Environmental Surveillance at Los Alamos during 2005

LA-14304-ENV
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Los Alamos NATIONAL LABORATORY
EST. 1943

POLICY ON ENVIRONMENT

It is the policy of Los Alamos National Laboratory to be a responsible steward of our environment while conducting mission work. It is our commitment to operate in a manner that ensures compliance with legal and other environmental regulatory requirements; work to prevent pollution by proactively identifying and preventing environmental risk; set quantifiable objectives, monitor progress, minimize consequences to the environment stemming from our past, present, and future operations; and work in harmony with the natural and human environment.

~August 2006

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Environmental Surveillance at Los Alamos during 2005

Environment & Remediation Support Services Division
505-667-0808

Water Stewardship Program
505-667-0132

Corrective Actions Program
505-667-2623

Environmental Protection Division
505-667-2211

Ecology and Air Quality Group
505-665-8855

Water Quality and RCRA Group
505-665-0453

Office of Risk Reduction
505-667-4348

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ABSTRACT

Environmental Surveillance at Los Alamos reports are prepared annually by the Los Alamos National Laboratory (LANL or the Laboratory) environmental organization, as required by US Department of Energy Order 5400.1, General Environmental Protection Program, and US Department of Energy Order 231.1A, Environment, Safety, and Health Reporting.

These annual reports summarize environmental data that are used to determine compliance with applicable federal, state, and local environmental laws and regulations, executive orders, and departmental policies. Additional data, beyond the minimum required, are also gathered and reported as part of the Laboratory's efforts to ensure public safety and to monitor environmental quality at and near the Laboratory.

Chapter 1 provides an overview of the Laboratory's major environmental programs. Chapter 2 reports the Laboratory's compliance status for 2005. Chapter 3 provides a summary of the maximum radiological dose the public and biota populations could have potentially received from Laboratory operations. The environmental surveillance and monitoring data are organized by environmental media (Chapter 4, Air; Chapters 5 and 6, Water and Sediments; Chapter 7, Soils; and Chapter 8, Foodstuffs and Biota) in a format to meet the needs of a general and scientific audience. Chapter 9, new for this year, provides a summary of the status of environmental restoration work around LANL. A glossary and a list of acronyms and abbreviations are in the back of the report. Appendix A explains the standards for environmental contaminants, Appendix B explains the units of measurements used in this report, Appendix C describes the Laboratory's technical areas and their associated programs, and Appendix D provides web links to more information.

In printed copies of this report or Executive Summary, we have enclosed a compact disc (CD) with a copy of the full report in Adobe Acrobat (PDF) form and detailed supplemental tables of data from 2005 in Microsoft Excel (.xls) format. These files are also available for download from the web.

Inquiries or comments regarding these annual reports may be directed to

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This report is also available on the World Wide Web at
http://www.lanl.gov/community/environment/docs/reports/esr.shtml

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at Los Alamos during 2005

Executive Summary

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EXECUTIVE SUMMARY

The Los Alamos National Laboratory (LANL) is located in Los Alamos County, in north-central New Mexico, approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe (Figure ES-1). The 40-square-mile Laboratory is situated on the Pajarito Plateau, which consists of a series of mesas separated by deep east-to-west-oriented canyons cut by streams. Mesa tops range in elevation from approximately 7,800 ft on the flanks of the Jemez Mountains to about 6,200 ft above the Rio Grande Canyon. Most Laboratory and community developments are confined to the mesa tops. With the exception of the towns of Los Alamos and White Rock, the surrounding land is largely undeveloped; large tracts of land north, west, and south of the Laboratory site are held by the Santa Fe National Forest, the US Bureau of Land Management, the Bandelier National Monument, the US General Services Administration, and the County of Los Alamos. In addition, Pueblo de San Ildefonso borders the Laboratory to the east.

The mission of LANL is to develop and apply science and technology to (1) ensure the safety and reliability of the US nuclear deterrent, (2) reduce the threat of weapons of mass destruction, proliferation, and terrorism, and (3) solve national problems in defense, energy, environment, and infrastructure. Meeting this diverse mission requires excellence in science and technology to solve multiple national and international challenges. Inseparable from the Laboratory's focus on excellence in science and technology is the commitment to environmental stewardship and compliance. Part of LANL's commitment is to report on the environmental performance of the Laboratory. This report

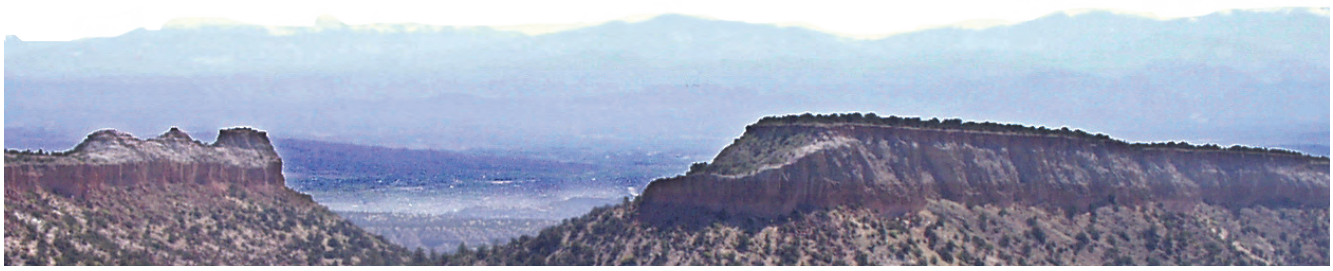
- Characterizes site environmental management,
- Describes compliance with environmental standards and requirements,
- Summarizes environmental occurrences and responses, and
- Highlights significant environmental programs and efforts.

► The Laboratory was certified as compliant with ISO 14001:2004 requirements for an Environmental Management System, the first DOE/NNSA Laboratory to achieve certification.

ENVIRONMENTAL MANAGEMENT SYSTEM (see Chapter 1)

LANL has implemented an Environmental Management System (EMS) pursuant to Department of Energy (DOE) Order 450.1 and the international standard International Standards Organization (ISO) 14001:2004. In early 2006, LANL was certified by a third-party auditor as compliant with the ISO standard, the first national laboratory operated by the DOE's National Nuclear Security Administration (NNSA) to be certified. DOE defines an EMS as "a continuous cycle of planning, implementing, evaluating, and improving processes and actions undertaken to achieve environmental missions and goals." The EMS provides a systematic method for assessing mission activities, determining the environmental impacts of those activities, prioritizing improvements, and measuring results.

The Laboratory developed a site-wide approach and framework for the EMS. Each division implemented the system within its organization and ensures internal systems are appropriate and tailored to its specific functions. The EMS core team supported divisions by facilitating meetings, providing standard procedures, tools, environmental subject matter expertise, and training as needed. The divisions evaluated products, activities, and processes to determine if they have significant potential environmental impacts. This evaluation guided development of objectives, targets, action plans, and continuous improvement plans.



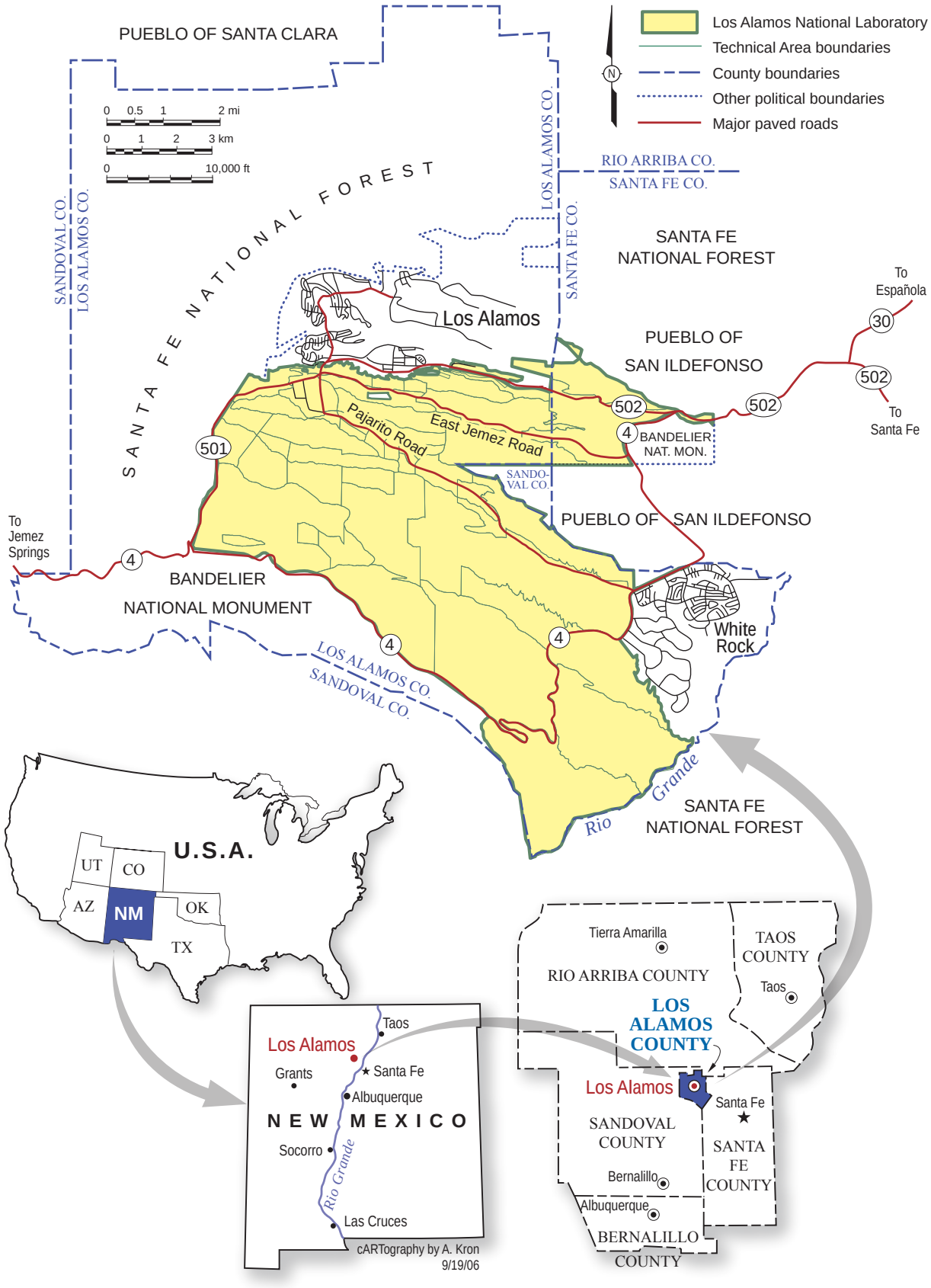


Figure ES-1. Regional location of Los Alamos National Laboratory.

ENVIRONMENTAL COMPLIANCE PROGRAMS (see Chapter 2)

The Laboratory uses the status of compliance with environmental requirements as a key indicator of performance. Federal and state regulations provide specific requirements and standards to implement these statutes and maintain environmental qualities. The EPA and the NMED are the principal administrative authorities for these laws. The Laboratory also is subject to DOE requirements for control of radionuclides. The Laboratory continues to make progress on its goal of being in full compliance with all environmental regulations. Table ES-1 presents a summary of the Laboratory's status in regard to environmental statutes and regulations.

Federal Facility Compliance Agreement

During 2005, the Laboratory continued to comply with the requirements of a Federal Facility Compliance Agreement (FFCA) between the Environmental Protection Agency (EPA) and the DOE. The agreement establishes a compliance plan for the regulation of storm water point source discharges from Solid Waste Management Units (SWMUs) and areas of concern (AOCs) at the Laboratory until such time as those sources are subject to an individual storm water permit issued by the EPA. In good faith, the Laboratory began implementing the intent of the FFCA in 2004 before the FFCA was finalized.

Compliance Order on Consent (Consent Order)

A Compliance Order on Consent (Consent Order) was signed by the NMED, DOE, and University of California (UC) in March 2005. The Consent Order is the principal regulatory document for the Laboratory's Environmental Remediation and Surveillance Program and replaces the corrective action requirements of the Hazardous and Solid Waste Amendments Module of the Laboratory's Hazardous Waste Facility Permit (Module VIII). The Consent Order contains requirements for investigation and cleanup of solid waste management units and areas of concern at the Laboratory. The major activities conducted by the Laboratory included investigations and cleanup actions. All of the Laboratory deliverables were submitted on time.

- ***The Consent Order with the NMED, signed in March 2005, replaces the corrective action requirements of the Laboratory's Hazardous Waste Facility Permit and regulates non-radioactive constituents at contaminated sites and in water at the Laboratory.***
- ***The Order specifies actions that the Laboratory must complete to characterize and remediate contaminated sites and monitor the movement of contaminants.***
- ***All required deliverables and remediations were submitted or completed on time.***

Unplanned Releases

There were no reportable unplanned airborne releases from LANL in 2005. There were no unplanned releases of radioactive liquids. There were 10 spills or releases of non-radioactive liquids which included potable water (100,000 gallons), raw sewage (750 gallons), treated wastewater (7,000 gallons), boiler condensate (36,000 gallons), storm water (18,000 gallons), vegetable oil (10 gallons), and diesel fuel from leaking vehicles (2 gallons). All liquid releases were reported to NMED and will be administratively closed upon final inspection.

ENVIRONMENTAL SURVEILLANCE PROGRAMS

LANL uses a variety of materials to accomplish mission activities. Some materials are relatively benign, while other materials are hazardous or radioactive. Experiments and mission activities result in the release of some excess materials in the forms of air emissions and water discharges. These releases have the potential to affect different receptors or components of the environment including people, air, water, plants, and animals by one or many pathways, such as breathing in contaminants or coming into close proximity or contact with hazardous materials.

Environmental monitoring (surveillance of) the complex activities and multiple receptors (people, air, water, plants, and animals) over a long time period requires a comprehensive monitoring plan and strategy. In addition, monitoring information has several uses, including serving as a basis for policy, identifying actions to protect or improve the environment, and calculating the doses received by the public (Chapter 3).

Table ES-1
Environmental Statutes under which LANL Operates and Compliance Status in 2005

Federal Statute	What it Covers	Status
Resource Conservation and Recovery Act (RCRA)	Generation and management of hazardous waste and cleanup of inactive, historical waste sites.	NMED conducted one RCRA hazardous waste compliance inspection in 2005 and identified 4 alleged violations. The Laboratory completed 1,888 self-assessments that resulted in a nonconformance finding rate of less than 2% (3.5% in 2004). The Laboratory, DOE, and NMED signed the Compliance Order on Consent (Consent Order) in March 2005, which replaces Module VIII of the Hazardous Waste Facility Permit.
Emergency Planning and Community Right-to-Know Act (EPCRA)	The public's right to know about chemicals released into the community.	Only lead and mercury were used above reportable quantities. The Laboratory reported releases, waste disposal, and waste transfers totaling 9,033 lb of lead and 222 lb of mercury. No leaks, spills, or releases exceeded reporting thresholds. No updates to Emergency Planning Notifications were necessary in 2005. Chemical Inventory Reports were updated to the Los Alamos County fire and police departments for 32 chemicals or explosives.
Clean Air Act (CAA)	Air quality and emissions into the air from facility operations	The Laboratory met all permit limits for emissions to the air. Non-radiological air emissions continued to be reduced in comparison to previous years. LANL is ahead of schedule in implementing requirements designed to eliminate the use of refrigerants. The radiation dose to the maximum exposed individual (MEI) from LANL air emissions increased to 6.46 mrem during 2005, but was less than the EPA annual limit of 10 mrem. The Los Alamos Neutron Science Center (LANSCE) was the principal contributor to the dose.
Clean Water Act (CWA)	Water quality and effluent stormwater discharges from facility operations	Only one sample (a residual chlorine level) of 949 samples collected from industrial outfalls, and none of the 126 samples collected from the Sanitary Wastewater Systems Plant's outfall, exceeded effluent limits. About 93% of the Laboratory's permitted construction sites were compliant with National Pollutant Discharge Elimination System (NPDES) stormwater requirements.
Toxic Substances Control Act (TSCA)	Chemicals such as PCBs	The Laboratory shipped 88 containers 37 kg of capacitors for disposal at an EPA-permitted treatment and disposal facility, and 1,893 kg of fluorescent light ballasts for recycling.
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	Storage and use of pesticides	The Laboratory remained in compliance with regulatory requirements regarding use of pesticides and herbicides. Four internal inspections were conducted in 2005 and no violations were found.
Endangered Species Act (ESA) & Migratory Bird Treaty Act (MBTA)	Rare species of plants and animals	The Laboratory maintained compliance with the ESA and MBTA and they continued to monitor endangered species status.
National Historic Preservation Act (NHPA) and others	Cultural resources	The Laboratory maintained compliance with the NHPA. The Laboratory identified seven new archaeological sites and 19 historic buildings. Forty-one archaeological sites were determined eligible for the National Register of Historic Places, and 10 historic buildings were determined eligible.
National Environmental Policy Act (NEPA)	Projects evaluated for environmental impacts	The NEPA team completed two environmental evaluations. No non-compliances were reported.

The Laboratory employs a tiered approach to monitor the environment and identify impacts from LANL operations. First, the Laboratory monitors the general region to establish a baseline of environmental conditions not influenced by LANL operations. Regional monitoring also demonstrates if LANL operations are impacting areas beyond the Laboratory's boundaries. Examples of regional monitoring include the radiological air-sampling network (AIRNET) and foodstuff and biota sampling locations. The second level of environmental monitoring is at the Laboratory perimeter. This information helps determine if operations are impacting the general LANL property and neighboring property (e.g., pueblo and county lands). Perimeter monitoring also measures the highest potential impact to the public. The third level of monitoring is at specific project sites on LANL lands or property that are known or have the potential to result in emissions or discharges. Examples of locations with this type of monitoring include facility stacks for air emissions, the Dual Axis Radiographic Hydrodynamic Test (DARHT) Facility, the Los Alamos Neutron Science Center (LANSCE), remediation sites where legacy waste is being managed, decontamination and decommissioning projects, Area G at TA-54 (where waste is being handled and stored), and water discharge locations (outfalls). This tiered approach provides the data used to demonstrate compliance with applicable environmental laws and regulations. During 2005, the Laboratory collected over 10,800 samples and requested over 601,000 analyses or measurements on these samples.

Radiation doses to the public were mostly from LANSCE and were up substantially from the previous year because of

- ***over twice the operational run time at LANSCE***
- ***a defective valve (now repaired) on the emissions control system that allowed radioactive gases to bypass the delay system.***
- ***All emissions are doses were below DOE and EPA regulatory limits.***

RADIOLOGICAL DOSE ASSESSMENT (see Chapter 3)

Humans, plants, and animals receive radiation doses from natural sources and from various Laboratory operations (Table ES-2). The DOE dose limits for the public and biota are the mandated criteria that are used to determine whether a measurement represents a potential exposure concern. Figure ES-2 shows doses to the hypothetical maximally exposed individual (MEI) over the last 13 years at an off-site location (East Gate). We calculated potential radiological doses to members of the public that resulted from LANL emissions and discharges. During 2005, the population within 80 km of LANL (approximately 280,000 people) received a collective dose of about 2.46 rem (called a person-rem), which is an increase from the dose of 0.90 person-rem reported for 2004. The dose to the hypothetical maximally exposed individual was approximately 6.46 millirem (mrem), compared to 1.68 in 2004 (Figure ES-2). The dose received in 2005 from Laboratory operations by an average Los Alamos residence and an average White Rock residence totaled about 0.11 mrem and 0.06 mrem, respectively. The increase in these doses was almost all attributable to emissions from the LANSCE accelerator facility which releases very short-lived radioactive gases from a location relatively close to the LANL boundary. The increase in emissions occurred because LANSCE operational time was over twice the previous year's level and a defective valve allowed some of the gases to bypass the emission control system. All emissions and doses were below DOE and EPA regulatory limits for the public.

Table ES-2
Where are the Sources of Radiological Doses?

Source or pathway (and receptor)	Dose	Location	Trends
Natural and man-made background (humans)	~500 mrem/yr	All sites	Not applicable
Air (humans)	6.46 mrem/yr	East Gate	Substantial increase from previous year but remains below DOE and EPA regulatory limits
Direct irradiation from Area G (humans)	0.9 mrem/yr	San Ildefonso – offsite	None
Food (humans)	<0.1 mrem/yr	All sites	None
Drinking water (humans)	<0.1 mrem/yr	All sites	None
All (terrestrial animals)	<10 mrad/day	TA-15 EF site, TA-21 MDA B	None
All (aquatic animals)	<11 mrad/day	LA Canyon between DP and SR-4	None
All (terrestrial plants)	<100 mrad/day	TA-15, TA-54 MDA G	None

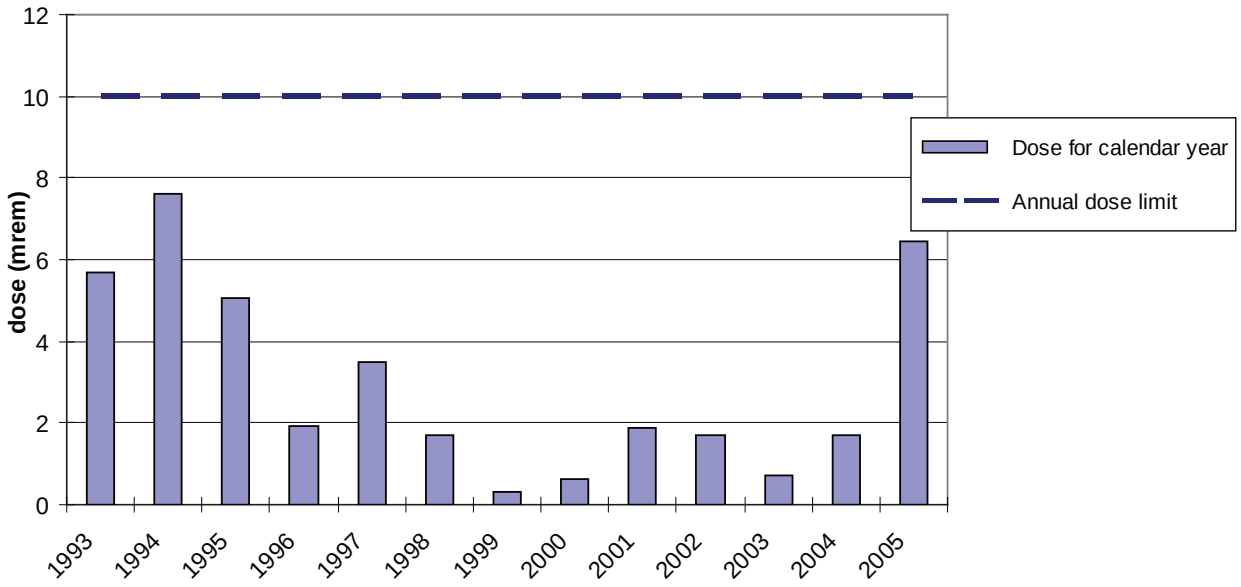


Figure ES-2. Annual dose (mrem) to the maximally exposed individual off-site over the past 13 years.

BIOTA DOSE (see Chapter 3)

The DOE biota dose limits are intended to protect populations, especially with respect to preventing the impairment of reproductive capability within the population, and are thus applied to biota populations rather than to individual plants and animals. Vegetation samples were collected from TA-54 Area G and DARHT, honey bees were collected in the area of DARHT, and surface waters were collected in specific canyons for purposes of comparing radionuclide concentrations with the DOE biota concentration guides (BCGs). Radionuclide concentrations in the vegetation and honey bee samples did not exceed 10 percent of the BCGs (and appropriate biota dose limits), which is the initial screening level. The time-weighted sum of ratios for estimated annual average surface water concentrations of radionuclides in the major canyons potentially affected by the Laboratory were well below the aquatic animal BCGs (less than 11 percent of the standard or 0.11 rad/day).

