at the proposed construction site, to determine the presence of wetlands or floodplains in the project area, and to determine whether habitat evaluations or species-specific surveys are needed. The Laboratory identified 133 projects that required habitat evaluation surveys to assess if the appropriate habitat types and habitat parameters were present to support any threatened and/or endangered species. These reviews identified 27 projects that required species-specific surveys. Each of these surveys resulted in the identification of special measures to protect existing threatened and endangered species. Measures that were implemented included avoiding nesting areas or disturbing habitat during breeding seasons and limiting direct impacts on habitats by curtailing activities such as vegetation removal. The Laboratory adhered to protocols set by the US Fish and Wildlife Service and to permit requirements of the New Mexico State Game and Fish Department.

4.0 Summary and Conclusion

4.1 Summary

The 1998 SWEIS Yearbook reviews operations for the 15 Key Facilities (as defined by the SWEIS) at LANL and compares those operations to the levels projected by the SWEIS ROD. The Yearbook also reviews the environmental parameters associated with operations at the same 15 Key Facilities and compares this data with the projections made by the ROD. 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: A total of 38 facility construction and modification projects were projected for LANL facilities by the SWEIS ROD. 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, the expansion of the LLW disposal area at TA-54, Area G, and the LPSS at TA-53. These ten projects did not proceed in 1998 since the ROD had not been issued. The remaining 28 construction projects, however, were also 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 BTF), 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 the first three years of the SWEIS ten-year period, 1996–1998, activities proceeded on some of the projects projected for the No Action Alternative. Six were completed and another 13 started and/or continued from 1995. The six completed projects were:

- construction of the HEWTF at TA-16-1508, which began operation in 1997;
- the modification of flows to 19 outfalls at the High Explosives Processing Key Facility, and their subsequent elimination during 1997 and 1998 from the NPDES permit;
- the replacement of the central steam plant at TA-16 with multiple, energy-efficient satellite steam boilers during 1997;
- the modification of three outfalls at TA-53, and their subsequent elimination from the NPDES permit;
- the 1997 installation of four above-grade tanks to receive influent radioactive liquid wastes at the RLWTF at TA-50; and
- the construction of four additional fabric domes at Area G for the storage of TRU wastes retrieved from earth-covered asphalt pads.

In addition to facility modification and construction projects forecast by the ROD, a number of other projects were completed during 1996–1998. These are discussed in Chapter 2 of the Yearbook, along with references to the NEPA document (Categorical Exclusion or Environmental Assessment) that preceded the project.

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 under 95 different capabilities for the Key Facilities. During 1998, there was activity under 91 of these capabilities. Those not used were uranium processing at the CMR, nonproliferation training at the CMR, ATW at LANSCE, and the processing of non-typical waste forms at TA-54, such as the land-farming of contaminated soils at Area J.

While there was activity under nearly all capabilities, the levels of these activities were often well below levels projected for the Expanded Alternative (and the ROD). For example, the LANSCE linac generated an H^+ proton beam for 1335 hours in 1998, at an average current of 740 microamps, versus 6400 hours at 1250 microamps projected by the ROD. Similarly, a total of 54 criticality experiments were conducted at Pajarito Site, compared to 1050 experiments projected by the ROD for its busiest year of research.

Only three of LANL's facilities operated during 1998 at levels approximating those projected by the ROD—the MSL, the HRL, and the Non-Key Facilities. These three are primarily research facilities operated to support the ebb and flow of research and development at LANL, and none are major contributors to the parameters that could lead to significant potential environmental impacts. The remaining 13 Key Facilities all conducted operations at or below activity levels projected by the SWEIS No Action Alternative.

Operations Data and Environmental Parameters: This 1998 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.

Effluents include air emissions, liquid effluents regulated through the NPDES program, and solid wastes. All effluents were below projections. Radioactive air emissions totaled about 9200 curies versus 21,700 projected by the ROD, with a resultant hypothetical maximum dose to a member of the public of 1.72 millirem (versus 5.44 projected). NPDES discharges totaled 211 million gallons versus a projected volume of 278 million gallons per year. Quantities of solid radioactive and chemical wastes were also low, ranging from 11% (MLLW) to 55% (chemical waste) of quantities projected by the ROD. Some correlation of reduced effluents and lower-than-projected operations is to be expected.