AIR EMISSIONS AND AIR QUALITY (see Chapter 4)

The Laboratory measures the emissions of radionuclides at the emission sources (building stacks) and categorizes its radioactive stack emissions into one of four types: (1) particulate matter, (2) vaporous activation products (radionuclides in gaseous state), (3) tritium, and (4) gaseous mixed activation products (air molecules made into radioactive isotopes by particle beam irradiation). Similarly, the Laboratory takes air samples at general locations within LANL boundaries, at the LANL perimeter, and regionally to estimate the extent and concentration of radionuclides that may be released from Laboratory operations. These radionuclides include plutonium, americium, uranium, and tritium.

- ***Stack emissions increased significantly in 2005 because of increased LANSCE operations and because of a malfunctioning valve in the LANSCE system.***
- ***About 98 percent of radioactive air emissions were from LANSCE operations.***
- ***The dose rate decreases very quickly with distance because of the very short half-lives of the radionuclides released by LANSCE.***

Gaseous activated air product emissions from the LANSCE stack were substantially increased from 2004 while emissions from all other stacks were comparable to previous years or slightly lower. Total stack emissions during 2005 increased to approximately 19,100 curies (Ci). Of this total, tritium emissions composed about 704 Ci (slightly less than in 2004), and short-lived air activation products from LANSCE stacks contributed nearly 18,400 Ci (a substantial increase from 2004 and 98 percent of total emissions). Combined airborne emissions of materials such as plutonium, uranium, americium, and thorium were about 0.00002 Ci and emissions of particulate/vapor activation products were less than 0.02 Ci (both about a fifth of 2004 emissions). Because of the close proximity of the LANSCE facility to the LANL site boundary, air activation emissions from LANSCE remain the greatest source of off-site dose from the airborne pathway, though this dose rate falls off very quickly with increasing distance.

- ***Measurable concentrations of radionuclides in ambient air were not detected at regional sampling locations nor at most perimeter locations.***
- ***The highest air concentrations at LANL and at perimeter locations were well below 1 percent of the applicable EPA and DOE dose guidelines.***

Radionuclide concentrations from ambient air samples in 2005 were generally comparable with concentrations in past years. Measurable concentrations of radionuclides were not detected at regional sampling locations nor at most perimeter locations. The highest annual mean radionuclide concentrations from air samples within LANL boundaries and at perimeter locations were well below one percent of the applicable EPA and DOE standards. Measurable amounts of tritium were reported at most on-site locations and at perimeter locations; the highest measurement was on-site at TA-16 near a known source and was less than 0.5 percent of the EPA public dose limit. We measured elevated tritium levels at a number of on-site stations, with the highest annual concentration, 950 picocuries per cubic meter (pCi/m^3) or about 0.005 percent of the DOE worker exposure limit, at TA-54, Area G, at a location near shafts containing tritium-contaminated waste. Plutonium was detected at two off-site stations: near Los Alamos Lodge at about 16 attocuries m^3 (aCi/m^3) or about 1 percent of the EPA public dose limit (from historical activities at LANL's old main technical area), and near the Los Alamos Airport (from remediation work at TA-21). On-site detections of plutonium occurred at TA-21 and at Area G and were substantially below 1 percent of the DOE limit for workplace exposure. Americium-241 was detected only at TA-21 and at TA-54 Area G at levels far less than 1 percent of public and worker exposure limits. The maximum annual uranium concentrations were from natural uranium at locations with high dust levels from local soil disturbances such as dirt roads at the Los Alamos County Landfill and LANL's TA-54, Area G. The regional and pueblo samples had higher average concentrations of uranium isotopes than the perimeter group at ratios that indicate natural sources.

- ***PM-10 and PM-2.5 particulate measurements in ambient air were well below EPA standards.***
- ***Beryllium air concentrations for 2005 were similar to past years and were equal to or less than 2 percent of the NESHAP standard; a natural origin is indicated by correlation with aluminum concentrations.***

Air monitoring continued at one White Rock and two Los Alamos locations for particles with diameters of 10 micrometers (μm) or less (PM-10) and for particles with diameters of 2.5 μm or less (PM-2.5). The annual average for PM-10 was about 13 $micrograms/m^3$ and about seven $micrograms/m^3$ for

PM-2.5 at all locations and was mostly caused by natural dust and wildfire smoke. These averages are well below the EPA standards. In addition, the 24 hour maxima for both PM-2.5 and PM 10 at all three locations were much less than the EPA standards.

The Laboratory analyzed filter samples from 23 sites for beryllium. These sites are located near potential beryllium sources at LANL or in nearby communities. Correlation with aluminum concentrations indicates that all measurements of beryllium are from naturally occurring beryllium in resuspended dust. Beryllium air concentrations for 2005 were similar to those measured in recent years. All values are equal to or less than 2 percent of the National Emission Standard for Hazardous Air Pollutants (NESHAP) standard.

GROUNDWATER MONITORING (see Chapter 5)

Groundwater at the Laboratory occurs as a regional aquifer at depths ranging from 600 to 1,200 feet and as perched groundwater of limited thickness and horizontal extent, either in canyon alluvium or at intermediate depths of a few hundred feet (Figure ES-3). All water produced by the Los Alamos County water supply system comes from the regional aquifer and meets federal and state drinking water standards. No drinking water is supplied from the alluvial and intermediate groundwater.

In general, groundwater quality is improving as

- ***outfalls are eliminated,***
- ***quantity of discharges are reduced, and***
- ***water quality of the discharges improves.***

However, contamination may be discovered in additional locations as contaminants migrate over time.

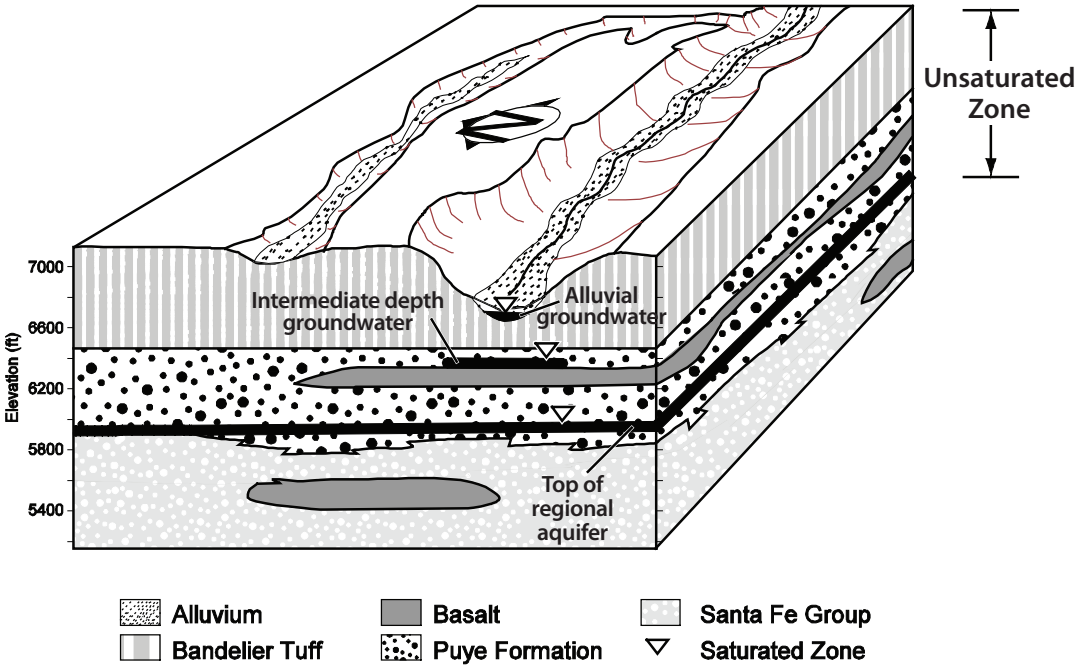


Figure ES-3. Illustration of geologic and hydrologic relationships in the Los Alamos area, showing the three modes of groundwater occurrence.

Monitoring of the groundwater increased substantially from previous years to work towards monitoring requirements specified in the Consent Order. Table ES-3 summarizes contaminants found in portions of the groundwater system.

Table ES-3
Where Can We See LANL Impacts on Groundwater That Result in Values Near or Above Regulatory Standards or Risk Levels?

Chemical	On-Site	Off-Site	Significance	Trends
Hexavalent chromium	Regional and intermediate groundwater in Mortandad Canyon, regional in Sandia Canyon	No	Exceeds NM groundwater standard by factor of 8 in regional aquifer beneath Mortandad Canyon; not seen above background in water supply wells	Insufficient data to evaluate trend, extent under investigation
Perchlorate	All groundwater zones in Mortandad Canyon, regional aquifer in Pueblo Canyon, alluvial groundwater in Cañon de Valle	Yes, in Pueblo Canyon	Values exceed EPA drinking water risk level in Mortandad Canyon alluvial and intermediate groundwater; supply well with values at 1/10th of risk level is permanently off line	Decreasing in Mortandad Canyon alluvial groundwater due to effluent quality improvement; insufficient data for other groundwater
Dioxane[1,4-]	Intermediate groundwater in Mortandad Canyon	No	Just below EPA drinking water risk level, not used as drinking water supply	Insufficient data to evaluate trend, extent under investigation
Nitrate	Intermediate groundwater in Mortandad Canyon, alluvial and intermediate groundwater in Pueblo Canyon	Yes, in Pueblo Canyon	Above NM groundwater standards in Mortandad Canyon intermediate groundwater; in Pueblo Canyon, may be due to LA County's Bayo Sewage Treatment Plant; just below EPA drinking water risk level	Insufficient data in Mortandad, source eliminated in 1999; values in Pueblo are variable
Barium	Alluvial and intermediate groundwater in Cañon de Valle	No	Exceeds NM groundwater standard by 10 times in alluvial groundwater, not used as drinking water supply	Values seasonably variable but remain high, most sources eliminated
High explosives	Alluvial and intermediate groundwater in Cañon de Valle	No	RDX exceeds EPA drinking water risk levels by 20 to 40 times in intermediate and alluvial groundwater, not used as drinking water supply	Values seasonably variable but remain high, most sources eliminated
Tritium	Intermediate groundwater in Mortandad Canyon	No	Exceeds MCL, not used as a drinking water supply	Insufficient data to evaluate trend, source eliminated in 2001
Other radionuclides	Alluvial groundwater in Mortandad Canyon	No	Not used as a drinking water supply; radionuclides have not moved to deeper groundwater	Some constituents are fixed in location; some are decreasing due to effluent quality improvements in 1999
Molybdenum	Alluvial groundwater in Los Alamos Canyon	No	Near NM groundwater standard, not used as drinking water supply, limited in extent	Fairly steady for over 10 years, source eliminated in 2002

▶ *Chromium contamination was recently detected in the regional aquifer at concentrations above drinking water standards.*

▶ *The contamination is likely the result of discharges made in the 1960s and early 1970s containing chromate in cooling tower discharges.*

▶ *No drinking water wells have been affected by the contamination.*

Chromium was detected in one well in the regional aquifer under Mortandad Canyon during 2005 at concentrations exceeding drinking water standards, though no drinking water wells are affected. The chromium is most likely from discharges of cooling water containing chromate (used to control corrosion) from TA-3 that took place from the 1960s until 1972. The Laboratory has started investigation of this contamination in cooperation with the NMED. High concentrations of naturally occurring uranium and arsenic are also found in groundwater samples from some regional aquifer wells and springs. Most other metals found at high concentrations (aluminum, manganese, and iron) in groundwater samples at LANL are due to well sampling and well construction issues rather than to LANL contamination. The use of fluids to assist with well drilling and the use of other materials in well completion has affected the chemistry of some groundwater samples.

Dioxane, a volatile organic compound used as a stabilizer for chlorinated organic solvents, was detected during June in two intermediate wells in Mortandad Canyon. The Laboratory has started investigation of this contamination in cooperation with the NMED.

Drainages that in the past received liquid radioactive effluents include Mortandad Canyon, Pueblo Canyon from its tributary Acid Canyon, and Los Alamos Canyon from its tributary DP Canyon; only Mortandad currently receives treated radioactive effluent, from the Radioactive Liquid Waste Treatment Facility. For the past six years, the facility has met all DOE radiological discharge standards and all NPDES requirements, and except during two weeks in 2003 (two weekly composite samples exceeded the fluoride standard) has voluntarily met NM groundwater standards for fluoride, nitrate, and total dissolved solids.

Water Canyon and its tributary Cañon de Valle formerly received effluents produced by high explosives (HE) processing and experimentation. In past years, Los Alamos County has operated three sanitary treatment plants in Pueblo Canyon; currently only one plant is operating. The Laboratory also operated many sanitary treatment plants.

Naturally occurring uranium was the main radioactive element detected in the regional aquifer, springs, and wells throughout the Rio Grande Valley. Other naturally occurring radioactivity in groundwater samples comes from members of the uranium isotope decay chains, including isotopes of thorium and radium.

We compared radionuclide levels in all groundwater with drinking water and human health standards even though these standards only apply to drinking water sources. Total LANL-derived radionuclide activity in alluvial groundwater in Mortandad and DP/Los Alamos was above the 4-mrem DOE derived concentration guide (which we use as a screening level) applicable to drinking water. The maximum strontium-90 values in Mortandad Canyon and DP/Los Alamos Canyon alluvial groundwater were also above the EPA drinking water standard.

LANL and the NMED DOE Oversight Bureau have detected perchlorate in most groundwater samples analyzed from across northern New Mexico. Numerous studies now show that perchlorate is formed naturally in the upper atmosphere, is deposited on the earth's surface by precipitation, and accumulates in soils and groundwater of arid regions. The EPA recently set a Drinking Water Equivalent Level of 24.5 micrograms per liter (μg/L) for perchlorate. Perchlorate in arid region groundwater may also arise from other sources such as fertilizers, or from natural sources like mineral weathering or electrochemical reactions. The naturally-occurring perchlorate concentrations range from about nondetect (<0.05 μg/L) to about 0.85 μg/L. Water samples from most LANL locations show low perchlorate concentrations in this range, but samples taken downstream from former perchlorate sources show higher values. Figure ES-4 illustrates the declining perchlorate values found in alluvial groundwater downstream of the radioactive liquid waste treatment facility (RLWTF) discharge

▶ *The Radioactive Liquid Waste Treatment Facility, which discharges into Mortandad Canyon, has met all DOE radiological discharge standards for six consecutive years; has met all NPDES requirements for six consecutive years; and has met NM groundwater standards for fluoride, nitrate, and total dissolved solids for six years except for fluoride in two weekly composite samples in 2003.*

in Mortandad Canyon. Discharge of perchlorate from the plant effectively ceased in 2002 with installation of equipment designed to remove perchlorate from the effluent and aggressive pollution prevention efforts to eliminate perchlorate from plant inflow.

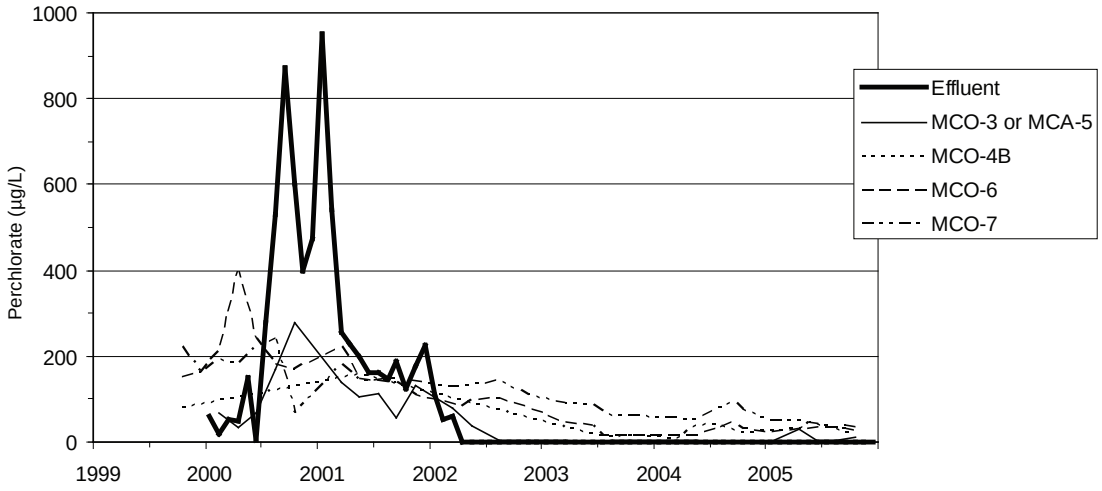


Figure ES-4. Perchlorate in Mortandad Canyon Alluvial Groundwater and RLWTF effluent, 1999–2005. Ion-exchange treatment was started in March 2002 to remove perchlorate to below 1 µg/L.

WATERSHED MONITORING (see Chapter 6)

Watersheds that drain the Laboratory are dry for most of the year. Of the 85 miles of watercourse, approximately two miles are naturally perennial, and approximately three miles are perennial waters created by effluent. No perennial surface water extends completely across the Laboratory in any canyon. Storm runoff occasionally extends across the Laboratory but is short-lived. Wildlife drink from the stream channels when water is present but the water is not used for any other purpose.

Hydrologic conditions in all LANL canyons and in Pueblo Canyon have recovered to near pre-fire levels. The overall quality of most surface water in the Los Alamos area is very good, with low levels of dissolved solutes. Of the more than 100 constituents (or "analytes") measured in sediment and surface water within the Laboratory, most are at concentrations far below regulatory standards or risk-based advisory levels. However, nearly every major watershed has some effect from Laboratory operations, often for just a few analytes. More data are available for 2005 than for prior years as a result of monitoring requirements of the Federal Facility Compliance Agreement.

- ***The overall quality of most surface water within the Los Alamos area is very good.***
- ***Of the more than 100 analytes, most are within normal ranges or at concentrations below regulatory standards or risk-based advisory levels.***
- ***However, nearly every major watershed shows some effect from Laboratory operations.***

LANL activities have caused contamination of sediments in several canyons, mainly because of past industrial effluent discharges. These discharges and contaminated sediments also affect the quality of storm runoff, which carries much of this sediment for short periods of intense flow. In some cases, sediment contamination is present from Laboratory operations conducted more than 50 years ago. Table ES-4 shows the locations of LANL-impacted surface water and sediments. All radionuclide levels are well below applicable guidelines or standards (Table ES-5).

The overall pattern of radioactivity in channel sediments, such as along lower Los Alamos Canyon, has not greatly changed in 2005. Sediment traps and other methods to slow or control sediment transport in these canyons reduce the potential for further transport down the canyons and potentially to the Rio Grande. Such a sediment trap, the Los Alamos Canyon Weir, decreased transport of sediments from lower Los Alamos Canyon by about two thirds in 2005.

Table ES-4
Where Can We See LANL Impacts on Surface Water and Sediments that Result in Values Near or Above Regulatory Standards or Risk Levels?

LANL Impact	On-Site	Off-Site	Significance	Trends
Radionuclides	Higher than background in sediments and storm runoff in Pueblo, DP, Los Alamos, and Mortandad canyons	Yes, in Los Alamos/Pueblo Canyons; slightly elevated in the Rio Grande and Cochiti Reservoir	Sediments well below recreation screening levels Minimal exposure potential to runoff because events are typically sporadic Concentrations below levels for protection of biota	Sediment concentrations in lower LA Canyon are stable Overall reduced transport in canyons due to post-fire recovery Expect increase in transport in Pueblo and DP Canyons due to new urbanization
Polychlorinated biphenyls (PCBs)	Detected in sediment in nearly every canyon Detected in runoff in several canyons above NM stream standards	Yes, in the Los Alamos/ Pueblo Canyons	Possible wildlife exposure in Los Alamos and Sandia Canyons when water is present. In Rio Grande, LANL contribution indistinguishable from high levels from upstream sources.	Insufficient data
Dissolved copper	Detected in many canyons above NM acute standards	Yes, in Los Alamos Canyon	Most probably of urban origin; Laboratory sources seen on localized basis	Insufficient data
High-explosive residues and barium	Detections near or above screening values in Cañon de Valle base flow and runoff	No	Minimal potential for exposure	Steady
Benzo(a)pyrene	Detections near or above industrial and recreational screening levels in Acid Canyon	Yes, in Los Alamos/ Pueblo/Acid Canyons	Associated with urban runoff; non-LANL sources contribute	Steady

Table ES-5
Estimated Annual Average Unfiltered Surface Water Concentrations (pCi/L) of Radionuclides in Selected Canyons Compared with the Biota Concentration Guides

Radionuclide	Lower Pueblo Canyon	DP Canyon below TA-21	LA Canyon between DP and SR-4	Mortandad Canyon below Effluent Canyon	Pajarito Canyon above SR-4	Max percent of BCG[a]
Am-241	0.4	0.02	3.3	5.1		1%
Cs-137		2	24	20		0.1%
H-3				237		0.0%
Pu-238		0.06	0.17	2.1		1%
Pu-239,240	11	0.4	2.5	2.9		1%
Sr-90	0.4	3.5	1.7	3.4	0.4	1%
U-234	1.7	1.9	7.9	2.0	0.1	4%
U-235,236	0.1	0.1	7.1	1.1		4%
U-238	1.6	1.8	0.5	1.9	0.1	2%

[a] BCG = DOE's Biota Concentration Guides.
Blank cells mean no analytical laboratory detection in 2005.

- ***Radioactive elements from past Laboratory operations are being transported by runoff events.***
- ***PCBs and radionuclides adsorb onto sediment particles and thus occur in far higher concentrations in unfiltered than filtered samples.***

Figure ES-5 shows the frequency at which concentrations of 16 analytes in surface water samples were greater than the NM water quality standards. Consistent with previous years, most of the higher concentrations were measured in storm runoff samples because of the large sediment load carried by the storm runoff events. Analytes with concentrations above the standards as a result of natural or non-Laboratory causes include aluminum (occurs naturally in all rocks and soil), gross alpha (associated with native soils and sediments), benzo(a)pyrene (associated with urban runoff and possibly created through the Cerro Grande Fire), and selenium (in volcanic soils and ash). For most analytes shown in Figure ES-5, concentrations were above standards by less than five times. As with radionuclides, PCBs adsorb onto sediment particles and thus occur in far higher concentrations in unfiltered samples. Despite the higher PCB concentrations measured in runoff within the Laboratory, monitoring results show no measurable effects in the Rio Grande (see Biota discussion on page 16). No credible pathway to humans exists for the contaminants in streams and sediments on Laboratory property.

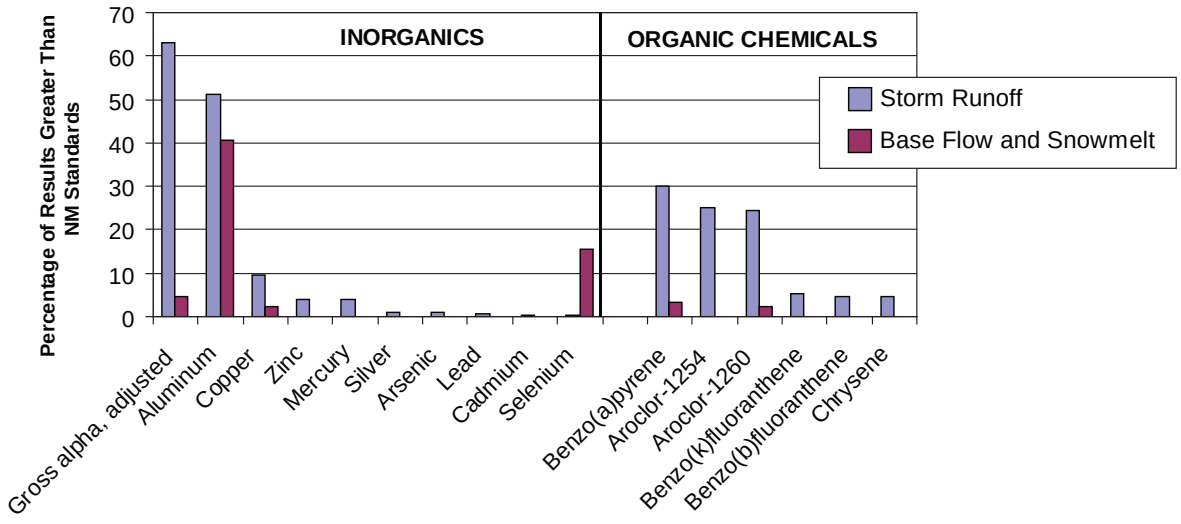


Figure ES-5. Frequency that storm runoff and base flow/snowmelt results were greater than New Mexico water quality standards.

SOIL MONITORING (see Chapter 7)

Soil sampling, as with foodstuffs and biota sampling, is performed on a rotating 3-yr cycle; the next soil sampling will occur in 2006. Data from previous years showed levels either not detectable or consistent with background levels except at some on-site locations where radionuclide contamination is expected.

Two perimeter soil samples were collected from Pueblo de San Ildefonso lands and showed concentrations of most radionuclides below the regional statistical reference levels (average plus three standard deviations). Only uranium in one sample was detected at values slightly above the regional statistical reference level but its isotopic distribution and location indicates it is not from Laboratory operations.

▶ Soil samples from off-site locations show radionuclides and metals have not increased over the past years and are mostly at background or non-detectable levels.

▶ Soil samples from on-site locations show no increases and some decreases of radionuclides and metals from previous years.

Soil samples were collected from around TA-54 Area G, the Laboratory's principal low-level waste disposal area, and TA-15 DARHT, the Laboratory's principal explosive test facility. At Area G, some radionuclides, principally tritium and plutonium, were measured above regional statistical reference levels but below LANL screening levels and are either consistent with levels measured in previous years or declining. Similarly, only a few radionuclides in samples from TA-15 were above regional statistical reference levels but below LANL screening levels and show no increases from levels measured in previous years.

FOODSTUFFS AND NONFOODSTUFFS BIOTA MONITORING (see Chapter 8)

▶ The levels of radionuclides and metals in soil, vegetation, and mice from the area above the LA Weir were mostly below background and indicate there is no significant impact to the biota in this area.

Foodstuffs samples that were collected in 2005 included fish from Cochiti Reservoir and purslane, an edible plant, from the Pueblo de San Ildefonso. We also collected nonfoodstuff biota such as native vegetation at Area G and at DARHT. Concentrations, trends, and doses were assessed.

Levels of radionuclides, non-radionuclide inorganic metals, and PCBs in fish upstream and downstream of LANL were similar to each other and support previous studies that imply LANL is not the source of significant contaminants. Radionuclides in the fish from upstream and downstream sources are near detection limits or nondetectable (the result is less than three times the analytical uncertainty), except for one sample from Cochiti Reservoir that contained uranium-234 and uranium-238 just

above the regional statistical reference levels (three standard deviations above background averages); however, the isotopic distribution indicates a natural origin of the uranium. Mercury levels in the fish upstream and downstream were similar but are at levels that have triggered fish consumption advisories on the Rio Grande. Similarly, PCB levels in bottom-feeding fish from both upstream and downstream sources exceed safe levels for regular consumption.

- ***Radionuclides, non-radionuclide metals, and PCBs in fish upstream and downstream of LANL are similar and do not indicate a measurable contribution to biota from LANL.***
- ***Levels of mercury in predator fish and PCBs in bottom-feeding fish upstream and downstream are similar and are above state consumption advisory levels.***

Data from past years on radionuclides in domestic crop plants (vegetables and fruits) from all communities surrounding the Laboratory were indistinguishable from natural or fallout levels. Similarly, all trace element concentrations in vegetable and fruit samples were within or similar to the regional statistical reference levels and showed no increasing trends in concentrations.

Wild edible plants (oak acorns, wild spinach, and purslane) were sampled in past years from Pueblo de San Ildefonso lands near the Laboratory boundary. Some radionuclides in these plants were at higher levels than natural or fallout levels; however, all were below levels that would result in a dose of 0.01 mrem for each pound of each consumed, which is 0.1 percent of the DOE dose limit of 100 mrem/yr. In 2005, additional purslane samples and soil samples were collected to investigate the slightly elevated strontium-90 levels. The results confirmed suspicions that lower calcium levels in the soil results in increased uptake of fallout strontium-90 by the plants.

All non-radionuclide contaminant concentrations, with the exception of barium, in these wild edible plants were either undetected or within the regional statistical reference levels. The additional samples of purslane from background locations confirmed elevated barium concentrations in these plants that are most likely due to bioaccumulation of barium by purslane plants.

Vegetation was collected at Area G and DARHT. All radionuclide concentrations in vegetation were indistinguishable from background reference levels except tritium and plutonium in plants next to the disposal area at Area G.

Honeybees sampled from hives on LANL property near a testing area where depleted uranium is used found only uranium-238 above regional statistical reference levels but at levels far below terrestrial animal dose screening levels (<0.01 rad/d). All other radionuclides and all non-radionuclides were below regional statistical reference levels.

We collected samples of soil, vegetation, and small mammals (deer mice) at the Los Alamos Canyon Weir, a low rock dam designed to trap sediment being transported off Laboratory property in Los Alamos Canyon. The levels of radionuclides and metals in these media were mostly below regional statistical reference levels and indicate that there is no measurable impact to the biota.

A special study of uranium uptake by ponderosa pine trees growing near firing sites at TA-15 was conducted to determine if variations in environmental uranium concentrations from open-air dynamic tests were similar to variations in uranium concentrations in trees. Results indicate that uranium concentrations were statistically similar in off-site and on-site ponderosa pine trees, indicating that dynamic tests conducted at LANL have not significantly impacted uranium concentrations in ponderosa pine pulp.

Moss samples were collected from several springs around northern New Mexico and analyzed for cesium-137 as part of another special study. Levels at two of the sampled springs were similar to those measured by other organizations at those springs. The varying levels of cesium-137 may be attributable to the exposure of the moss to dust or soil that contains fallout levels of cesium-137; the lowest levels were generally found on moss from springs that are relatively sheltered.

ENVIRONMENTAL RESTORATION PROGRAM (see Chapter 9)

- ***Characterization and cleanup of sites contaminated or potentially contaminated by past LANL activities is subject to the Consent Order with the NMED.***
- ***Fourteen investigation work plans and five investigation reports were approved by NMED in 2005.***
- ***Nine reports were submitted to NMED and are now under review.***

Corrective actions proposed and/or conducted at the Laboratory in 2005 are subject to the Consent Order signed by the NMED, the DOE, LANL, and the State of New Mexico Attorney General in March 2005. The goal of the investigation efforts is to ensure that past operations do not threaten human or environmental health and safety in and around Los Alamos County. Accomplishments include the completion of investigation activities, approvals of proposed investigation activities, and approvals of the work completed at some sites. Under the Consent Order, investigation work plans and investigation reports were submitted to NMED and were approved in 2005 or were under review. Proposed investigation activities were commenced and/or completed in 2005 at a number of complex sites including material disposal areas (MDAs) C, G, L, U, and V; Mortandad Canyon; Pajarito Canyon; TA-19; Mortandad/Ten Site Canyon Aggregate Area; and the TA-16-340 Complex. In addition, several individual sites (solid waste management units [SWMUs] and areas of concern [AOCs]) were investigated and remediated.

A total of 14 investigation work plans were approved by NMED with or without modifications in 2005. Of the work plans approved, seven were submitted in 2005. A total of five investigation reports were approved by NMED with or without modifications, which signifies that either the investigation has been completed or that additional activities are needed in order to complete the investigation. In addition, nine reports were submitted in 2005 and as of the end of the calendar year, are under review by NMED. These reports either recommended that corrective actions are completed or that additional sampling and/or remediation are warranted.

The investigation activities proposed are designed to characterize SWMUs, AOCs, consolidated units, aggregates, and watersheds. The characterization activities conducted include surface and subsurface sampling, drilling boreholes, geophysical studies, and installation of monitoring wells. Corrective actions performed included the removal of structures (e.g., buildings, septic systems, sumps, and drainlines), soil vapor extraction, excavation of contaminated media, and confirmatory sampling. These activities define the nature and extent of contamination and whether there are unacceptable risks to human health and the environment.

- ***Investigations at restoration sites included drilling a substantial number of boreholes, collecting hundreds of samples, and obtaining thousands of analytical results.***
- ***Cleanup activities included the removal of structures (e.g., buildings, septic systems, sumps, and drainlines), soil vapor extraction, excavation of contaminated media, and confirmatory sampling.***
- ***In 2005, 35 percent of all environmental samples collected and 74 percent of all analyses on the samples were for environmental characterization and remediation work at LANL.***

Major investigations conducted in 2005 included MDA L, MDA G, and the Mortandad/Ten Site Canyons Aggregate Area. The Mortandad/Ten Site Canyon Aggregate Area investigation included SWMUs, AOCs, and consolidated units associated with six technical areas including TA-35, which is a major Laboratory industrial complex. The documents for these sites were among the first major reports submitted under the Consent Order. The investigations included drilling a substantial number of boreholes, collecting hundreds of samples, and obtaining thousands of analytical results. Recommendations for MDAs L and G included the monitoring of subsurface vapors and a corrective measure evaluation. The majority of the aggregate area sites were recommended as having corrective action complete with controls, while some sites require additional sampling and/or remediation. Investigation and/or monitoring activities are continuing at these sites.

I. INTRODUCTION

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A. BACKGROUND AND REPORT OBJECTIVES

1. Introduction to Los Alamos National Laboratory

In March 1943, a small group of scientists came to Los Alamos for Project Y of the Manhattan Project. Their goal was to develop the world's first nuclear weapon. Although planners originally expected that the task would require only 100 scientists, by 1945, when the first nuclear bomb was tested at Trinity Site in southern New Mexico, more than 3,000 civilian and military personnel were working at Los Alamos Laboratory. In 1947, Los Alamos Laboratory became Los Alamos Scientific Laboratory, which in turn became Los Alamos National Laboratory (LANL or the Laboratory) in 1981. Through May 2006, the Laboratory was managed by the Regents of the University of California (UC) under a contract administered by the National Nuclear Security Administration (NNSA) of the Department of Energy (DOE) through the Los Alamos Site Office and the NNSA Service Center based in Albuquerque. In June 2006, a new management organization, Los Alamos National Security, LLC, took over management of the Laboratory.

The Laboratory's original mission to design, develop, and test nuclear weapons has broadened and evolved as technologies, US priorities, and the world community have changed. The current mission is to develop and apply science and technology to

- Ensure the safety and reliability of the US nuclear deterrent;
- Reduce the threat of weapons of mass destruction, proliferation, and terrorism; and
- Solve national problems in defense, energy, environment, and infrastructure.

Los Alamos National Laboratory's vision is to be "The trusted, competitive scientific solution for today's and tomorrow's national security challenges." The Laboratory has identified seven national security goals to implement its vision and mission:

- Create an integrating core competency for science-based prediction of complex systems linking experiment, simulation, and theory.
- Design and engineer manufacturable and certifiable replacement nuclear weapons without new nuclear testing.
- Be acknowledged as the premier laboratory for nonproliferation research and development.
- Be the preferred laboratory for providing the defense, intelligence, and homeland security communities with revolutionary, success-enabling science and technology.
- Be the best materials science and technology laboratory in the world in support of our mission.
- Use LANL expertise and capability to solve national problems in energy security.
- Be a strategic partner of the Office of Science to benefit its national missions and the science base critical to our national security missions.

Inseparable from the Laboratory's commitment to excellence in science and technology is its commitment to complete all work in a safe, secure, and environmentally responsible manner. The Laboratory uses Integrated Safety Management (ISM) to set, implement, and sustain safety performance and meet environmental expectations. In addition, the Laboratory uses an International Standards Organization (ISO) 14001:2004 registered Environmental Management System (EMS) as part of ISM to focus on environmental performance, protection, and stewardship (see Section D of this chapter for additional information). The foundation of the EMS and demonstration of the Laboratory's commitment is the April 2004 LANL environmental policy:

> *It is the policy of Los Alamos National Laboratory that we will be responsible stewards of our environment. It is our policy to manage and operate our site in compliance with environmental laws and standards and in harmony with the natural and human environment; meet our environmental permit requirements; use continuous improvement processes to recognize, monitor, and minimize the consequences to the environment stemming from our past, present, and future operations; prevent pollution; foster sustainable use of natural resources; and work to increase the body of knowledge regarding our environment.*

2. Objectives

As part of the Laboratory's commitment to our environmental policy, we will monitor and report on how Laboratory activities are affecting the environment. The objectives of this environmental surveillance report, as directed by DOE Order 231.1 (DOE 2003a, DOE 2004), are to

- Characterize site environmental management performance including effluent releases, environmental monitoring, and estimated radiological doses to the public.
- Summarize environmental occurrences and responses reported during the calendar year.
- Confirm compliance with environmental standards and requirements.
- Highlight significant programs and efforts, including environmental performance indicators and/or performance measures programs.

Over and above the DOE requirements, the Laboratory establishes annual environmental objectives, targets, and key performance indicators through its EMS. The current objectives are to

- Conduct the Laboratory mission while demonstrating rigorous compliance with federal and state environmental regulations and permits.
- Conduct the Laboratory mission through continuous and measurable environmental risk reduction to protect workers, the public, and the natural environment.
- Use an ISO 14001:2004 prevention-based EMS to improve environmental performance.
- Effectively manage waste, excess materials, and equipment generated during historical, current, and future Laboratory operations.

B. ENVIRONMENTAL SETTING

1. Location

The Laboratory and the associated residential and commercial areas of Los Alamos and White Rock are located in Los Alamos County, in north-central New Mexico, approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe (Figure 1-1). The 40-square-mile Laboratory is situated on the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep east-to-west-oriented canyons cut by streams. Mesa tops range in elevation from approximately 7,800 ft on the flanks of the Jemez Mountains to about 6,200 ft near the Rio Grande Canyon. Most Laboratory and community developments are confined to the mesa tops.

The surrounding land is largely undeveloped, and large tracts of land north, west, and south of the Laboratory site are held by the Santa Fe National Forest, the US Bureau of Land Management, the Bandelier National Monument, the US General Services Administration, and the Los Alamos County. Pueblo de San Ildefonso borders the Laboratory to the east.

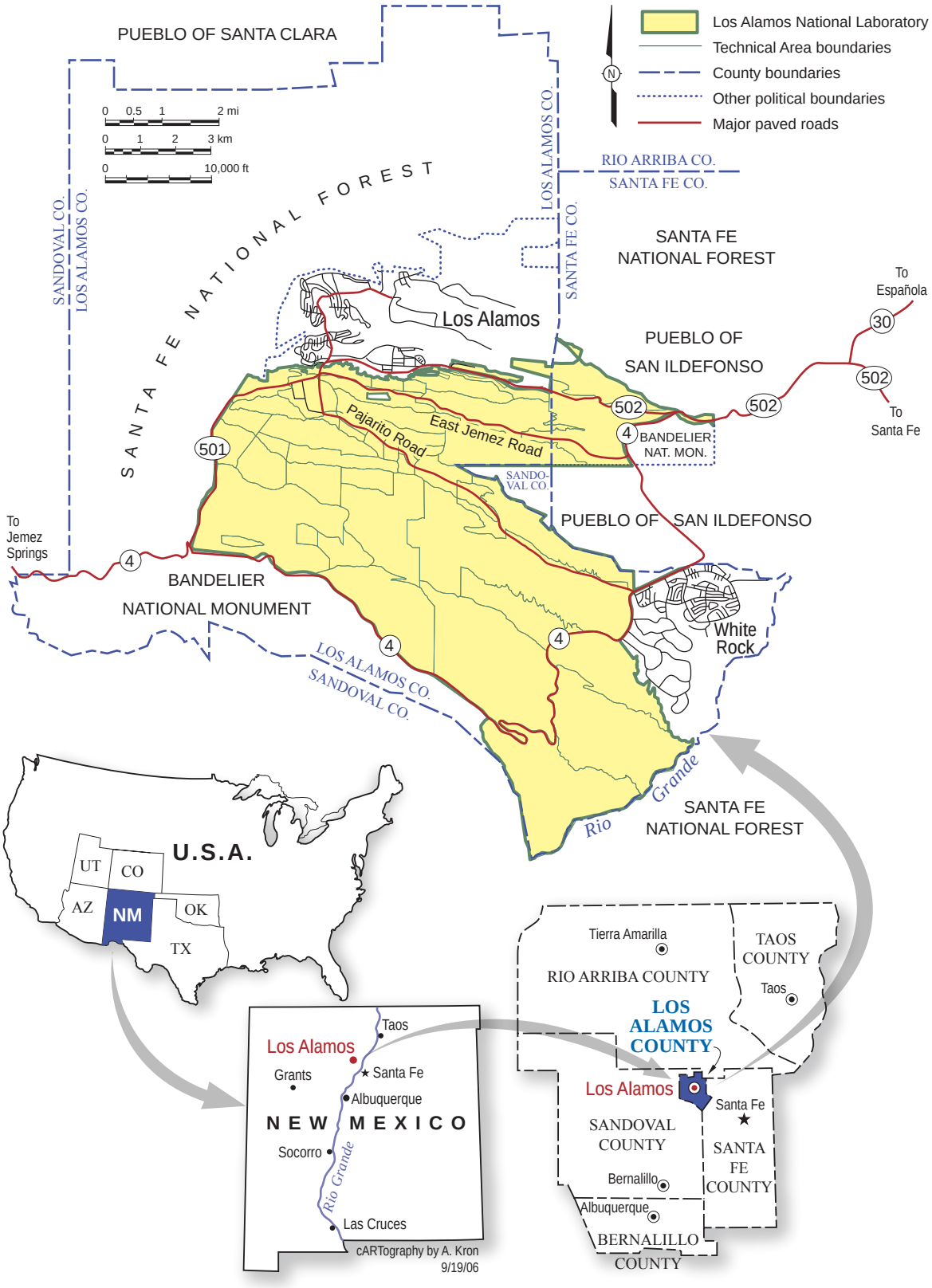

Figure 1-1. Regional location of Los Alamos National Laboratory.

2. Geology and Hydrology

The Laboratory lies at the western boundary of the Rio Grande Rift, a major North American tectonic feature. Three major potentially active local faults constitute the modern rift boundary. Studies indicate that the seismic surface rupture hazard associated with these faults is localized (Gardner et al., 1999). Most of the finger-like mesas in the Los Alamos area (Figure 1-2) are formed from Bandelier Tuff, which includes ash fall, ash fall pumice, and rhyolite tuff. Deposited by major eruptions in the Jemez Mountains volcanic center 1.2–1.6 million years ago, the tuff is more than 1,000 ft thick in the western part of the plateau and thins to about 260 ft eastward above the Rio Grande.

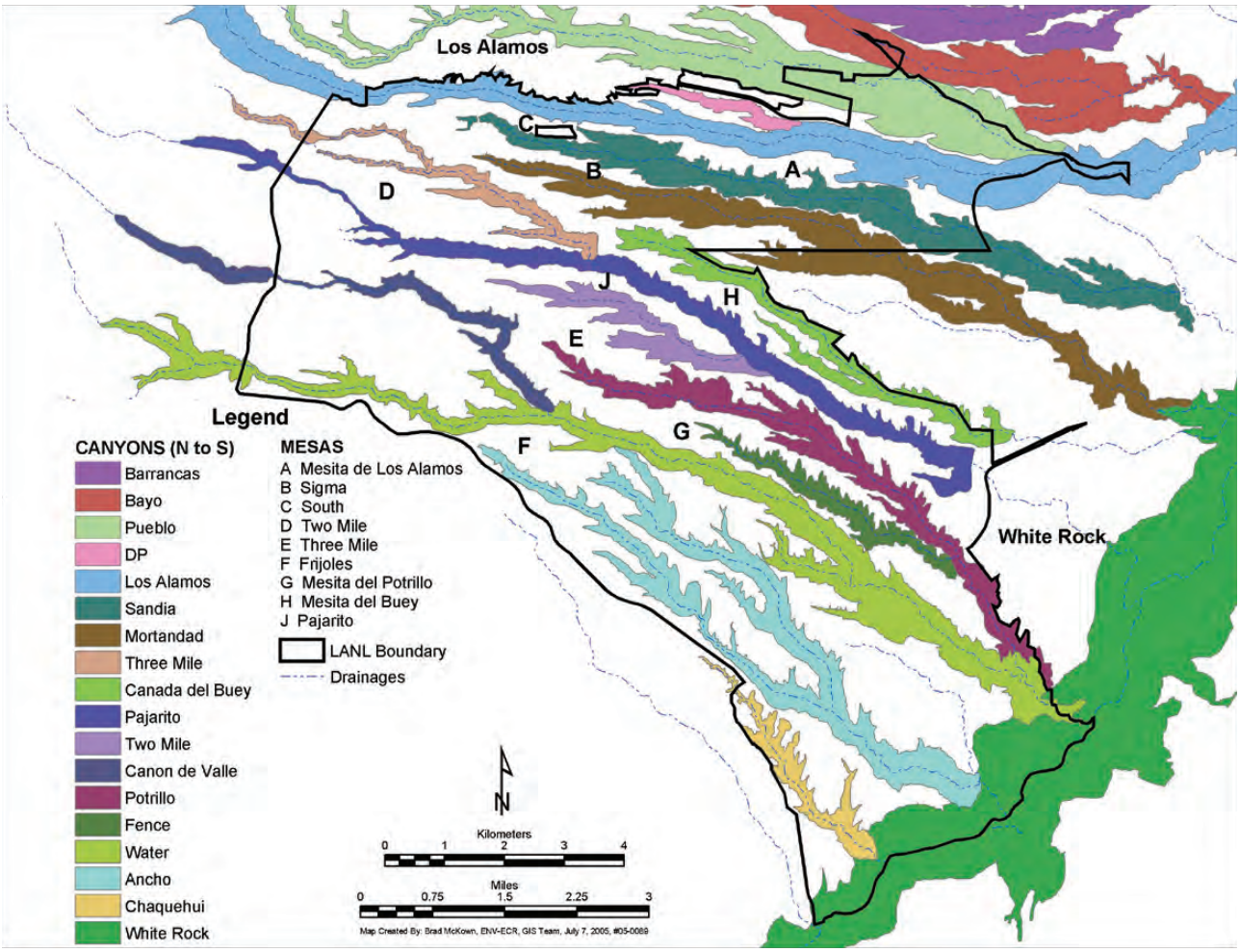

Figure 1-2. Major canyons and mesas on Laboratory land.

On the western part of the Pajarito Plateau, the Bandelier Tuff overlaps onto the Tschicoma Formation, which consists of older volcanics that form the Jemez Mountains. The tuff is underlain by the conglomerate of the Puye Formation in the central plateau and near the Rio Grande. The Cerros del Rio Basalts interfinger with the conglomerate along the river. These formations overlie the sediments of the Santa Fe Group, which extend across the Rio Grande Valley and are more than 3,300 ft thick.