Workforce data were also below those projected by the ROD. Electricity use during 1998 totaled 327 gigawatt-hours (GWH) with a peak demand of 64 megawatts, versus projections of 782 GWH and 113 megawatts. Water usage was 461 million gallons (versus 759 million gallons projected), and natural gas consumption totaled 1.36 million decatherms (versus 1.84 projected). Radiation exposures of the workforce amounted to just 20% of exposures projected by the ROD (161 person-rem in 1998 versus 833 person-rem projected). In contrast, regional socioeconomic consequences, such as salaries and procurement, were likely greater than projected by the ROD since the total LANL workforce of 12,008 persons at the end of 1998 exceeded the workforce size projected by the ROD (11,351 persons). Nearly all workforce growth was in the Non-Key Facilities, not the Key Facilities.

Finally, parameters of environmental stewardship were the same as (ecological resources and groundwater) or lower than (cultural resources and land) those projected by the ROD. For land use, the ROD projects the disturbance of 41 acres of new land at TA-54 due to the need for additional disposal cells for LLW. Through 1998, however, this expansion had not begun, and there has been no additional land disturbance at LANL. Similarly, cultural resources remained protected, and no excavation of sites at TA-54 or any other part of LANL occurred over the past three years. (The ROD projected that 15 prehistoric sites would be affected by the expansion of Area G into Zones 4 and 6 at TA-54.) The decline in depth to groundwater continued as projected by the ROD, at the rate of 1 to 2 feet per year. Finally, ecological resources continued to be enhanced 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.

4.2 Conclusions

The data for 1998 reveals effects from LANL operations that are well below levels projected by the SWEIS ROD and, in most cases, below levels projected for the SWEIS No Action Alternative. Site-wide, there are two major reasons for this fact. The ROD was not issued until September 1999; consequently operations were more likely to be at levels consistent with the No Action Alternative. Moreover, data in the SWEIS were presented for the highest level projected over the ten-year period 1996–2005. Thus, the data from an early year in the projection period (1998) might be expected to fall below the maximum.

One purpose of the 1998 Yearbook is to compare LANL operations and resultant 1998 data to the SWEIS in order to determine if LANL was still operating within the environmental envelope established by the SWEIS and the ROD. Because operational data for 1998 were well below SWEIS projections, the negative impacts for 1998 were also well below SWEIS projections. In addition, these data indicate that positive impacts (such as socioeconomics) were greater than SWEIS projections. Overall, these data indicate that the Laboratory was operating within the SWEIS envelope. Thus, one can conclude that the SWEIS, coupled with the environmental assessments of items not addressed in the SWEIS, continues to provide a valid envelope that bounds LANL operations and environmental impacts.

4.3 To the Future

DOE is currently engaged in other NEPA reviews that include LANL as an alternate location for actions under consideration. These other NEPA reviews include environmental impact statements for waste management, the disposition of surplus plutonium, and the conveyance or transfer of parcels of land in the vicinity of LANL to either Los Alamos County or the Department of Interior, in trust for the Pueblo of San Ildefonso. Decisions reached for these, and future, NEPA reviews will make reference to and be tiered from the ROD.

The Yearbook will be prepared on an annual basis, with operations and relevant parameters in a given year compared to the SWEIS projections for the level of activity chosen by the ROD. To a degree, the 1999 Yearbook will have the same problem in making comparisons as this 1998 Yearbook. Since the ROD was signed in September 1999, operations in calendar year 1999 should largely reflect the No Action Alternative (appropriate until the ROD was signed). The presentation proposed for the 1999 Yearbook will follow that developed for the 1998 Yearbook—comparison to the ROD, and occasional comparisons to the No Action Alternative, if these comparisons prove useful.

The 1998 Yearbook is an important step forward in fulfilling a commitment to make the SWEIS for LANL a living document. The 1999 Yearbook is planned to continue that role.

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