Surface water in the Los Alamos region occurs primarily as short-lived or intermittent reaches of streams. Perennial springs on the flanks of the Jemez Mountains supply base flow into the upper reaches of some canyons, but the volume is insufficient to maintain surface flows across the Laboratory property before the water is depleted by evaporation, transpiration, and infiltration.

Groundwater in the Los Alamos area occurs in three modes: (1) water in shallow alluvium in canyons, (2) perched water (a body of groundwater above a less permeable layer that is separated from the underlying main body of groundwater by an unsaturated zone), and (3) the regional aquifer, which is the only aquifer in the area capable of serving as a municipal water supply. Water in the regional aquifer is in artesian conditions under the eastern part of the Pajarito Plateau near the Rio Grande (Purtymun and Johansen 1974). The source of most recharge to the aquifer appears to be infiltration of precipitation that falls on the Jemez Mountains. The regional aquifer discharges into the Rio Grande through springs in White Rock Canyon. The 11.5-mile reach of the river in White Rock Canyon, between Otowi Bridge and the mouth of Rio de los Frijoles, receives an estimated 4,300–5,500 ac-ft of water from the regional aquifer.

3. Biological Resources

The Pajarito Plateau, including the Los Alamos area, is biologically diverse. This diversity of ecosystems is due partly to the dramatic 5,000-ft elevation gradient from the Rio Grande on the east to the Jemez Mountains 12 mi (20 km) to the west and partly to the many steep canyons that dissect the area. Five major vegetative cover types are found in Los Alamos County. The juniper (*Juniperus monosperma* Englem. Sarg.)-savanna community is found along the Rio Grande on the eastern border of the plateau and extends upward on the south-facing sides of canyons at elevations between 5,600 to 6,200 ft. The piñon (*Pinus edulis* Engelm.)-juniper cover type, generally in the 6,200- to 6,900-ft elevation range, covers large portions of the mesa tops and north-facing slopes at the lower elevations. Ponderosa pine (*Pinus ponderosa* P. & C. Lawson) communities are found in the western portion of the plateau in the 6,900- to 7,500-ft elevation range. These three cover types predominate, each occupying roughly one-third of the LANL site. The mixed conifer cover type, at an elevation of 7,500 to 9,500 ft, overlaps the ponderosa pine community in the deeper canyons and on north-facing slopes and extends from the higher mesas onto the slopes of the Jemez Mountains. Spruce (*Picea* spp.)-fir (*Abies* spp.) is at higher elevations of 9,500 to 10,500 ft. Several wetlands and riparian areas enrich the diversity of plants and animals found on LANL lands.

In May 2000, the Cerro Grande fire burned over 43,000 ac of forest on and around LANL. Most of the habitat damage occurred on Forest Service property to the west and north of LANL. Approximately 7,684 ac or 28 percent of the vegetation at LANL was burned in some fashion during the fire. However, few areas on LANL were burned severely. Wetlands in Mortandad, Pajarito, and Water canyons received increased amounts of ash and hydromulch runoff because of the fire.

The extreme drought conditions prevalent in the Los Alamos area and all of New Mexico from 1998 to the present have resulted directly and indirectly in the mortality of many trees. To date, more than 90 percent of the piñon trees greater than 10 ft tall have died in the Los Alamos area. Lower levels of mortality are also occurring in ponderosa and mixed conifer stands. Mixed conifers on north-facing canyon slopes at lower elevations have experienced widespread mortality. These changes are ongoing and likely will have long-lasting impacts to vegetation community composition and distribution.

4. Cultural Resources

The Pajarito Plateau is an archaeologically rich area. Approximately 86 percent of DOE land in Los Alamos County has been surveyed for prehistoric and historic cultural resources, and more than 1,900 sites have been recorded. More than 85 percent of the resources are Ancestral Pueblo and date from the 13th, 14th, and 15th centuries. Most of the sites are found in the piñon-juniper vegetation zone, with 80 percent lying between 5,800 and 7,100 ft. Almost three-quarters of all cultural resources are found on mesa tops. Buildings and structures from the Manhattan Project and the early Cold War period (1943–1963) are being evaluated for eligibility for listing in the National Register of Historic Places, and more than 280 buildings have been evaluated to date. In addition, there are "key facilities" (facilities considered of national historic significance) dating from 1963 to the end of the Cold War in 1990.

5. Climate

Los Alamos County has a temperate, semiarid mountain climate. Large differences in locally observed temperature and precipitation exist because of the 1,000-ft elevation change across the Laboratory site and the complex topography. Four distinct seasons occur in Los Alamos County. Winters are generally mild, with occasional winter storms. Spring is the windiest season. Summer is the rainy season, with occasional afternoon thunderstorms. Fall is typically dry, cool, and calm.

Daily temperatures are highly variable (a 23˚F range on average). On average, winter temperatures range from 30˚F to 50˚F during the daytime and from 15˚F to 25˚F during the nighttime. The Sangre de Cristo Mountains to the east of the Rio Grande Valley act as a barrier to wintertime arctic air masses that descend into the central United States, making the occurrence of local subzero temperatures rare. On average, summer temperatures range from 70˚F to 88˚F during the daytime and from 50˚F to 59˚F during the nighttime.

From 1971 to 2000, the average annual precipitation (which includes both rain and the water equivalent of frozen precipitation) was 18.95 in., and the average annual snowfall amount was 58.7 in. [NOTE: By convention, full decades are used to calculate climate averages (WMO 1984).] The months of July and August account for 36 percent of the annual precipitation and encompass the bulk of the rainy season, which typically begins in early July and ends in early September. Afternoon thunderstorms form as moist air from the Pacific Ocean and the Gulf of Mexico is convected and/or orographically lifted by the Jemez Mountains. The thunderstorms yield short, heavy downpours and an abundance of lightning. Local lightning density, among the highest in the US, is estimated at 15 strikes per square mile per year. Lightning is most commonly observed between May and September (about 97 percent of the local lightning activity).

The complex topography of the Pajarito Plateau influences local wind patterns. Often a distinct diurnal cycle of winds occurs. Daytime winds measured in the Los Alamos area are predominately from the south, consistent with the typical upslope flow of heated daytime air moving up the Rio Grande valley. Nighttime winds (sunset to sunrise) on the Pajarito Plateau are lighter and more variable than daytime winds and typically from the west, resulting from a combination of prevailing winds from the west and downslope flow of cooled mountain air. Winds atop Pajarito Mountain are more representative of upper-level flows and primarily range from the northwest to the southwest, mainly because of the prevailing westerly winds.

C. LABORATORY ACTIVITIES AND FACILITIES

The Laboratory is divided into technical areas (TAs) that are used for building sites, experimental areas, support facilities, roads, and utility rights-of-way (see Appendix C and Figure 1-3). However, these uses account for only a small part of the total land area; much of the LANL land provides buffer areas for security and safety or is held in reserve for future use. The Laboratory has about 2,000 structures with approximately 8.6 million square ft under roof, spread over an area of approximately 40 square miles.

In its 1999 Site-Wide Environmental Impact Statement (SWEIS) (DOE 1999), LANL identified 15 Laboratory facilities as "Key Facilities" for the purposes of facilitating a logical and comprehensive evaluation of the potential environmental impacts of LANL operations (Table 1-1). Operations in the Key Facilities represent the majority of exposure risks associated with LANL operations. The facilities identified as "Key" for the purposes of the 1999 SWEIS and the new SWEIS in preparation during 2006 are those that house activities critical to meeting work assignments given to LANL and also include:

- In-house operations that could potentially cause significant environmental impacts,
- Activities or operations of most interest or concern to the public based on SWEIS scoping comments, or
- Activities or operations that would be the most subject to change because of programmatic decisions.

In the 1999 SWEIS and now in the new SWEIS, the remaining LANL facilities were identified as "Non-Key" facilities simply because these facilities do not meet the above criteria. The Non-Key Facilities comprise all or the majority of 30 of LANL's 48 TAs and approximately 14,224 acres of LANL's 26,480 acres (Table 1-1). The Non-Key Facilities also currently employ about 42 percent of the total LANL workforce. The Non-Key Facilities include such important buildings and operations as the Nicholas C. Metropolis Center for Modeling and Simulation, the Nonproliferation and International Security Center (NISC), the new National Security Sciences Building (NSSB) that is now the main administration building, and the TA-46 sewage treatment facility.

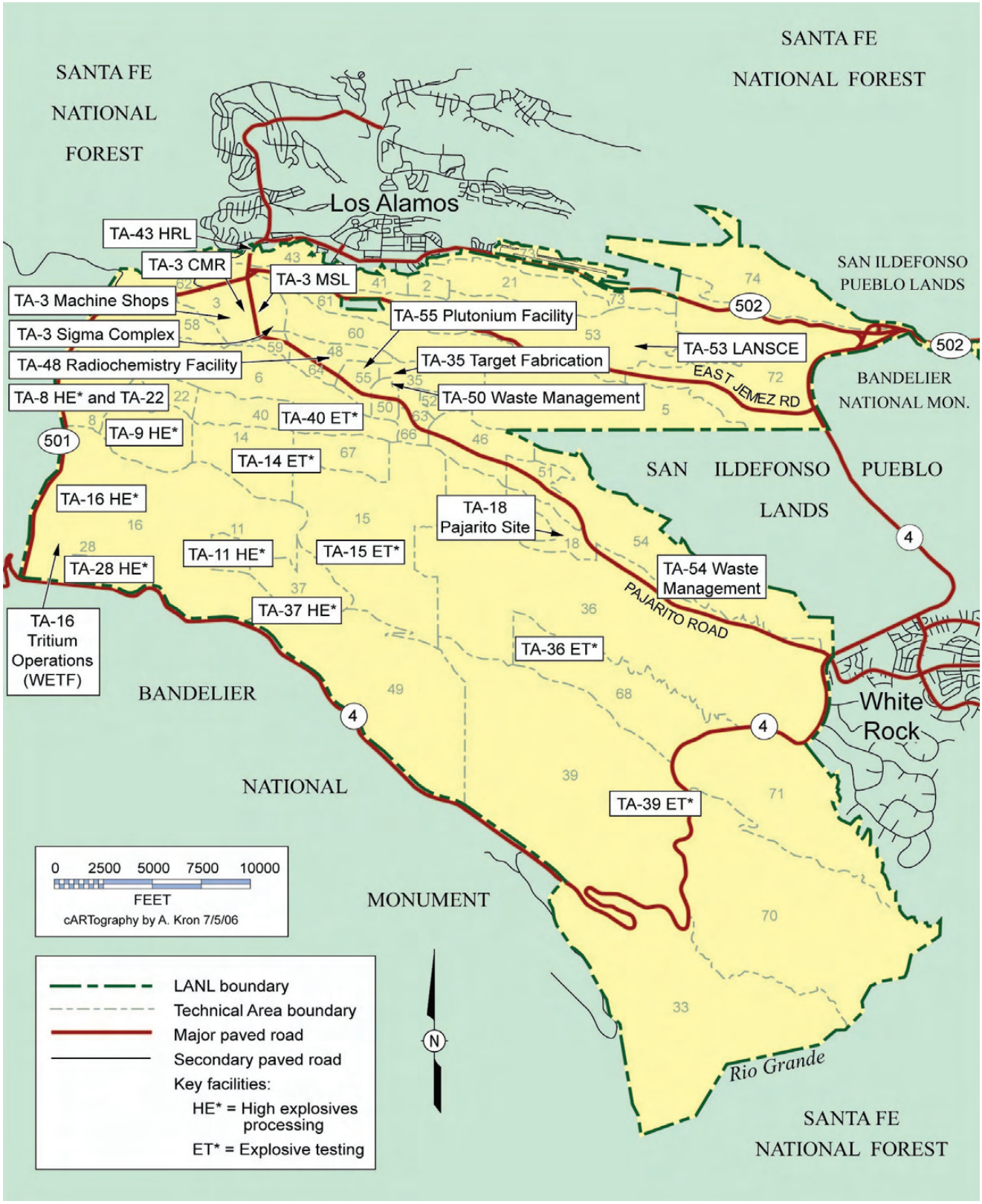

Figure 1-3. Technical Areas (TAs) and key facilities of Los Alamos National Laboratory in relation to surrounding landholdings.

Table 1-1
Key Facilities

Facility	Technical Areas	~Size (Acres)
Plutonium Complex	TA-55	93
Tritium Facilities	TA-16 & TA-21	312
Chemical and Metallurgy Research (CMR) Building	TA-03	14
Pajarito Site	TA-18	131
Sigma Complex	TA-03	11
MSL	TA-03	2
Target Fabrication Facility (TFF)	TA-35	3
Machine Shops	TA-03	8
High-Explosives Processing	TA-08, -09, -11, -16, -22, -28, -37	1,115
High-Explosives Testing	TA-14, -15, -36, -39, -40	8,691
LANSCE	TA-53	751
Biosciences Facilities (Formerly Health Research Laboratory)	TA-43, -03, -16, -35, -46	4
Radiochemistry Facility	TA-48	116
Radioactive Liquid Waste Treatment Facility (RLWTF)	TA-50	62
Solid Radioactive and Chemical Waste Facilities	TA-50 & TA-54	943
Subtotal, Key Facilities		**12,256**
Non-Key Facilities	30 of 48 TAs	14,224
LANL Acreage		**26,480**

The operation of the 15 Key Facilities, together with functions conducted in other Non-Key Facilities, formed the basis of the description of LANL facilities and operations analyzed in the 1999 SWEIS for potential environmental impacts. For the purpose of the impact analysis provided by the new SWEIS, the identity of the LANL Key Facilities has been modified to reflect subsequent DOE decisions that resulted in changes to LANL facilities and operations. The Nicholas C. Metropolis Center for Modeling and Simulation (Metropolis Center) has been added as a Key Facility because of the amounts of electricity and water it may use. Security Category I and II materials and operations have been moved from the TA-18 Pajarito Site. Under either of the Action Alternatives evaluated in the new SWEIS, Security Category III and IV materials and operations would be removed from the Pajarito Site and it would be eliminated as a Key Facility. Under the No Action Alternative, the Pajarito Site would remain a Key Facility.

D. MANAGEMENT OF ENVIRONMENT, SAFETY, AND HEALTH

Integrated safety management (ISM) provides the Laboratory with a comprehensive, systematic, standards-based performance-driven management system for setting, implementing, and sustaining safety performance and meeting environmental expectations. The term "integrated" is used to indicate that the safety and environmental management system is a normal and natural element of the performance of work. Safety, protection of the environment, and compliance with environmental, safety, and health (ES&H) laws and regulations are an integral part of how the Laboratory does business. ISM is the way that we meet the moral commitment to avoid injury to people and the environment and the business imperative to meet the safety and environmental requirements of the contract for managing and operating the Laboratory.

ISM is integral to accomplishing the Laboratory mission. The goal of ISM is to establish "safety" (used generically to encompass all aspects of environment, safety, and health) as a fundamental value for operating the Laboratory and that this value would be reflected in the attitudes and behaviors of all workers. ISM is structured

to manage and control work at the institutional, the facility, and the activity level. A seamless integration of ES&H with the work being done is fundamental. Inseparable from this concept is the important principle that line management is responsible for safety, with clear and unambiguous roles and lines of responsibility, authority, and accountability at all organizational levels and with full participation of the workforce. ISM requires that all work and all workers meet the safety and environmental requirements defined by the Laboratory requirements system.

1. Environmental Management Program

The Laboratory is committed to protecting the environment while conducting its important national security and energy-related missions. In support of this commitment, LANL has implemented a pollution-prevention-based EMS pursuant to DOE Order 450.1, Environmental Protection Program. An EMS is a systematic method for assessing mission activities, determining the environmental impacts of those activities, prioritizing improvements, and measuring results. DOE Order 450.1 defines an EMS as "a continuous cycle of planning, implementing, evaluating, and improving processes and actions undertaken to achieve environmental missions and goals." This order mandates that the EMS be integrated with an existing integrated management system already established pursuant to DOE Policy 450.4. Although it significantly exceeds DOE Order 450.1 requirements, LANL elected in November 2004 to seek ISO 14001:2004 registration of its EMS.

The EMS program met several milestones in 2005. New Implementing Procedures (IMP 401, 402, 403) governing communication, legal and other requirements and environmental aspects were developed by the EMS management and core teams and approved by the Laboratory's Executive Board in April 2005. These procedures defined EMS roles and responsibilities from the Laboratory Director to individual staff levels. In addition to these institutional policy changes, each Division Director was asked to sign an EMS charter for their Division that reiterated commitment to the process.

Using multi-disciplinary teams from each Division (all 31 LANL Divisions that existed in 2005), the major support services subcontractor (KSL, Inc.) and the security subcontractor (PTLA) identified their activities, products, and services and their potential environmental aspects. They then prioritized these aspects to determine which were significant and developed an Environmental Action Plan designed to prevent or eliminate the environmental risk associated with those aspects. The Division teams were aided by a trained support person from the EMS Core Team, whose members were trained in ISO 14001:2004 systems (many became certified EMS professionals). All information on the LANL EMS is available to the public via Laboratory websites.

All 31 LANL Divisions, KSL, PTLA, and the Enterprise Project completed the Division Environmental Action Plans on schedule by September 30, 2005, a performance metric of LANL Appendix F contract requirements with NNSA. Those plans together commit to nearly 600 environmental improvement and pollution prevention actions beginning in fiscal year (FY) 2006. The Laboratory also met the DOE Order 450.1 requirement to have an EMS implemented by December 31, 2005. In December 2005, based on extensive documentation provided by the EMS Management Team and the positive results of a pre-assessment and desk audits, the NNSA Los Alamos Site Office certified to NNSA headquarters that LANL had met the requirements of DOE Order 450.1 and had a functioning EMS.

For five full days in March 2006, a team of five independent third-party auditors conducted the final ISO 14001:2004 audit of the Laboratory's EMS. The audit covered most of the Divisions and all major support contractors and included interviews conducted from the Director and Deputy Director level to individual staff and students chosen at random by the auditors. The auditors concluded that the LANL EMS meets all the requirements of the ISO 14001:2004 standard with no major nonconformities and recommended that LANL be fully certified. On April 13, 2006, LANL received full certification of its EMS to the ISO 14001:2004 standard. LANL is the first of the NNSA national laboratories and was the first UC-operated facility to receive this distinction.

NNSA recognized the success of the EMS Management and Core Teams' unique approach by giving the Laboratory the 2005 NNSA "Best in Class" Award. The Laboratory also received the US Department of Energy Pollution Prevention STAR Award for 2005.

A second important component of the EMS is the institutional environmental stewardship and management support programs. These programs, described below, assist with the integration of job and work-specific evaluations and ensure natural and cultural resources are managed from a Laboratory-wide perspective.

a. Waste Management Program

Research programs that support the Laboratory's mission generate contaminated waste that must be properly managed to avoid risks to human health, the environment, or national security. The Laboratory generates Resource Conservation and Recovery Act regulated waste, Toxic Substances Control Act regulated waste, low-level radioactive waste, mixed low-level waste, transuranic waste, wastewater, administratively controlled waste, medical waste, New Mexico Special Waste, and solid waste. Certain wastes are also treated and/or disposed of at the Laboratory.

The Laboratory's goal is to conduct waste management operations in a manner that minimizes hazardous and nonhazardous waste generation as much as is technically and economically feasible and maintains excellence in safety, compliance, environment, health, and waste management operations. This goal is accomplished through

- Ensuring a safe and healthy workplace;
- Minimizing adverse impact to the general public;
- Minimizing adverse impact to the environment; and
- Ensuring compliance with all applicable laws, standards, and regulations governing environment, safety, and health.

b. Pollution Prevention Program

The Pollution Prevention (P2) Program implements waste minimization, pollution prevention, sustainable design, and conservation projects to increase operational efficiency, reduce life-cycle costs, and reduce risk. Reducing waste directly contributes to the efficient performance of the Laboratory's national security, energy, and science missions. Specific P2 activities include

- Collecting data and reporting on DOE P2 goals;
- Forecasting waste volume to identify P2 opportunities;
- Conducting P2 opportunity assessments for customer divisions;
- Funding specific waste reduction projects through the Generator Set-Aside Fund Program;
- Managing affirmative procurement efforts;
- Conducting an annual LANL P2 awards program to recognize achievements;
- Supporting sustainable design for the construction of new buildings; and
- Communicating P2 issues to the Laboratory community.

The Laboratory's P2 Program continues to be recognized for its accomplishments. The Laboratory received five national NNSA Pollution Prevention awards for Laboratory projects in fiscal year (FY) 2005. Projects in FY 2005 yielded more than $4,000,000 in savings to the Laboratory. The P2 Program was instrumental in incorporating preventive measures into the EMS, and the Laboratory received ISO 14001:2004 certification. The Laboratory achieved a rating of "outstanding" for pollution prevention in FY 2005 as measured against DOE-mandated reduction of waste volume. The Pollution Prevention performance index for the 2005 DOE Pollution Prevention goals is to meet 97 percent of the DOE-mandated reductions of waste volumes compared to a 1993 baseline.

c. Environmental Remediation and Surveillance Program

The Laboratory's Environmental Remediation and Surveillance (ERS) Program (formerly the Environmental Restoration Project) is part of a national DOE effort to reduce risk to human health and the environment at its facilities. (In mid-2006, this program became part of the new Environment and Remediation Support Services

Division.) The goal of the program is to ensure that residual materials and contaminants from past Laboratory operations do not threaten human or environmental health and safety. To achieve this goal, the Laboratory is investigating and, as necessary, remediating sites contaminated by past Laboratory operations. Fieldwork at several sites was either implemented, ongoing, or completed in calendar year 2005. Much of the work under the ERS Program is also subject to the requirements in the Compliance Order on Consent (see Chapter 2, Section B.1). A new chapter of this report, Chapter 9, summarizes ERS work conducted or completed in calendar year 2005.

d. Compliance and Surveillance Programs

Air Resources. The Laboratory maintains a vigorous air quality compliance program for the emissions of both radionuclide and nonradionuclide air pollutants. The Laboratory operates under a number of air emissions permits issued by the New Mexico Environment Department (NMED) and approvals for construction of new facilities/operations by the Environmental Protection Agency (EPA). These permits and approvals require pollution control devices, stack emissions monitoring, and routine reporting. This report describes these permits and reports; they are also available online at http://www.lanl.gov/community/environment/air/. Proposals for new Laboratory operations and facilities are reviewed to determine the requirements for permitting, monitoring, and reporting of air emissions.

In addition to the compliance program, the Laboratory operates an extensive network of ambient air quality monitoring stations and direct penetrating radiation monitoring stations. The network includes station locations on-site, in adjacent communities, and in regional locations. These stations are operated to ensure that air quality and ambient radiation doses meet EPA and DOE standards. These data are published in this report (see Chapter 4) and online at http://www.lanl.gov/community/environment/air/.

The Laboratory also works with and assists neighboring communities and pueblos in performing ambient air, direct penetrating radiation, and meteorological monitoring.

Water Resources. The LANL Groundwater Protection Program and Water Quality and Hydrology (now part of the Water Stewardship program) monitoring program manages and protects groundwater and surface water resources (see Chapters 5 and 6). The Laboratory conducts these programs to comply with the requirements of DOE Orders and New Mexico and federal regulations.

Groundwater resource management and protection efforts at the Laboratory focus on (1) the regional aquifer underlying the region, (2) the perched groundwater found within canyon alluvium, and (3) the perched groundwater at intermediate depths above the regional aquifer. The objectives of the Laboratory's groundwater programs are to determine compliance with waste-discharge requirements and to evaluate any impact of Laboratory activities on groundwater resources. This program addresses environmental monitoring, resource management, aquifer protection, and hydrogeologic investigations.

Surface water protection efforts focus on monitoring surface water and stream sediments in northern New Mexico in order to evaluate the potential environmental effects of Laboratory operations. The objectives of the surface water program are to address water pollution control compliance, environmental surveillance, watershed management, surface and ground water protection, drinking water quality protection, pesticide protection obligations, and public assurance needs. The Laboratory analyzes samples for several parameters such as radionuclides, high explosives, metals, a wide range of organic compounds, and general chemistry.

Biological Resources. The LANL biological resources program focuses on assisting Laboratory projects and programs to comply with federal and state laws and regulations, DOE Orders, and LANL directives related to natural resources. DOE/NNSA and LANL administrators determined that management of natural resources strongly benefits the Laboratory (DOE 1996). The Mitigation Action Plan for the SWEIS for Continued Operation of the Los Alamos National Laboratory (DOE 1999) formalized this effort by requiring LANL to (1) mitigate the danger of wildfire and (2) develop a comprehensive plan for integrated natural resources management. One of the lasting results of wildfires that have occurred in and around LANL has been a significant increase in a regional, multi-agency approach to managing biological resources.

The current approach to managing biological resources at LANL includes developing an institutional Biological Resources Management Plan (LANL 2006) and on-the-ground resource management activities (e.g., forest thinning and fuels treatment). The plan is currently being developed to integrate short- and long-term mission activities and compliant and effective management of LANL's biological resources. The plan uses a combined discipline- and geographic-based approach to identify and integrate actions for management of biological resources. It addresses the following biological resources elements: forest and range, wildlife, sensitive species and habitats (including wetlands), and contaminants in biota. In addition, intensive forest management is currently being conducted under an institutional wildfire hazard reduction project that is implemented through the Wildfire Hazard Reduction Project Plan (LANL 2005a).

Soil, Foodstuffs, and Non-foodstuff Biota Resources. The Laboratory collects surface soil, foodstuffs, and non-foodstuffs biota from the Laboratory, perimeter communities (Los Alamos, White Rock, and surrounding Pueblos), and regional (background) areas to determine the impact of Laboratory operations on human health via the food chain and the environment. The Laboratory conducts these programs to comply with the requirements of DOE Orders and New Mexico and federal regulations. Samples of the various media are collected on a three-year rotating basis and analyzed for radionuclides, heavy metals, and organic constituents to determine source terms (concentrations and distribution) in soils and potential uptake by plants, animals, and humans. Radiation doses to humans and biota and changes in contamination levels over time are also measured and analyzed. These data are published in this report (see Chapters 3, 7, and 8) and other Laboratory publications.

Cultural Resources. The Laboratory manages the diverse cultural resources according to the requirements of the National Historic Preservation Act and the other federal laws and regulations concerned with cultural resources protection. Cultural resources include archaeological sites, historic buildings and artifacts, and traditional cultural places of importance to Native American and other ethnic groups. The act's goal is for federal agencies to act as responsible stewards of our nation's resources when their actions potentially affect historic properties. Section 106 of the act requires federal agencies to take into account the effects their projects may have on historic properties and to allow for comment by the State Historic Preservation Office and the Advisory Council on Historic Preservation. The Section 106 regulations outline a project review process that is conducted on a project-by-project basis.

The Laboratory has adopted a Cultural Resources Management Plan (LANL 2005b) as an institutional comprehensive plan that defines the responsibilities, requirements, and methods for managing its cultural properties. The plan provides an overview of the cultural resources program, establishes a set of procedures for effective compliance with applicable historic preservation laws, addresses land-use conflicts and opportunities, ensures public awareness of DOE's cultural heritage stewardship actions at LANL, and provides a 10-year road map that summarizes and prioritizes the steps necessary to manage these resources.

2. Organizations Implementing Environmental Management

Safety, environmental protection, and compliance with ES&H laws and regulations are underlying values in all Laboratory work. The Laboratory uses ISM to create a worker-based safety and environmental compliance culture where all workers are committed to safety and environmental protection in their daily work.

Each Laboratory organization is responsible for its own environmental management and performance. Line management provides leadership and ensures ES&H performance is within the context of the Laboratory's values and mission. Laboratory managers establish and manage ES&H initiatives, determine and communicate expectations, allocate resources, assess performance, and are held accountable for safety performance.

The former Environmental Stewardship Division (ENV) was established in 2004 under the former Technical Services Directorate to represent the Laboratory on environmental issues with regulators and external stakeholders. ENV Division provided technical expertise and assistance in areas of environmental protection, waste management, pollution prevention, air quality, water quality, National Environmental Policy Act requirements, wildfire protection, and natural and cultural resources management. ENV Division was responsible for performing environmental monitoring, surveillance, and compliance activities to help ensure that Laboratory operations do not adversely affect human health and safety or the environment.

During the time period covered by this report, ENV Division developed and managed the Laboratory programs for environmental regulatory compliance. This work was conducted in five ENV Division groups: Meteorology and Air Quality (MAQ), Water Quality and Hydrology (WQH), Solid Waste Regulatory Compliance (SWRC), Ecology (ECO), and Environmental Characterization and Remediation (ECR). With assistance from Laboratory legal counsel, ENV Division worked to define and recommend Laboratory policies for applicable federal and state environmental regulations and laws and DOE orders and directives. The Division was responsible for communicating environmental policies to Laboratory employees and made appropriate environmental training programs available. The ENV Division groups worked with line managers to prepare and review required environmental documentation. The five groups also initiated and managed Laboratory programs for environmental assessment and were responsible for executing environmental surveillance work under the auspices of the ENV Division's Environmental Protection Program.

In mid-2006, the Laboratory underwent a reorganization of all environmental programs as part of the transition to a new management contractor (Los Alamos National Security, LLC). This new organization was not in place during the calendar year covered by this report. Under the new organizational structure, environmental surveillance and remediation programs are part of the Environment and Remediation Support Services Division and environmental permitting is part of the Environmental Protection Division.

The Laboratory conforms to applicable environmental regulatory and reporting requirements of DOE Orders 450.1 (DOE 2003b), 5400.5 (DOE 1993), and 231.1-1A (DOE 2004). Through 2005, ENV Division had the responsibility and the authority to serve as the central point of institutional contact, coordination, and support for interfaces with regulators, stakeholders, and the public, including the DOE/NNSA, NMED, US Environmental Protection Agency, and the US Defense Nuclear Facilities Safety Board.

The Laboratory routinely collects samples of air particles and gases, water, soils, sediments, foodstuffs, and associated biota. For 2005, the Laboratory requested more than 600,000 analyses for chemical and radiochemical constituents on more than 10,800 environmental samples from over 1,600 sampling locations (Table 1-2). By far, the largest number of samples was collected to characterize or assess sites being cleaned up as part of environmental restoration efforts. The remainder of the analyses help identify whether impacts occurred from LANL operations or whether emissions and releases were within limits. Trained personnel collect and analyze additional samples to obtain information about particular events, such as major surface-water runoff events, non-routine radiation releases, or special studies such as monitoring the continuing effects of the 2000 Cerro Grande fire, which burned more than 7,684 acres of Laboratory property.

Table 1-2
Approximate Number of Environmental Samples, Locations, and Analytes

Type	Locations	Samples	Analytes or Measurements
Ambient Air*	65	2,614	7,788
Stack Monitoring	29	1,892	26,578
Ground Water	150	545	59,435
Surface Water Base Flow	50	154	16,569
Surface Water Snowmelt	27	64	3,004
Surface Water Storm Runoff	123	847	26,682
Sediment	63	66	6,939
Soil, Foodstuffs, and Biota	66	195	7,078
Neutron Radiation	52	203	203
Gamma Radiation	91	348	348
Environmental Restoration	922	3,904	446,619
Totals:	**1,638**	**10,832**	**601,243**

* Does not include particulate (in air) measurements made by six TEOM (Tapered Element Oscillating Membrane) instruments that calculated particulate concentrations every half hour.

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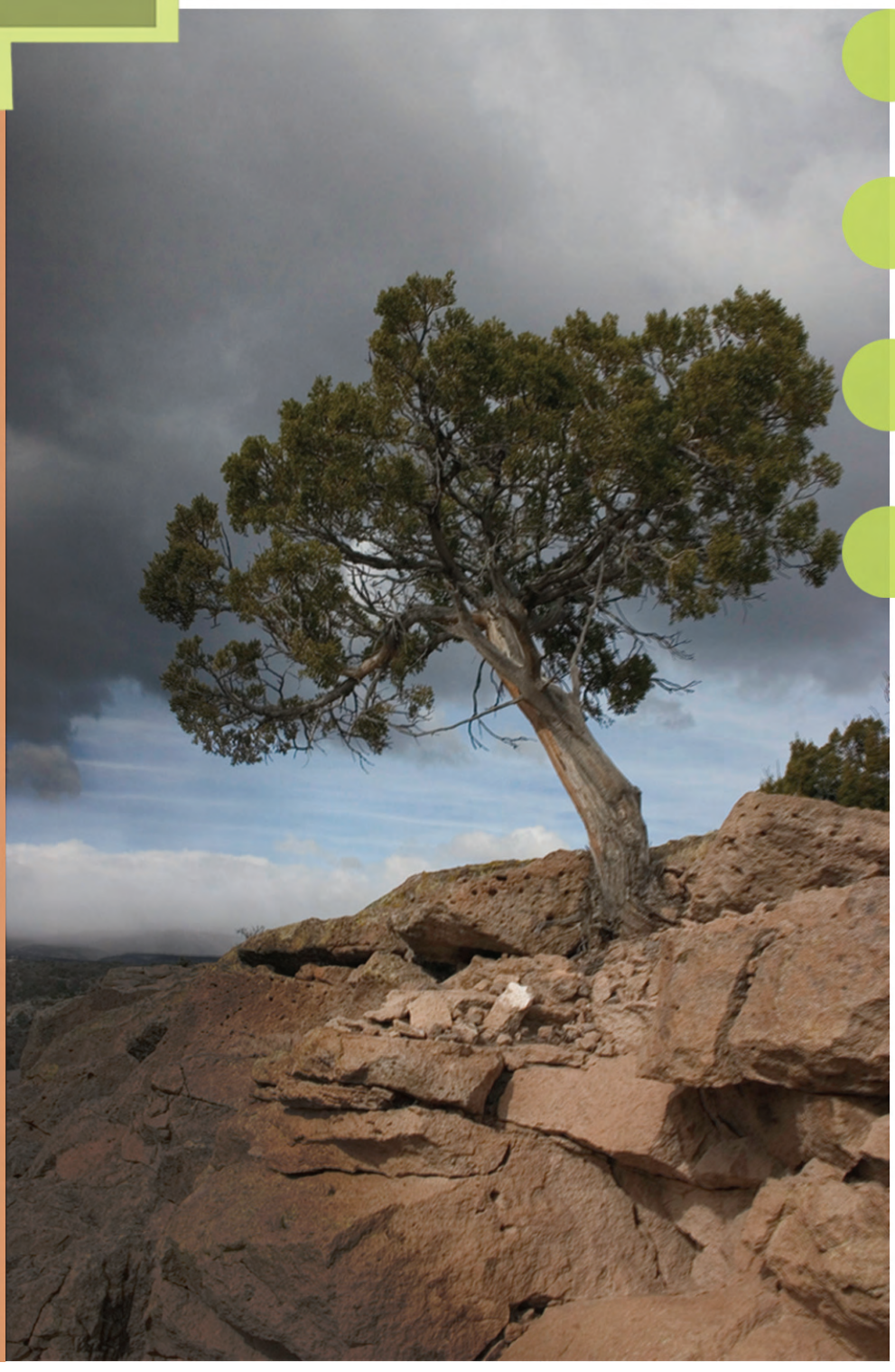
2. COMPLIANCE SUMMARY



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A. INTRODUCTION

Many activities and operations at Los Alamos National Laboratory (LANL or the Laboratory) use or produce liquids, solids, and gases that may contain nonradioactive hazardous and/or radioactive materials. Laboratory policy implements Department of Energy (DOE) requirements by directing employees to protect the environment and meet compliance requirements of applicable federal and state environmental protection regulations. Federal and state environmental laws address (1) handling, transporting, releasing, and disposing of contaminants, pollutants, and wastes; (2) protecting ecological, archaeological, historic, atmospheric, soil, and water resources, and (3) conducting environmental impact analyses. Regulations provide specific requirements and standards to ensure maintenance of environmental quality. The Environmental Protection Agency (EPA) and the New Mexico Environment Department (NMED) are the principal administrative authorities for these laws. DOE and its contractors are also subject to DOE-administered requirements for control of radionuclides. Table 2-1 presents the environmental permits or approvals the Laboratory operated under in 2005 and the specific operations and/or sites affected. Table 2-2 lists the various environmental inspections and audits conducted at the Laboratory during 2005. The following sections summarize the Laboratory's regulatory compliance performance during 2005.

B. COMPLIANCE STATUS

The Laboratory continues to make progress on its goal of being in full compliance with all environmental regulations. The number of alleged violations or non-compliances has continued to drop compared to prior years.

The Laboratory completed 1,888 Resource Conservation and Recovery Act (RCRA) self-assessments in 2005 with a nonconformance finding rate of less than 2 percent (down from 3.5 percent in 2004). Similarly, the Laboratory's performance on NMED inspections continues to improve. NMED identified only four violations in 2005 compared with seven in 2004. The Laboratory met all permit limits for emissions to the air. The Laboratory continued to address cleanup and legacy waste issues in accordance with NMED requirements.

The Laboratory continues to meet requirements under the Clean Water Act. None of the 126 samples collected from the Sanitary Waste System Plant's outfall and only one (a residual chlorine measurement) of 949 samples collected from industrial outfalls exceeded Clean Water Act effluent limits. Compliance with National Pollutant Discharge Elimination System (NPDES) requirements at permitted construction sites improved substantially in 2005 to 93 percent overall (from 76 percent in 2004).

Table 2-1
Environmental Permits or Approvals under which the Laboratory Operated during 2005

Category	Approved Activity	Issue Date	Expiration Date	Administering Agency
RCRA[a] Hazardous Waste Facility	Hazardous waste Facility Permit and mixed-waste storage and treatment permit	November 1989	November 1999***	NMED[b]
	TA-50 Part B Permit Renewal Application Revision 3.0	Submitted August 2002	—	NMED
	General Part B Permit Renewal Application, Revision 2.0	Submitted August 2003	—	NMED
	TA-54 Part B Permit Renewal Application, Revision 3.0	Submitted June 2003	—	NMED
	TA-16 Part B Permit Renewal Application, Revision 4.0	Submitted June 2003	—	NMED
	TA-55 Part B Permit Application, Revision 2.0	Submitted September 2003	—	NMED
	General Part A Permit Application, Revision 4.0	Submitted December 2004	—	NMED
HSWA[c]	RCRA corrective activities	March 1990	December 1999***	NMED
TSCA[d]	Disposal of PCBs[e] at TA-54, Area G	June 25, 1996	June 25, 2001***	EPA[f]
CWA[g]/NPDES[h]	Outfall permit for the discharge of industrial and sanitary liquid effluents	February 1, 2001	January 31, 2005***	EPA
	MSGP[i] for the discharge of stormwater from industrial activities	October 30, 2000	October 30, 2005*	EPA
	Federal Facility Compliance Agreement for storm water discharges from Solid Waste Management Units (SWMUs)	February 5, 2005	—	EPA
	Construction General Permits (24) for the discharge of stormwater from construction activities	Varies	July 1, 2008**	EPA
CWA Sections 404/401	COE[j] Nationwide Permits (2)	Varies	varies	COE[j]/NMED
Groundwater Discharge Plan, TA-46 SWWS Plant[k]	Discharge to groundwater	January 7, 1998	January 7, 2003***	NMED
Groundwater Discharge Plan, TA-50, Radioactive Liquid-Waste Treatment Facility	Discharge to groundwater	Submitted August 20, 1996	—	NMED

Table 2-1 (continued)

Category	Approved Activity	Issue Date	Expiration Date	Administering Agency
Air Quality Operating Permit (20.2.70 NMAC[l])	LANL air emissions	April 30, 2004	April 29, 2009	NMED
Air Quality (20.2.72 NMAC)	Portable rock crusher	June 16, 1999	None	NMED
	TA-3 Power Plant	September 27, 2000; Revised, November 26, 2003; Modified, July 30, 2004	None	NMED
	Generator at TA-33	October 10, 2002	None	NMED
	Asphalt Plant at TA-60	October 29, 2002	None	NMED
	Data disintegrator	October 22, 2003	None	NMED
	Chemistry and Metallurgy Research Replacement (CMRR)	September 16, 2005	None	NMED
	Radiological Laboratory, Utility, Office Building		None	NMED
	TA-11 Fuel/wood fire testing and TA-16 flash pad	March 29, 2005	None	NMED
	TA-36 sled track	March 29, 2005	None	NMED
Air Quality (NESHAP)[m]	Beryllium machining at TA-3-141	October 30, 1998	None	NMED
	Beryllium machining at TA-35-213	December 26, 1985	None	NMED
	Beryllium machining at TA-55-4	February 11, 2000	None	NMED
	Radiological air emissions at CMRR	July 14, 2005	None	EPA
	Radiological Laboratory, Utility, Office Building			
Open Burning	TA-11 Fuel/wood fire testing	December 27, 2002	December 27, 2007	NMED
	TA-14 Burn cage	December 27, 2002	December 27, 2007	NMED
	TA-16 Flash pad	December 27, 2002	December 27, 2007	NMED
	TA-36 Sled track and open burn area	December 27, 2002	December 27, 2007	NMED

[a] Resource Conservation and Recovery Act
[b] New Mexico Environment Department
[c] Hazardous and Solid Waste Amendments
[d] Toxic Substances Control Act
[e] Polychlorinated biphenyls
[f] Environmental Protection Agency
[g] Clean Water Act
[h] National Pollutant Discharge Elimination System
[i] Multi-Sector General Permit
[j] US Army Corps of Engineers
[k] Sanitary Wastewater Systems Plant
[l] New Mexico Administrative Code
[m] National Emission Standards for Hazardous Air Pollutants

*MSGP expiration date
**Construction General Permit (CGP) expiration date
***Permit has been administratively continued

Table 2-2
Environmental Inspections and Audits Conducted at the Laboratory during 2005

Date	Purpose	Performing Agency
02/28/05-03/28/05	Hazardous waste compliance inspection (Closeout 4/07/2005)	NMED[a]
3/30/2005	PCB[b] inspection for compliance with TSCA[c] requirements	EPA Region 6
05/24/05–05/25/05	NPDES outfall compliance evaluation inspection	NMED-SWQB[d]
5/25/2005	CGP[e] compliance inspection, TA-50 Pumphouse Project	NMED[a]
6/28/2005 and 7/19/2005	Above-ground storage tank inspections at various Laboratory facilities	NMED[a]
9/14/2005	CGP[e] compliance inspection, TA-60 Roads & Grounds Relocation Project	NMED[a]
9/16/05	Asbestos management inspection of building TA-3, SM-31 demolition project	NMED[a]

(No FIFRA[f], Section 401/404, or Groundwater Discharge Plan inspections were conducted in 2005.)
[a] New Mexico Environment Department
[b] Polychlorinated biphenyls
[c] Toxic Substances Control Act
[d] Surface Water Quality Bureau
[e] Construction General Permit
[f] Federal Insecticide, Fungicide, and Rodenticide Act

The Laboratory signed a Compliance Order on Consent (Consent Order) with NMED in March 2005. The Consent Order replaced the RCRA permit under which the Laboratory operated with respect to corrective action activities (Permit Module VIII). The Consent Order contains requirements for investigation and, as necessary, cleanup of solid waste management units (SWMUs) and areas of concern (AOCs) at the Laboratory. The Laboratory signed a Federal Facility Compliance Agreement (FFCA) and Administrative Order (AO) with EPA in February 2005. The FFCA/AO included monitoring, corrective actions, and reporting requirements for certain SWMUs and AOCs at the Laboratory.

1. Resource Conservation and Recovery Act

a. Introduction

The Laboratory produces a variety of hazardous wastes, mostly in small quantities relative to industrial facilities of comparable size. RCRA, as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984, establishes a comprehensive program to regulate hazardous wastes from generation to ultimate disposal. The EPA has authorized the State of New Mexico to implement the requirements of the program, which it does through the New Mexico Hazardous Waste Act and state regulations of New Mexico Administrative Code (NMAC) Title 20, Chapter 4, Part 1, as revised October 1, 2003 (20.4.1 NMAC). Federal and state laws regulate management of hazardous wastes based on a combination of the facility's status; large- or small-quantity generation; and the types of treatment, storage, and disposal conducted by the facility.

Certain operations may require an operating permit, called a hazardous waste facility permit, or a RCRA permit. The LANL hazardous waste facility permit expired in 1999 but was administratively continued beyond the expiration date as allowed by the permit and by 20.4.1.900 NMAC. In anticipation of the permit's expiration, and by agreement with NMED, the Laboratory submitted preliminary permit renewal applications for NMED review starting in 1996. The permit renewal applications have been revised as needed; the final set of revised Part B permit applications was submitted in 2003 for final NMED review.

b. Resource Conservation and Recovery Act Permitting Activities

The Laboratory submitted several proposed modifications to the LANL hazardous waste facility permit in 2005. These included Class III modifications removing the corrective action requirements in Module VIII of the permit in response to the March 1, 2005, Consent Order and to remove three TA-21 SWMUs approved by NMED for No Further Action. The modifications were presented for comment in public review periods in the fall of 2005. Additional permit-related activities included the submittal of supplemental information to NMED for TA-55 storage area upgrades and for additional facilities to support Waste Isolation Pilot Plant (WIPP) transuranic waste characterization and transport project activities at TA-54, Area G, Dome 375, and Pad 10.

Closure reports for the TA-16 Filter Vessels 401/406 and the TA-55, Room B38 Container Storage Unit were completed and submitted. NMED approved the closure of the filter vessels in September 2005. Closure activities proceeded for the TA-54 Area L treatment tanks and the Area L 36 and 37 lead stringer shafts.

c. Other Resource Conservation and Recovery Act Activities

The compliance assurance program, managed by the regulatory compliance group, performed Laboratory self-assessments to determine whether hazardous and mixed waste is managed to meet the requirements of federal and state regulations, DOE orders, and Laboratory policy. RCRA staff communicated findings from these self-assessments to waste generators, waste-management coordinators, and waste managers who help line managers implement appropriate actions to ensure continual improvement in LANL's hazardous waste program. In 2005, the Laboratory completed 1,888 self-assessments with a nonconformance finding rate of 1.96 percent.

d. Resource Conservation and Recovery Act Compliance Inspection

From February 28 to March 28, 2005, NMED conducted a hazardous waste compliance inspection at the Laboratory (Table 2-2). NMED identified four alleged RCRA violations for this inspection in a Notice of Violation issued on April 20, 2005.

e. Site Treatment Plan

In October 1995, the State of New Mexico issued a Federal Facility Compliance Order to the DOE and the University of California (UC), requiring compliance with the Site Treatment Plan. The plan documents the use of off-site facilities for treating and disposing of mixed waste generated at LANL and stored for more than one year. The Laboratory met all 2005 Site Treatment Plan deadlines and milestones by treating and disposing of more than 5.4 cubic meters of Site Treatment Plan low-level mixed waste.

f. Solid Waste Disposal

LANL sends sanitary solid waste (trash), concrete/rubble, and construction and demolition debris for disposal to the Los Alamos County Landfill on East Jemez Road. The DOE owns the property and leases it to Los Alamos County under a special-use permit. Los Alamos County operates this landfill and is responsible for obtaining all related permits for this activity from the state. The landfill is registered with the NMED Solid Waste Bureau. Laboratory trash placed in the landfill in 2005 included 1788 metric tons of trash and 411 metric tons of construction and demolition debris. Through LANL recycling efforts, 4,607 tons of material did not go to the landfill in 2005.

g. Compliance Order on Consent (Consent Order)

At the beginning of 2005, under its Environmental Remediation and Surveillance Program, the Laboratory continued to operate in accordance with the corrective action requirements of Module VIII of the Laboratory's hazardous waste facility permit, which specifies conditions for compliance with the Hazardous and Solid Waste Amendments to RCRA. Effective March 1, 2005, the corrective action requirements of Module VIII were replaced by a Consent Order signed by NMED, DOE, and UC. Prior to March 1, 2005, the Laboratory voluntarily complied with the provisions of a draft Consent Order negotiated by NMED, DOE, and UC and issued by NMED on September 1, 2004.

The Consent Order is the principal regulatory driver for the Laboratory's Environmental Remediation and Surveillance Program. The Consent Order contains requirements for investigation and, as necessary, cleanup of SWMUs and AOCs at the Laboratory. The Consent Order includes the following major activities:

- Investigation of canyon watersheds;
- Investigation of material disposal areas (MDAs) at TAs-21, -49, -50, and -54;
- Completion of ongoing investigations and cleanups begun under Module VIII; and
- Investigation of SWMUs and AOCs within watershed aggregate areas.

The Consent Order contains enforceable deadlines for submitting the investigation work plans associated with the above investigations and for completing corrective actions in each watershed. The Consent Order also contains specific technical requirements for implementing investigations, conducting corrective measures, and preparing documents. It establishes cleanup levels for groundwater, soil, and surface water. NMED is the administrative authority for all corrective actions conducted at SWMUs and AOCs under the Consent Order. DOE is the administrative authority for corrective actions associated with radionuclides, which are specifically excluded from the Consent Order.

All of the Laboratory deliverables (plans and reports) required by the Consent Order were submitted on time or early to NMED (see Tables 9-1 and 9-2 in Chapter 9 of this report). In addition, the Laboratory submitted several other plans and reports not specifically required by the Consent Order to NMED during 2005. The new Chapter 9 in this report describes the investigation and cleanup activities conducted under the Environmental Remediation and Surveillance Program during 2005.

h. Hazardous Waste Report

The Hazardous Waste Report covers hazardous and mixed waste generation, treatment, and storage activities performed at LANL during 2005 as required by RCRA, under 40 CFR 262.41, Biennial Report. In 2005, the Laboratory generated about 89,000 kg of RCRA hazardous waste, 570 kg of which were generated by the Environmental Remediation and Surveillance Program. The waste is recorded for more than 10,000 waste movements, treatment, or storage actions resulting in more than 640 Waste Generation and Management forms in the Hazardous Waste Report. The entire report is available on the web at http://www.lanl.gov/community/environment/docs/waste/2005LANLBiennial.pdf

2. Comprehensive Environmental Response, Compensation, and Liability Act

As part of its Conveyance and Transfer Project, the Laboratory prepared environmental baseline survey documents for three subparcels of land during 2005. One survey was completed for A-5 Airport South. The other two surveys (A-10 DP Road East and A-18 TA-74 South) are waiting for "no further action" determinations from DOE's Los Alamos Site Office for an AOC at these sites. These documents contain the Comprehensive Environmental Response, Compensation, and Liability Act 120(h) information required to transfer these properties to private ownership and indicate that "no hazardous substances exist on these sites," that "all remedial action necessary to protect human health and the environment has been taken," or that certain restrictions on use are required. These documents provide sufficient information to demonstrate that no environmental impacts exist that would trigger actions under the Comprehensive Environmental Response, Compensation, and Liability Act.

3. Emergency Planning and Community Right-to-Know Act

a. Introduction

The Laboratory is required to comply with the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and Executive Order 13148, Greening the Government Through Leadership in Environmental Management. Executive Order 13148 supersedes Executive Order 12856.

b. Compliance Activities

For 2005, the Laboratory submitted two annual reports to fulfill its requirements under EPCRA, as shown in Table 2-3 and described below.

Table 2-3
Compliance with Emergency Planning and Community Right-to-Know Act during 2005

Statute	Brief Description	Compliance
EPCRA Sections 302-303 Planning Notification	Requires emergency planning notification to state and local emergency planning committees.	No changes to the notification have been made since the July 30, 1999 notification and an update in 2000.
EPCRA Section 304 Release Notification	Requires reporting of releases of certain hazardous substances over specified thresholds to state and local emergency planning committees and to the National Response Center.	No leaks, spills, or other releases of chemicals into the environment required EPCRA Section 304 reporting during 2005.
EPCRA Sections 311-312 Material Safety Data Sheets and Chemical Inventories	Requires facilities to provide appropriate emergency response personnel with an annual inventory and other specific information for any hazardous materials present at the facility over specified thresholds.	The presence of 32 hazardous materials stored at LANL over specified quantities in 2005 required submittal of a hazardous chemical inventory to the state emergency response commission and the Los Alamos County Fire and Police Department.
EPCRA Section 313 Annual Toxic Release Inventory	Requires all federal facilities to report total annual releases of listed toxic chemicals used in quantities above reportable thresholds.	Use of lead and mercury exceeded the reporting thresholds in 2005, requiring submittal of Toxic Chemical Release Inventory Reporting Forms (Form Rs) to the EPA and the state emergency response commission.

Emergency Planning Notification. Title III, Sections 302–303, of Emergency Planning and Community Right-to-Know Act require the preparation of emergency plans for more than 360 extremely hazardous substances if stored in amounts above threshold limits. The Laboratory is required to notify state and local emergency planning committees (1) of any changes at the Laboratory that might affect the local emergency plan or (2) if the Laboratory's emergency planning coordinator changes. No updates to this notification were made in 2005.

Emergency Release Notification. Title III, Section 304, of Emergency Planning and Community Right-to-Know Act requires facilities to provide emergency release notification of leaks, spills, and other releases of listed chemicals into the environment, if these chemicals exceed specified reporting quantities. Releases must be reported immediately to the state and local emergency planning committees and to the National Response Center. The Laboratory did not have any leaks, spills, or other releases that exceeded any reporting thresholds in 2005.

Material Safety Data Sheet/Chemical Inventory Reporting. Title III, Sections 311–312, of Emergency Planning and Community Right-to-Know Act require facilities to provide an annual inventory of the quantity and location of hazardous chemicals that are above specified thresholds present at the facility. The inventory includes hazard information and storage location for each chemical. The Laboratory submitted a report to the state emergency-response commission and the Los Alamos County fire and police departments listing 32 chemicals and explosives at the Laboratory that were stored on-site in quantities that exceeded threshold limits during 2005.

Toxic Release Inventory Reporting. Executive Order 13148 requires all federal facilities to comply with Title III, Section 313, of the Emergency Planning and Community Right-to-Know Act. This section requires reporting of total annual releases to the environment of listed toxic chemicals that exceed activity thresholds. Beginning with reporting year 2000, new and lower chemical-activity thresholds were put in place for certain persistent,

bioaccumulative, and toxic chemicals and chemical categories. The thresholds for these chemicals range from 0.1 g to 100 lb. Until this change went into effect, the lowest threshold was 10,000 lb. LANL exceeded two thresholds in 2005 and therefore reported the uses and releases of these chemicals. The reported materials were lead and mercury. The largest use of reportable lead is at the on-site firing range where security personnel conduct firearms training. The largest use of reportable mercury is at the reservoirs of mercury that Los Alamos Neutron Science Center (LANSCE) uses as shields on the neutron beam shutter system. In contrast to previous years, nitric acid use was below reporting thresholds because the plutonium processing facility was not operating for much of the year due to facilities upgrades and maintenance activities. Table 2-4 summarizes the reported releases for the two EPCRA Section 313 reportable chemicals for 2005.

Table 2-4
Summary of 2005 Reported Releases under EPCRA Section 313

	Lead (lb)	Mercury (lb)
Air Emissions	7.1	0.3
Water Discharges	542	0.8
On-Site Land Disposal	7,007	0
Off-Site Waste Transfers	1,477	221

4. Toxic Substances Control Act

Because the Laboratory's activities are research and development (R&D) rather than the manufacture of commercial chemicals, the Laboratory's main concern under the Toxic Substances Control Act (TSCA) is the regulations covering polychlorinated biphenyls (PCB) and import/export of R&D chemical substances. The PCB regulations govern substances including, but not limited to, dielectric fluids, contaminated solvents, oils, waste oils, heat-transfer fluids, hydraulic fluids, slurries, soils, and materials contaminated by spills.

During 2005, the Laboratory shipped 88 containers of PCB waste off-site for disposal or recycling. The quantities of waste disposed of included 37 kg of capacitors and 1,893 kg of fluorescent light ballasts. The Laboratory manages all wastes in accordance with 40 CFR 761 manifesting, record keeping, and disposal requirements. PCB wastes go to EPA-permitted disposal and treatment facilities. Light ballasts go off-site for recycling. The primary compliance document related to 40 CFR 761.180 is the annual PCB report that the Laboratory submits to EPA Region 6.

The Laboratory disposes of nonliquid wastes that contain PCBs and are contaminated with radioactive constituents at its TSCA-authorized landfill located at TA-54, Area G. Radioactively contaminated PCB liquid wastes are stored at the TSCA-authorized storage facility at TA-54, Area L. Although some of these items have exceeded TSCA's one-year storage limitation, radioactively contaminated PCB liquid wastes are currently in storage as allowed by TSCA.

The five-year letter of authorization to use Area G for PCB disposal expired in July 2001, and EPA granted an administrative extension to LANL for continued use of Area G during the review process. The renewal request for the Area G PCB disposal authorization was withdrawn in 2006. During 2005, EPA performed one PCB site inspection, and approximately 55 TSCA reviews were conducted on imports and exports of chemical substances for the Laboratory's Property Management Group Customs Office.

5. Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act regulates pesticides manufacturing and the protection of workers who use these chemicals. Sections of this act that apply to the Laboratory include requirements for certifying workers who apply pesticides. The New Mexico Department of Agriculture has the primary responsibility to enforce pesticide use under the act. The New Mexico Pesticide Control Act applies to the Laboratory's licensing and certifying of pesticide workers, record keeping, applying of pesticides, inspecting of equipment, storing of pesticides, and disposing of pesticides.

The New Mexico Department of Agriculture did not conduct assessments or inspections of the Laboratory's pesticide application program in 2005. The Laboratory conducted four quarterly inspections of the pesticide storage area in 2005 and found that the storage area was being maintained in accordance with RCRA regulations.

Table 2-5 shows the amounts of pesticides the Laboratory used during 2005.

Table 2-5
Pesticides and Herbicides Used at LANL in 2005

Herbicides		Insecticides	
VELPAR L (Liquid)	148 gal	TEMPO (Powder)	1.3 oz
CONFRONT	3 oz	MAXFOURCE ANT BAIT	5 oz
		TALSTAR F	18.3 oz
		HIGHYIELD WASP	9 oz
		PT250 BAYGON	3.5 oz
		POWDER KEG	3 oz

6. Clean Air Act

Pursuant to the federal Clean Air Act (CAA) Amendments and Title 20 of NMAC, Chapter 2, Part 70, Operating Permits (20.2.70 NMAC), UC is authorized to operate LANL per the terms and conditions as defined in Operating Permit No. P100. The operating permit conditions mirror existing source-specific permit conditions applicable to operating requirements, record keeping, monitoring, and reporting. Compliance with the conditions of the Title V Operating Permit is deemed to be in compliance with any applicable air requirements existing at the date of permit issuance.

As part of the Title V Operating Permit program, LANL reports annual emissions for sources included in the Operating Permit. These sources, as defined in the Title V Operating Permit Application, include multiple boilers, two steam plants, a paper shredder (decommissioned in July 2004), a data disintegrator (initial start-up in August 2004), carpenter shops, three degreasers, a rock crusher (retired in July 2004), multiple storage tanks, and asphalt production. LANL also reports emissions from chemical use associated with R&D and permitted beryllium activities.

According to reporting requirements in the Title V Operating Permit's terms and conditions, the Laboratory must submit an Annual Compliance Certification report. 2005 was the first full year in which LANL was required to meet these reporting requirements. LANL demonstrated full compliance with the permit's applicable terms and conditions and met all reporting requirement deadlines.

In 2005, LANL initiated the process to modify Operating Permit No. P100. This modification was specifically for incorporating the permit conditions from the combustion turbine New Source Review (NSR) Permit 2195B-M1, incorporating the permit conditions from the data disintegrator NSR Permit 2195H, implementing new permit conditions for the soil vapor extraction system processed as Notice of Intent (NOI) 2195L, and removing the rock crusher from the Title V permit application as this source was retired. A permit modification is expected in 2006.

According to the terms and conditions of NSR air quality permit GCP3-2195, LANL performed start-up and began operations of a BDM Engineering Model Number TM2000 asphalt plant. This replaced an existing unit and does not represent a new capability.

Under the Title V Operating Permit program, LANL is a major source, based on the potential to emit, for nitrogen oxides (NOX), carbon monoxide (CO), and volatile organic compounds (VOCs). In 2005, the TA-3 steam plant and boilers located across the Laboratory were the major contributors of NO_X, CO, and particulate matter (PM). R&D activities were responsible for most of the VOC and hazardous air pollutants emissions. A summation of the data is present in Table 2-6.

Table 2-6
Calculated Actual Emissions for Regulated Pollutants (Tons) Reported to NMED for Operating Permit Compliance

	Pollutants					
Emission Units	NO_x	SO_x	PM	CO	VOC	HAPs
Asphalt Plant[a]	0.02	0.004	0.008	0.32	0.007	0.006
TA-21 Steam Plant	1.58	0.016	0.12	1.33	0.09	0.03
TA-3 Steam Plant	16.2	0.17	2.13	11.2	1.54	0.53
Regulated Boilers	6.7	0.04	0.62	4.6	0.39	0.13
R&D Chemical Use	NA	NA	NA	NA	11.2	5.4
Degreaser	NA	NA	NA	NA	0.011	0.011
Data Disintegrator	NA	NA	0.29	NA	NA	NA
Rock Crusher	0	0	0	0	0	0
Carpenter Shops	NA	NA	0.085	NA	NA	NA
Storage Tanks	NA	NA	NA	NA	0.05	NA
Stationary Standby Generators[b]	7.0	1.55	0.32	1.7	0.35	0.003
Miscellaneous Small Boilers[b]	19.0	0.11	1.44	15.9	1.0	0.36
TOTAL	**50.5**	**1.9**	**5.0**	**35.1**	**14.6**	**6.5**

[a] The old asphalt plant was shut down in 2003. A new asphalt plant began operation in July 2005.

[b] Emissions from these source categories were reported for the first time in 2004, as required by the Title V Operating Permit. Emissions units in these categories are exempt from construction permitting and annual emission inventory reporting requirements and are not included in Figure 2-1.

LANL staff calculates air emissions using emission factors from source tests, manufacturer's data, and EPA documentation. Calculated emissions are based on actual production rates, fuel and fuel usage, and/or material throughput. To satisfy requirements set forth in the Title V Operating Permit, LANL completed its annual Emissions Inventory Report and submitted the report to NMED. Figure 2-1 depicts the historical emissions of criteria pollutants. The only appreciable change from 2004 is the small increase in VOC emissions from R&D chemical use.

a. New Mexico Air Quality Control Act

i. Construction Permits. LANL reviews plans for new and modified projects, activities, and operations to identify all applicable air quality requirements including the need to revise the operating permit application, to apply for construction permits, or to submit notifications to NMED. During 2005, the Laboratory performed approximately 200 air quality reviews and received an NSR air quality permit for open burning activities for the TA-11 fuel/wood fire testing and the TA-16 flash pad and a second permit for the TA-36 sled track. LANL also submitted and received a NSR air quality permit for the Chemistry and Metallurgy Research Replacement (CMRR) radiological laboratory and utility and office buildings. LANL did not submit to or receive from NMED any exemption notifications. LANL currently operates under the air permits listed in Table 2-1.

ii. Open Burning. LANL performed open burns under both 20.2.60 and 20.2.72 NMAC regulations. LANL has four open burning permits (20.2.60 NMAC) for operational burns conducted to thermally treat or dispose of high explosives or material contaminated with high explosives and to test accident scenarios involving fire.

Under 20.2.72 NMAC, in 2005 LANL received from NMED one New Source Review air quality permit for the open burn activities at the TA-11 fuel/wood fire testing and the TA-16 flash pad as well as a NSR air quality permit for the TA-36 sled track. These permits were appealed and a hearing before the Environmental Improvement Board was scheduled for 2005 but postponed until 2006 to allow for a potential agreement between the interested parties.

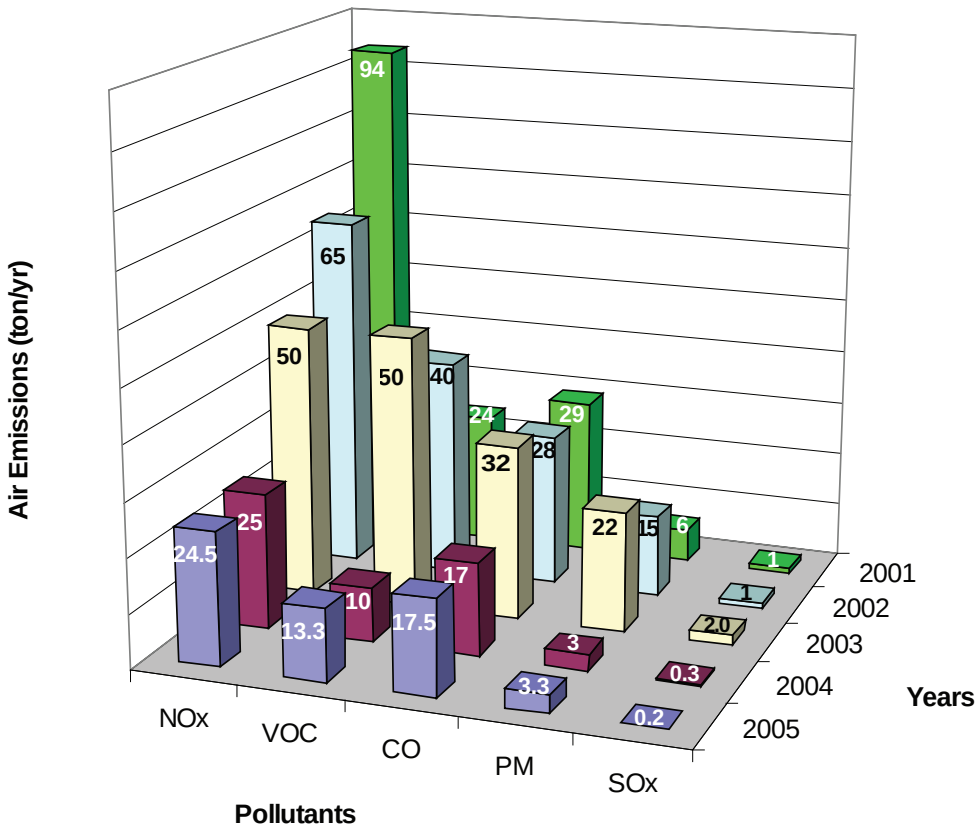

Figure 2-1. Criteria pollutant emissions from LANL 2001 to 2005 for emissions inventory reporting.

All operational burns for 2005 were conducted within the terms specified in the permits. To document compliance with permit requirements, the Laboratory reports the results of these operations to NMED.

iii. Asbestos. The National Emission Standard for Hazardous Air Pollutants (NESHAP) for Asbestos requires that LANL provide advance notice to NMED for large renovation jobs that involve asbestos and for all demolition projects. The Asbestos NESHAP further requires that all activities involving asbestos be conducted in a manner that mitigates visible airborne emissions and that all asbestos-containing wastes be packaged and disposed of properly.

LANL continued to perform renovation and demolition projects in accordance with the requirements of the Asbestos NESHAP. Major activities in 2005 included 48 large renovation jobs and demolition projects of which NMED received advance notice. These projects, combined with other smaller activities, generated approximately 694.39 m^3 of asbestos waste. All asbestos wastes were properly packaged and disposed of at approved landfills.

To ensure compliance, the Laboratory conducted internal inspections of job sites and asbestos packaging approximately monthly. In addition, NMED conducted one inspection during the year and identified no violations. The Quality Assurance Project Plans for the Asbestos Report Project and the National Emission Standard for Hazardous Air Pollutants for Radionuclides (Rad-NESHAP) Compliance Project are available online at http://www.lanl.gov/community/environment/air/.

b. Federal Clean Air Act

i. Ozone-Depleting Substances. Title VI of the Clean Air Act contains specific sections that establish regulations and requirements for ozone-depleting substances, such as halons and refrigerants. The main sections applicable to the Laboratory prohibit individuals from knowingly venting an ozone-depleting substance into the atmosphere

during maintenance, repair, service, or disposal of halon fire-suppression systems and air-conditioning or refrigeration equipment. All technicians who work on refrigerant systems must be EPA-certified and must use certified recovery equipment. The Laboratory is required to maintain records on all work that involves refrigerants and the purchase, usage, and disposal of refrigerants. The Laboratory's standards for refrigeration work are covered under Criterion 408, "EPA Compliance for Refrigeration Equipment," of the Operations and Maintenance manual.

In addition to routine compliance demonstration, DOE has established two goals to eliminate usage of class 1 refrigerants. In 2004, the Laboratory met the first goal, which was to retrofit or replace all chillers with greater than 150 tons of cooling capacity and manufactured before 1984 by 2005 (Figure 2-2). The second goal is to eliminate the procurement of the remaining equipment containing class 1 refrigerants by 2010.

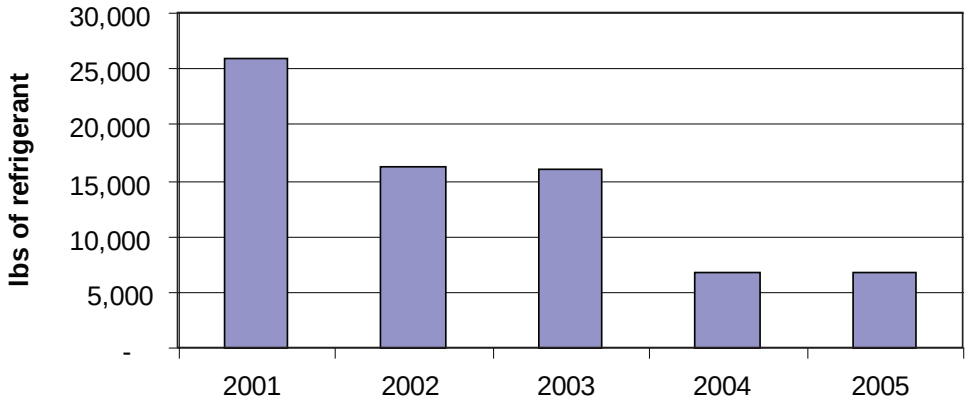

Figure 2-2. Amounts of total class 1 refrigerants in LANL equipment from 2001 to 2005.

ii. Radionuclides. Under 40 CFR 61 Subpart H (Rad-NESHAP), the EPA establishes a framework of requirements for DOE facilities using radioactive materials and limits the effective dose equivalent of radioactive airborne releases from a DOE facility, such as LANL, to any member of the public to 10 mrem/yr. The 2005 dose to the maximally exposed individual (MEI) (as calculated using EPA-approved methods) was 6.46 mrem. The location of the highest dose was at East Gate. Operations at LANSCE made the principal contribution to that highest dose.

7. Clean Water Act

a. NPDES Industrial Point Source Outfall Self-Monitoring Program

The primary goal of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The act established the requirements for NPDES permits for point-source effluent discharges to the nation's waters. The NPDES outfall permit establishes specific chemical, physical, and biological criteria that the Laboratory's effluent must meet before it is discharged.

In 2005, UC and the DOE/National Nuclear Security Administration (NNSA) were co-permittees of the NPDES permit covering Laboratory operations. EPA Region 6 in Dallas, Texas, issues and enforces the permit. NMED certifies the EPA-issued permit and performs some compliance-evaluation inspections and monitoring for the EPA. The Laboratory's current industrial point-source NPDES permit contains 21 permitted outfalls that include one sanitary outfall and 20 industrial outfalls. To view the Laboratory's NPDES permit, go online to http://www.lanl.gov/community/environment/h2o/.

The Laboratory's long-term objectives require that outfall owners continue evaluating outfalls for possible elimination and that new construction designs and modifications to existing facilities provide for reduced or no-flow effluent discharge systems (Figure 2-3). No NPDES outfalls were deleted in 2005; however, four outfalls were eliminated and not included in the Laboratory's NPDES Permit re-application submitted to EPA on July 30, 2004. The Laboratory's new NPDES point-source permit is anticipated to be issued in 2006 and will include one sanitary outfall and 16 industrial outfalls for a total of 17 permitted outfalls.

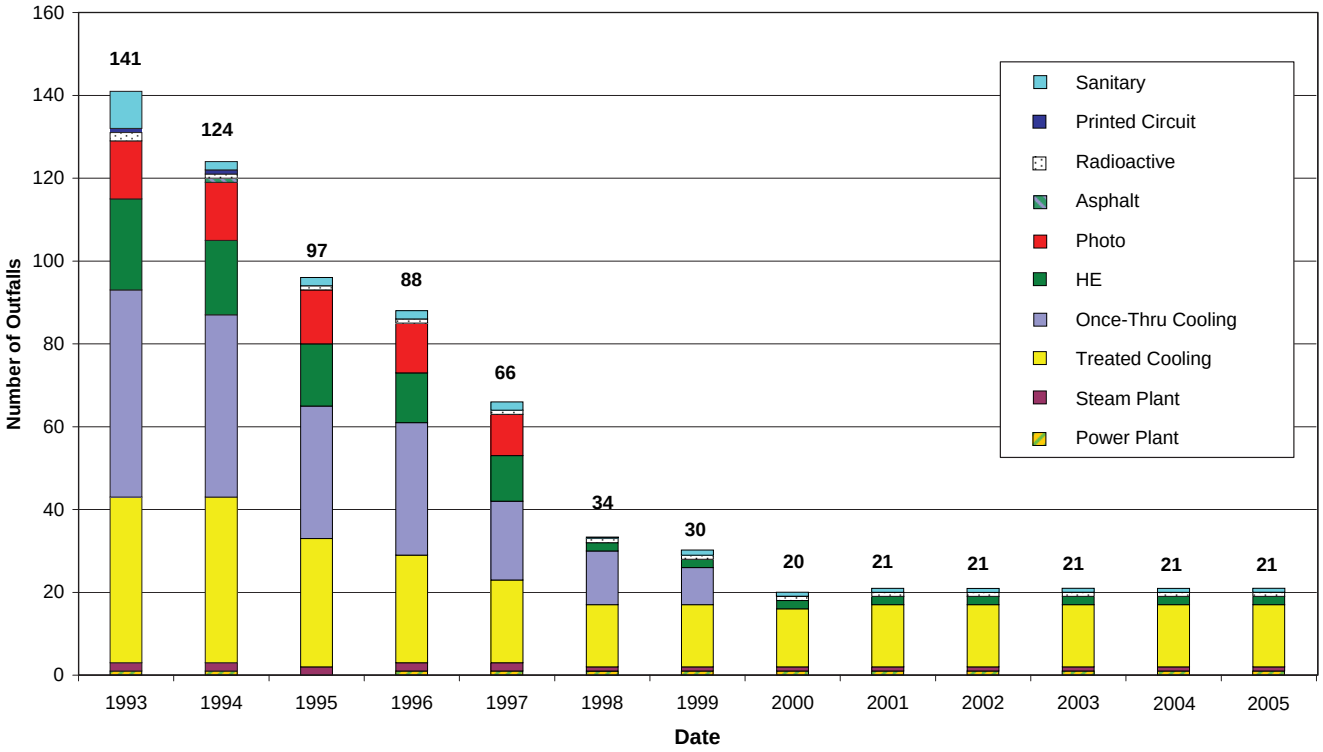

Figure 2-3. Number and type of permitted NPDES outfalls at LANL over the past 13 years.

The Laboratory's NPDES outfall permit requires weekly, monthly, and quarterly sampling to demonstrate compliance with effluent quality limits. The Laboratory also collects annual water-quality samples at all outfalls. The Laboratory reports analytical results to EPA and NMED at the end of the monitoring period for each respective outfall category. During 2005, none of the 126 samples collected from the Sanitary Wastewater Systems (SWWS) Plant's outfall exceeded effluent limits for residual chlorine; however, one of the 949 samples collected from industrial outfalls exceeded effluent limits. Figure 2-4 shows the number of effluent exceedances over the past 12 years. Monitoring data obtained from sampling at NPDES permitted outfalls are available online at http://www.lanl.gov/community/environment/h2o/.

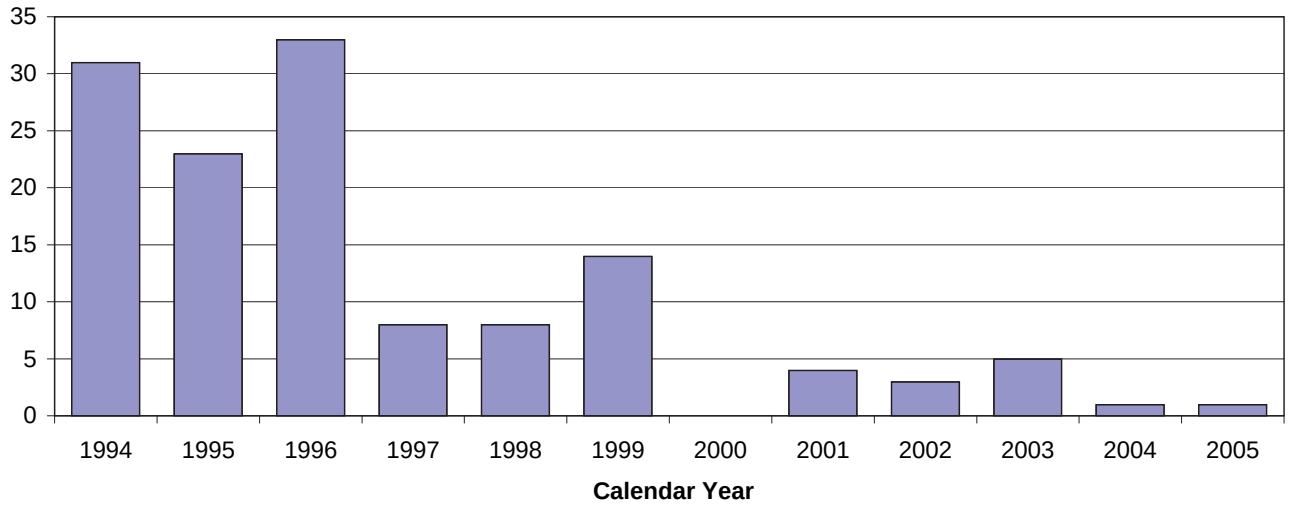

Figure 2-4. Number of exceedances of NPDES outfall effluent limits over the past 12 years.

The following is a summary of the corrective actions taken by the Laboratory during 2005 to address the NPDES outfall permit noncompliance cited above.

TA-3-22 Outfall 001Power Plant. On December 12, 2005, a total residual chlorine concentration of 0.34 mg/L exceeded the NPDES daily maximum permit limit of 11 µg/L and the Minimum Quantification Level (MQL) of 100 µg/L in NPDES Permit NM0028355. The noncompliance was attributed to fluctuating levels of chlorine in the treated re-use water coming from the sanitary plant and inadequate operational sampling. The immediate corrective action was to increase the drip-rate of the chlorine neutralizer. The long-term corrective actions are to change the sampling point for operational samples and to install an automated monitoring system that will inject chlorine neutralizer based on flow rate coming from the sanitary plant.

b. National Pollutant Discharge Elimination System Sanitary Sewage Sludge Management Program

The Laboratory's WA-Site (TA-46) SWWS Plant is an extended-aeration, activated-sludge sanitary wastewater treatment plant. The activated-sludge treatment process requires periodic disposing of excess sludge (waste-activated sludge) from the plant's clarifiers to synthetically lined drying beds. After air-drying for a minimum of 90 days to reduce pathogens, the dry sludge is characterized and then disposed of as a New Mexico Special Waste. Monitoring data obtained from routine characterization of SWWS Plant sludge is available online at http://www.lanl.gov/community/environment/h2o/. During 2005, the SWWS Plant generated approximately 36.89 dry tons (73,790 dry lb) of sewage sludge. All of this sludge was disposed of as a New Mexico Special Waste at a landfill authorized to accept this material.

c. National Pollutant Discharge Elimination System Industrial Point Source Permit Compliance Evaluation Inspection

NMED's Surface Water Quality Bureau conducted an NPDES Outfall Compliance Evaluation Inspection (CEI) on May 24 and 25, 2005, at 15 facilities throughout the Laboratory.

From the inspections, NMED prepared three reports: a report for Outfall 051, a report for Outfall 13S, and a report for the other 13 outfalls. Evaluation ratings were 4, 3, and 4 respectively on a scale of 1 to 5, with 5 for very reliable self-monitoring programs, 3 for satisfactory, and 1 for very unreliable programs. Below is a summary of the corrective actions taken by the Laboratory to address some deficiencies noted in the CEI Reports.

1. **DOE/LANL reporting "0" on Discharge Monitoring Reports (DMRs) without EPA authorization for parameters not on the list in Part II.B.** The Laboratory will include the "<" symbol and will report non-detects as < DL (detection limit) for those parameters not specified in Part II of the permit.
2. **TA-46 sanitary treatment facility not sufficiently operated or maintained at all times to minimize upsets.** Sanitary treatment plant personnel will include a check of clarifier short-circuiting and the rubber components on the daily inspections. If any problems are noted, a corrective maintenance ticket will be written to correct the problem(s) as soon as possible, instead of waiting until a preventive maintenance request is issued. The sanitary treatment facility operators will also consider an increase in the frequency of solid wasting and/or increasing the return activated sludge pump rate.
3. **Within the chlorine contact chamber, there were grease balls, approximately 3 mm in size, as well as some grit observed before effluent exited the treatment system via the Parshall flume.** A new grease interceptor and discharge line were installed in July 2005. Installation of the inlet line to the grease interceptor from the Otowi kitchen was completed in late 2005. Several lines into the old grease trap will be removed and connected to the new grease interceptor before it can become fully operational.
4. **Requested documentation for Outfall 051 was not provided.** Per NMED's request on May 31, 2005, sampling documentation from data packages for 2004 water quality standards, October, November, and December was provided to the inspector for Outfall 051. The complete data packages for October, November, and December 2004 for Outfall 051 were provided to NMED with the Laboratory's response letter. Also included with the response were the logbook entries for supporting pH measurements recorded on the October, November, and December DMRs.

5. **The pH on DMRs conflict with pH on summary sheets for Outfall 051.** The Laboratory's permit requires a weekly grab sample for pH at Outfall 051. TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) personnel also collect "operational" pH samples using a continuous pH monitor. The "internal summary sheet" will be modified to clarify that the continuous pH readings are operational samples.
6. **Contradictory and largely incomprehensible language describing tritium results in the second paragraph of the cover letter accompanying the yearly Water Quality Standards DMR.** The Laboratory will address NMED's concern by re-writing the language in future DMRs.
7. **Samples obtained at the sample sink inside the RLWTF apparently do not qualify as "representative" of the permitted activity.** Corrective actions have been completed to address NMED concerns regarding representative sampling.

d. NPDES Storm Water Construction Permit Program

The NPDES Construction General Permit (CGP) Program regulates storm water discharges from construction activities disturbing one or more acres, including those construction activities that are part of a larger common plan of development collectively disturbing one or more acres.

LANL and the general contractor apply individually for NPDES CGP coverage and are permittees at most construction sites. Compliance with the NPDES CGP includes the development and implementation of a Storm Water Pollution Prevention (SWPP) Plan before soil disturbance begins and site inspections once soil disturbance has commenced. A SWPP Plan describes the project activities, site conditions, and Best Management Practices (BMPs) required for reducing pollution in storm water discharges and protecting endangered or threatened species and critical habitat. Compliance with the NPDES CGP is demonstrated through inspections and reports that document the condition of the site and corrective actions required to keep pollutants from moving off the construction site. Data collected from these reports is tabulated monthly and annually in the form of Site Inspection Compliance Reports.

During 2005, the Laboratory implemented and maintained 64 construction site SWPP Plans and addendums to SWPP Plans and performed 833 storm water inspections. The Laboratory uses a geographic information system (GIS) to manage project information and generate status reports that facilitate Appendix F reporting. During the final quarter of 2005, 97.3 percent of the Lab's construction projects were in compliance with NPDES CGP requirements. At the end of 2005, 100 percent of the Laboratory's permitted sites were in compliance with the CGP. Corrective actions implemented in 2005 account for the improved compliance status from 2004. The overall compliance percentage in 2005 was 93 percent for all inspections compared to 76 percent in 2004. The LANL storm water team identified problems leading to noncompliances and difficulties with stabilizing disturbed landscapes. These mitigating factors have been incorporated into the team's Quality Improvement Performance Report. To further reduce future CGP noncompliances and increase Laboratory project manager and construction personnel awareness of CGP requirements, the storm water team is revising the BMP guidance document, developing a CGP training program, revising business and Request for Proposal contract language, and providing presentations on environmental requirements to contractors at pre-bid presentations. In addition, construction site representatives and/or LANL project managers are now required to attend storm water inspections to raise awareness of noncompliances and potential noncompliances and to ensure appropriate corrective measures for BMPs are implemented.

e. NPDES Industrial Storm Water Program

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

LANL, UC, and the DOE are co-permittees under the EPA 2000 NPDES Storm Water Multi-Sector General Permit for Industrial Activities (MSGP-2000). The MSGP-2000 requires the development and implementation of site-specific SWPP Plans, which must include identification of potential pollutants and activities and implementing BMPs. Permit requirements also include the monitoring of storm water discharges from permitted sites.

In 2005, LANL implemented and maintained 15 SWPP Plans under the MSGP-2000 covering 25 facilities and site-wide SWMUs. Compliance with the MSGP-2000 requirements for these sites is achieved primarily by implementing the following:

- Identifying potential pollutants and activities that may impact surface water quality and identifying and providing controls (BMPs) to limit the impact of those pollutants.
- Developing and implementing facility-specific SWPP Plans.
- Monitoring storm water runoff at facility gauging stations for industrial sector-specific benchmark parameters, and visually inspecting storm water runoff to assess color; odor; floating, settled, or suspended solids; foam; oil sheen; and other indicators of storm water pollution. Flow-discharge information is reported in Shaull et al. (2006) and in DMRs submitted to EPA and NMED.

The MSGP-2000 expired October 30, 2005, without EPA issuing a new permit. Administrative continuance of the MSGP-2000, which requires continued compliance with the expired permit requirements, was granted to existing permit holders. This continuance will remain in effect until a new permit is issued. On December 1, 2005, EPA issued a draft MSGP with expected issuance of the final permit sometime in 2006. Proposed changes to the permit include increased storm water monitoring requirements, changes in benchmark monitoring parameters, increased inspection frequencies, additional SWPP Plan content requirements, and increased requirements for BMP selection, implementation, and maintenance.

f. Federal Facility Compliance Agreement/Administrative Order

On February 3, 2005, DOE entered into a compliance agreement with EPA to protect surface water quality at the Laboratory through a Federal Facility Compliance Agreement (FFCA). The FFCA establishes a compliance program for the regulation of storm water discharges from SWMUs and AOCs until such time as those sources are regulated by an individual storm water permit pursuant to the NPDES Permit Program. All SWMUs and AOCs (collectively, Sites) are covered by this agreement. On March 30, 2005, EPA issued an Administrative Order (AO) to the Laboratory that coincides with the FFCA.

The FFCA/AO establishes a schedule for monitoring and reporting requirements and requires the Laboratory to minimize erosion and the transport of pollutants or contaminants from Sites in storm water runoff.

The FFCA/AO requires two types of monitoring at specified sites, pursuant to two monitoring management plans, including: 1) watershed sampling at approximately 60 automated gauging stations at various locations within the Laboratory canyons pursuant to a Storm Water Monitoring Plan (SWMP); and, 2) site-specific sampling at approximately 294 Sites, on a rotating basis pursuant to a SWMU Storm Water Pollution Prevention Plan (SWMU/SWPPP) over a four year period. The purpose of storm water monitoring is to determine if there is a release or transport of pollutants/contaminants into surface water that could cause or contribute to a violation of applicable surface water quality standards. If a release or transport occurs, it may be necessary to implement BMPs to reduce erosion or to re-examine, repair, or modify existing BMPs to reduce erosion. The SWMU/SWPPP must also describe an erosion control program to control and limit contamination migration and transport from Sites and to monitor the effectiveness of controls at the Sites.

In 2005, the Laboratory completed the following tasks:

1. Submitted the annual modification of the SWMP that describes how the telemetry-based network of monitoring stations would be used to implement watershed-scale monitoring at the Laboratory;
2. Submitted the annual modification of the SWPP for SWMU/AOCs that describes site-specific monitoring and erosion control program at SWMU/AOCs;
3. Submitted administratively complete individual permit application for storm water discharges from SWMUs, March 2005;
4. Submitted all monthly water screening action level exceedance reports and quarterly status reports required by the FFCA on schedule;

5. Completed the following fieldwork:
   - Installed 40 new site-specific samplers to bring the total to 80;
   - Collected 312 storm water samples at site-specific locations;
   - Collected 191 storm water samples at gauge locations;
   - Conducted 1,087 inspections at 294 Sites;
   - Completed 248 new BMP installations; and
   - Completed maintenance of BMPs at 151 sites.

g. Aboveground Storage Tank Compliance Program

The Laboratory's Aboveground Storage Tank (AST) Compliance Program is responsible for ensuring compliance with the requirements established by EPA (CWA, 40 CFR, Part 112) and NMED Petroleum Storage Tank Bureau Regulations (20.5 NMAC). During 2005, the Laboratory was in full compliance with both EPA and NMED requirements.

The Spill Prevention Control and Countermeasures (SPCC) Plan establishes the federal requirements for the AST Compliance Program, as required by the CWA (40 CFR, Part 112, Oil Pollution Prevention Regulations). Comprehensive SPCC Plans are developed to meet EPA requirements that regulate water pollution from oil spills.

EPA proposed extending compliance deadlines for meeting new regulatory requirements under the federal Clean Water Act (40 CFR, Part 112). Proposed new regulations will require the Laboratory to modify and implement its SPCC Plans by October 31, 2007. The primary modifications address AST storage capacity, inspection frequency, and integrity testing requirements. The Laboratory has completed all modifications to existing and new SPCC Plans and continues to implement those modifications.

On August 15, 2003, NMED implemented new regulations that combined requirements for underground storage tanks and ASTs (20.5 NMAC). The Laboratory continues to maintain and operate ASTs in compliance with 20.5 NMAC. In July 2005, the Laboratory paid annual AST registration fees ($100 per AST) to NMED.

During 2005, the Laboratory continued to work on removing and decommissioning ASTs that were no longer in service. In 2005, we developed a quarterly assessment program for AST systems to assist Laboratory AST owners and operators in meeting regulatory compliance requirements and associated deadlines.

NMED conducted AST inspections on June 28, 2005 and July 19, 2005 at various Laboratory facilities. The NMED cited no violations during these inspections.

On February 21, 2002, the Laboratory notified EPA, NMED, and the National Response Center of a discharge of approximately 48,000 gallons of diesel fuel into the environment from a tank at TA-21-57. Soil removal and sampling were performed in accordance with Laboratory, state, and federal regulatory requirements to determine the extent of the leak. The Laboratory completed characterization of the release in December 2003 and is continuing to work with NMED on a path forward for mitigation efforts. In 2005, the Laboratory worked on developing a Sampling and Analysis Plan to conduct additional characterization of the TA-21-57 diesel release site to further evaluate subsurface diesel contamination. Additional characterization will provide information needed for establishing current conditions for the subsurface diesel contamination. Upon evaluation of additional characterization, the Laboratory intends to develop applicable processes for site mitigation.

On April 3, 2003, the Laboratory notified NMED of the discovery of diesel-contaminated soil near the TA-3 Power Plant AST (TA-3-26). The Laboratory completed initial characterization of the diesel contaminated soil in April 2004 and is continuing to work with NMED on a path forward for additional characterization and mitigation efforts. In 2005, the Laboratory began developing a Sampling and Analysis Plan to conduct secondary characterization at the TA-3-26 site to further evaluate nature and extent of the diesel contaminated soil.

h. Dredge and Fill Permit Program

Section 404 of the CWA requires the Laboratory to obtain permits from the US Army Corps of Engineers to perform work within perennial, intermittent, or ephemeral watercourses. Section 401 of the CWA requires states to certify that Section 404 permits issued by the Corps will not prevent attainment of state-mandated stream standards. NMED reviews Section 404/401 joint permit applications and then issues separate Section 401 certification letters which may include additional permit requirements to meet state stream standards for individual Laboratory projects. In addition, the Laboratory must comply with 10 CFR 1022, which specifies how DOE sites comply with Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands.

During 2005, two Section 404/401 permits were issued to the Laboratory for (1) the Pueblo Canyon Channel Stabilization Project in Pueblo Canyon (Nationwide Permit No. 13, Bank Stabilization) and (2) the Security Perimeter Road Project in an ephemeral tributary to Twomile Canyon (Nationwide Permit No. 14, Road Crossings). In addition, LANL reviewed 916 excavation permits and 132 project profiles for potential impacts to watercourses, floodplains, or wetlands. No Floodplain/Wetland Assessments were prepared in 2005.

No violations of the DOE Floodplains/Wetlands Environmental Review Requirements were recorded. NMED and the Corps of Engineers did not inspect active sites permitted under the Section 404/401 regulations during 2005.

8. Safe Drinking Water Act

Los Alamos County, as owner and operator of the Los Alamos water supply system, is responsible for compliance with the requirements of the federal Safe Drinking Water Act (SDWA) and the New Mexico Drinking Water Regulations (NMEIB 2002). The SDWA requires Los Alamos County to collect samples from various points in the water distribution systems at the Laboratory, Los Alamos County, and Bandelier National Monument to demonstrate compliance with SDWA maximum contaminant levels (MCLs). EPA has established MCLs for microbiological organisms, organic and inorganic constituents, and radioactivity in drinking water. The state has adopted these standards in the New Mexico Drinking Water Regulations. EPA has authorized NMED to administer and enforce federal drinking water regulations and standards in New Mexico. In 2005, the Laboratory conducted additional confirmation monitoring of the Los Alamos water supply system for quality assurance purposes. Chapter 5 presents these data.

In 2005, Los Alamos County and NMED conducted sampling for microbiological organisms, nitrate+nitrite (as N), radionuclides, total trihalomethanes, total haloacetic acids, volatile and semi-volatile organic compounds, and heavy metals in drinking water for SDWA compliance purposes. In addition, lead and copper samples were collected from 34 residential taps. Results showed that all samples were compliant with SDWA MCLs. More information on the quality of the drinking water from the Los Alamos Water Supply System is in the County's annual Consumer Confidence Report, available online at: http://www.lac-nm.us/.

NMED did not conduct an inspection of the drinking-water system in 2005.

9. Groundwater

a. Groundwater Protection Compliance Issues

DOE Order 450.1 requires the Laboratory to prepare a groundwater protection management program plan to protect groundwater resources in and around the Los Alamos area and ensure that all groundwater-related activities comply with the applicable federal and state regulations. The March 2005 Consent Order superseded Module VIII of the RCRA Hazardous Waste Facility Permit, which required the Laboratory to collect information about the environmental setting at the facility and to collect data on groundwater contamination.

The Laboratory completed activities under the Hydrogeologic Workplan (LANL 1998a) in 2004. The Hydrogeologic Workplan defined a multiyear drilling and hydrogeologic analysis program to characterize the hydrogeologic setting of the Pajarito Plateau. The program provided a greater understanding of the geology, groundwater flow, and geochemistry beneath the 40-square-mile Laboratory area. The program culminated in a report, entitled "Los Alamos National Laboratory's Hydrogeologic Studies of the Pajarito Plateau: A Synthesis of Hydrogeologic Workplan Activities (1998-2004)," which was published in December 2005. This report

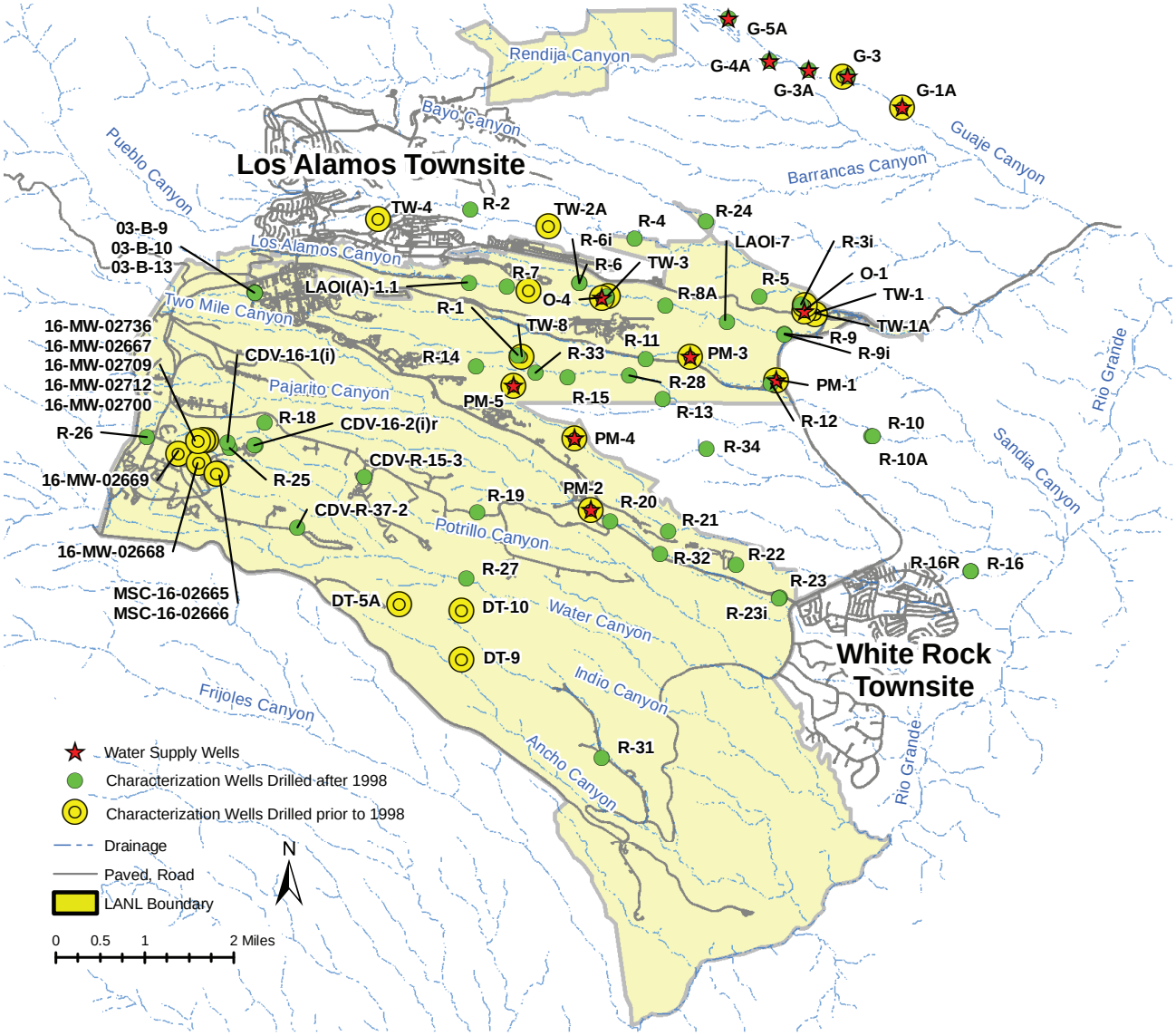

Figure 2-5. Intermediate-perched and regional aquifer characterization wells at LANL and vicinity.

summarizes all information on groundwater data collected as part of Hydrogeologic Workplan activities. Figure 2-5 below depicts the location the intermediate-perched and regional groundwater aquifer characterization wells and supply wells installed before and after 1998 (i.e., the initiation of the Hydrogeologic Workplan).

Sample analytical, water-level, well-construction, and other programmatic data can be reviewed online on the Laboratory's Water Quality Database website, http://www.lanl.gov/community/environment/h2o/.

New Mexico Water Quality Control Commission (NMWQCC) regulations control liquid discharges onto or below the ground surface to protect all groundwater in New Mexico. Under the regulations, when required by NMED, a facility must submit a groundwater discharge plan and obtain NMED approval (or approval from the Oil Conservation Division for energy/mineral-extraction activities). Subsequent discharges must be consistent with the terms and conditions of the discharge plan.

In 2005, the Laboratory had one approved groundwater discharge plan (Table 2-1) for the TA-46 SWWS Plant. On August 27, 2002, the Laboratory submitted a renewal application for the SWWS Plant groundwater discharge plan. NMED approval was pending at the end of 2005. On August 20, 1996, the Laboratory submitted a groundwater discharge plan application for the RLWTF at TA-50. As of December 31, 2005, NMED approval of the plan was still pending.

b. Compliance Activities

Early in 2005, the Laboratory conducted work as part of the Hydrogeologic Characterization Program, as described in the Hydrogeologic Workplan (LANL 1998). However, the Laboratory performed most of the work in 2005 pursuant to the Consent Order, which was signed by NMED, DOE, and UC in March 2005. By the end of 2005, LANL installed 21 additional characterization wells. The characterization wells were drilled using air rotary in the vadose zone and rotary with water, foam, mud, or EZ-MUD (a polymer) in the saturated zone. Geologic core was collected in the upper vadose zone in some of the wells and geologic cuttings were collected at defined intervals during the drilling operations and described to record the stratigraphy encountered. Geophysical logging was conducted in each well to enhance the understanding of the stratigraphy and rock characteristics.

The characterization borehole and wells include the following:

- CdV-16-2(i)r in Cañon de Valle,
- LADP-5 in DP Canyon,
- LAOI-3.2 in Los Alamos Canyon,
- LAOI-7 in Los Alamos Canyon,
- R-3i in Los Alamos Canyon,
- R-10 and R-10A in Sandia Canyon,
- R-16A in Cañada del Buey,
- R-17 on a Pajarito Canyon bench,
- R-23i in Pajarito Canyon,
- R-24 in Bayo Canyon, and
- R-27 in Water Canyon.

Intermediate well CdV-16-2(i)r is located on the mesa top in TA-16. It replaces well CdV-16-2(i), which was drilled and installed in December 2003 but did not sustain water in the well. CdV-16-2(i)r was drilled in an attempt to complete a monitoring well at the same location to evaluate water quality in the deep intermediate perched zone. It was drilled approximately 50 ft northwest of the original well. The area's primary chemicals of potential concern are high explosives that have been discharged from TA-16 and possibly from other nearby sites. The single screened well was installed within the upper portion of the Puye Formation. The depth to water remained steady at a depth of approximately 840 ft after the well was completed at a total depth of 863.2 ft.

Intermediate borehole LADP-5 was drilled in November 2005 on the south rim of DP Canyon within TA-21. LADP-5 was drilled to identify the western extent of tritium, nitrate, and perchlorate contamination found in monitoring wells R-6/6i and production well Otowi-4. However, measurable groundwater was not encountered in either the corehole or borehole. Therefore, a monitoring well was not installed at the LADP-5 location. Subsequently, both the borehole and corehole were plugged and abandoned.

Intermediate well LAOI-3.2 is located in Los Alamos Canyon in the northern portion of the Laboratory. Well LAOI-3.2 was drilled to define the lateral extent of the deeper perched groundwater found in the Puye Formation at wells Otowi-4 (O-4) and R-6i. LAOI-3.2 was drilled in February 2005 with a target depth of 300 ft below ground surface (bgs); however, drilling was halted at 165 ft bgs to install an intermediate perched zone monitoring well for groundwater encountered in the Guaje Pumice Bed. LAOI-3.2 was installed to 165 ft bgs with a single screened interval from 153.3 to 162.8 ft bgs; the water level after well installation was approximately 136 ft bgs.

Intermediate well LAOI-7 was drilled in August and September 2005 in lower Los Alamos Canyon within TA-72. The well was drilled to identify the western extent of perched-intermediate groundwater within the Cerros del Rio basalt found at wells R-9/R-9i and to help define the eastern extent of contamination in the vadose zone in lower Los Alamos Canyon. The well was constructed with a single screen approximately 20 ft below the perched-intermediate water zone at a total completed depth of 264.9 ft.

Regional well R-3i is located in Los Alamos Canyon, west of the White Rock "Y." The primary purpose of the well is to target the zone(s) within the regional aquifer that contain the same contaminants (nitrate, perchlorate, and tritium) as well O-1. Drilling started in August 2005 and was completed in the Puye Formation at a total of 268.3 ft. The regional aquifer table is at a depth of 190.9 ft in the Cerros del Rio Basalt. The well was constructed with a single screened interval from 215.2 to 220 ft bgs.

Regional wells R-10a and R-10 are located in lower Sandia Canyon on Pueblo de San Ildefonso property. R-10a was installed to monitor water quality in the upper portion of the regional aquifer; R-10 was installed to monitor water quality and to evaluate the effects of nearby water supply pumping on the deeper portions of the regional aquifer. The majority of the fieldwork for these wells was conducted between June 27 and November 4, 2005. R-10a was drilled to a total depth of 765 ft using air-rotary and fluid-assisted air-rotary techniques. A well was installed with one screened interval from 690 to 700 ft bgs. The depth to water after the installation of R-10a was 623.83 ft bgs. R-10 was drilled 56 ft east of R-10a to a total depth of 1,165 ft bgs using air rotary and mud rotary drilling techniques; it was completed with two screened intervals, one between 874 and 897 ft bgs and one between 1,042 and 1,065 ft bgs.

Regional well R-16A (also known as R-16R) was drilled in September 2005 south of Cañada del Buey, approximately 3,000 ft northwest of the Rio Grande and near the town of White Rock. R-16A was drilled to monitor the upper portion of the regional aquifer, replacing the blocked upper screened interval in R-16. The purpose of R-16 (and R-16A) was to determine the depth of the water table and vertical gradients for the regional aquifer near the Rio Grande, serve as monitoring points between TA-54 and the Rio Grande, and aid in determining the relationship between the regional water table and springs in White Rock Canyon. The well was constructed with a single screen at the water table at a total completed depth of 631.4 ft.

Regional well R-17 is located in Pajarito Canyon and was installed to evaluate perched intermediate and regional groundwater in the west-central region of the Laboratory downstream of release sites in TA-03, -06, -59, and -69. A corehole was advanced to 300.9 ft bgs and the R-17 borehole was drilled to a total depth of 1,167 ft bgs. A well was installed with two screened intervals, one from 1,057 to 1,080 ft bgs and one from 1,124 to 1,134 ft bgs, in the regional aquifer within the Puye Formation. The depth to water for the isolated upper screen is approximately 1,036.2 ft bgs and for the isolated lower screen it is 1,037.7 ft bgs.

Intermediate well R-23i was drilled in October 2005 in lower Pajarito Canyon, south of Pajarito Road. The well was drilled to sample perched intermediate groundwater encountered during the drilling of R-23. The 550.7-ft well was constructed with a dual-screened inner well, and a shallow single-screened well in the annular space. Perched intermediate water in the inner wells was at 405.8 ft after well completion.

Regional well R-24 was drilled in August 2005 in Bayo Canyon, near the northeastern portion of the Laboratory. The purpose of R-24 was to drill and sample 300-ft-deep corehole and to drill and install a regional aquifer monitoring well. The well was constructed with a single screen approximately 100 ft below the regional water table at a total completed depth of 861 ft.

Regional well R-27 was drilled in October 2005 in Water Canyon within TA-36 in the south-central portion of the Laboratory. The purpose of R-27 is to monitor regional groundwater for potential contamination from TA-16 and other nearby sites. The well was constructed with a single screen approximately 40 ft below the regional water table at a total completed depth of 878.7 ft.

In addition to the site-wide hydrogeologic characterization wells, the Laboratory made substantial progress in 2005 on investigating groundwater in Mortandad Canyon and at two TA-3 SWMUs (see the Mortandad Canyon Groundwater Work Plan, LANL 2003d and Investigation Report for Solid Waste Management Units 03-010(a) and 03-001(e) at Technical Area 3, LANL 2005a).

Seven wells were installed on Laboratory property in and adjacent to Mortandad Canyon as part of investigation of Mortandad Canyon groundwater. The purpose of these intermediate wells was to improve the conceptual model of the geology, hydrogeology, and hydrochemistry of the area and to provide data for numerical models that address contaminant migration in the vadose (unsaturated) zone.

The alluvial wells were planned to characterize groundwater flow and determine contaminant distributions within alluvial perched water systems, and the piezometers were planned to evaluate the water table response to seasonal infiltration and to characterize hydraulic gradients and conductivities.

Intermediate well MCOI-1 is located in TA-35 within Mortandad Canyon, approximately 0.25 miles east of the TA-50 outfall. It was specifically installed to determine if contaminant releases have affected the quality of intermediate perched groundwater between the TA-50 outfall and Test Well 8. Air-rotary drilling started in November 2004 and was completed in January 2005 at a total of 843.2 ft. The well was constructed with a single screen at the water table. However, water has not accumulated in this well so well development, aquifer testing, and pump installation have not been performed.

Intermediate well MCOI-6 is located in TA-5 within Mortandad Canyon and was drilled from November 2004 through January 2005 to a total depth of 720 ft bgs using air-rotary drilling. The well was constructed with a single-screened interval from 686 to 708 ft bgs, near the base of the Cerros del Rio basalt. The total depth of the well was 713 ft bgs. On January 21, 2005, the depth to water after well installation was 665.80 ft bgs.

Intermediate well MCOI-8 is located in TA-5 within Mortandad Canyon and was drilled from November 2004 through January 2005 to a total depth of 745 ft bgs using air-rotary and fluid-assisted drilling methods. The well was completed in the Cerros del Rio Basalt with a single screened-interval from 665 to 675 ft bgs. The depth to water after installation of the well screen was 656.7 ft bgs.

Intermediate borehole MCOI-10 is located on the mesa top south of Mortandad Canyon, approximately 3,500 ft east of water production well PM-5. MCOI-10 was drilled from November 2004 through February 2005 to a total depth of 1,050 ft bgs using air-rotary and fluid-assisted air-rotary drilling methods. The well was completed 76 ft into the Puye Fanglomerate; however, no intermediate-perched groundwater was observed entering the borehole, so the borehole was plugged and abandoned.

Alluvial well MCA-1 is located in upper Mortandad Canyon and was hand-augered to a total depth of 5.9 ft bgs where the Tshirege Member of the Bandelier tuff was encountered in January 2005. Water was encountered at 3.3 ft bgs in the surficial alluvium. The well was cased to a depth of 5.9 ft bgs and constructed with a single screened interval from 2.4 to 5.4 ft.

Alluvial well MCA-4 is located in middle Mortandad Canyon and was hand-augered to a total depth of 5.4 ft bgs where the Tshirege Member of the Bandelier tuff was encountered in February 2005. Water was encountered at 5 ft bgs in the alluvium. The well was cased to a depth of 5.4 ft bgs and constructed with a single screened interval from 3.3 to 5.3 ft.

Alluvial well MCA-5 is located in upper Mortandad Canyon and was hand-augered to a total depth of 6 ft bgs in February 2005. Water was encountered at 4 ft bgs in the alluvium. The well was cased to a depth of 6 ft bgs and constructed with a single screened interval from 1.75 to 5.75 ft.

In June 2005, monitoring wells were installed in three of the 14 boreholes drilled near SWMU 03-010(a) and SWMU 03-001(e) to monitor shallow alluvial groundwater. Monitoring wells 03-B-9, 03-B-10 and 03-B-13 were completed with single screens and range in depth from 30.6 to 31.5 ft bgs.

10. National Environmental Policy Act

The intent of the National Environmental Policy Act (NEPA) (42 U.S.C. 4331 et seq.) is to promote productive harmony between humans and the environment. Federal agencies such as the DOE/NNSA must consider the environmental impacts of proposed projects and assure public participation as part of the decision-making process. The Laboratory's Ecology Group devotes considerable resources to assist NNSA in compliance with the NEPA, pursuant to DOE Order O451.1B. Proposed projects and actions at LANL are reviewed by the group to determine if there are resource impacts, and the appropriate coverage under NEPA, and provides these recommendations to NNSA. NEPA has made a positive contribution in support of LANL's ongoing missions.

The following NEPA analyses were prepared or reviewed in 2005:

a. NEPA Compliance Review for Proposed Modifications to the Security Perimeter Project at Los Alamos National Laboratory

Recent proposed Security Perimeter Project modifications would have altered some aspects of the original Security Perimeter Project as it was described in the DOE Environmental Assessment (EA)-1429 and subsequently revised in the March 2004 NEPA Compliance Review. Specifically, this project would relocate the proposed access control station near the intersection of West Jemez Road (also known as State Road 501) with State Road 4 to a location just west of the intersection of West Jemez Road and Camp May (the Ski Hill Road). The Pajarito Road access control stations would remain in operation as previously analyzed in DOE/EA-1429. This analysis compared the potential environmental consequences to resources that would result from implementing the proposed modifications to the Security Perimeter Project with EA-1429 and the five other applicable subject EAs previously identified. In all cases, the consequences would likely be less than previously analyzed and therefore are bounded by DOE/EA-1429 and the other applicable EAs. The analysis concluded that the proposed modifications would not result in changes to affected resources that exceed what has previously been analyzed and determined to have no significant impacts. Therefore, a new EA was not required. Subsequent legal actions by the Incorporated County of Los Alamos have resulted in an agreement between the NNSA and the County regarding specific design aspects of the proposal.

b. NEPA Compliance Review for Proposed Modifications to DOE/EA-1409

On July 30, 2002, DOE/NNSA issued a Finding of No Significant Impact (FONSI) for DOE/EA-1409, Proposed Modifications to the Environmental Assessment for the Proposed Issuance of an Easement to Public Service Company of New Mexico for the Construction and Operation of a 12-in. Natural Gas Pipeline within Los Alamos National Laboratory (DOE 2002). Further changes, primarily to the proposed alignment of the natural gas line, have been proposed since that time, and these require a subsequent NEPA review. Construction of this project was delayed through 2003 and 2004 due to wildfire concerns and drought conditions. Recent modifications proposed for the alignment of the natural gas line within Los Alamos Canyon would have altered some aspects of the original project as it was described in the EA-1409. Specifically, the proposed natural gas line would not run in an easement under the electrical lines within Los Alamos Canyon, but underneath the existing unpaved access road. The analysis concluded that the proposed modifications would not result in changes to affected resources that exceed what has previously been analyzed and determined to have no significant impacts. Therefore, a new EA was not required.

c. New LANL Site-Wide Environmental Impact Statement (SWEIS)

DOE NEPA implementing regulations (10 CFR Part 1021.330[d]) require a SWEIS to be reviewed at least every five years and a Supplemental Analysis performed to examine whether the SWEIS still adequately covers site operations. DOE/NNSA LASO produced a Supplemental Analysis in September 2004 that was reviewed by DOE-HQ. In October 2004, DOE-HQ made the decision to expand the Supplement Analysis to a Supplemental SWEIS. In April 2005, DOE-HQ decided to convert the Supplemental SWEIS to a full SWEIS and consider three alternatives for future operations at LANL. The new SWEIS would consider operations for a period of five years, 2007–2011. The three SWEIS alternatives being considered are as follows:

1. **The No Action Alternative:** This alternative would continue operations at current levels. This alternative considers the levels of operation covered in the 1999 SWEIS Record of Decision Expanded Operations Alternative. This alternative would include updates on the operations of the 15 Key Facilities defined in the 1999 SWEIS to anticipate operational levels over the next five years and consideration of new facilities proposed for construction over this period.
2. **The Expanded Operations Alternative:** This alternative would include the No Action Alternative plus new or enhanced facilities for ongoing operations. Waste management levels would increase. The major change in this alternative would be the increase in pit production to 50 pits/year in the current TA-55 facilities (same PF-4 facility).

3. **The Reduced Operations Alternative:** This alternative would include operational reductions at certain facilities while enhancing some facilities for ongoing operations. Pit production would remain at the 1999 SWEIS Record of Decision levels of 20 pits/year. The major changes considered in this alternative are the closing of LANSCE and a reduction in operations of approximately 20 percent for DARHT and a 20 percent reduction in firing site operations.

The three alternatives will be analyzed and a preferred alternative will be selected. The preferred alternative could include elements from all three of the alternatives, but no decisions have been made on what elements of the three alternatives will be included.

The SWEIS document is being prepared by Science Applications International Corporation (SAIC) under contract with DOE/NNSA LASO. Data gathering to support this effort and three project specific analyses are being prepared by LANL staff. A concurrence draft of the SWEIS was produced in February 2006. The date for the issuance of a Record of Decision on the new SWEIS is April 2007.

11. Endangered Species Act

The Endangered Species Act requires, among other things, federal agencies to ensure that agency action is not likely to jeopardize the continued existence of any threatened or endangered species and to consult with the US Fish and Wildlife Service on any prospective action that will likely affect a listed threatened or endangered species.

The Laboratory was in full compliance with the Endangered Species Act during 2005. During 2005, LANL reviewed 962 excavation permits and 125 project profiles (Permits and Requirements Identification System) for potential impacts to threatened or endangered species. LANL prepared Biological Assessments for the following four NNSA/DOE projects in support of informal consultations with the US Fish and Wildlife Service:

- Asphalt Batch Plant and Rock Crushing Operation on Sigma Mesa
- RedLANLNet (classified computing) Infrastructure Expansion Program
- Construction and Monitoring of Permeable Reactive Barriers
- Mexican Spotted Owl habitat redelineation

12. Migratory Bird Treaty Act

Under the provisions of the Migratory Bird Treaty Act, it is unlawful "by any means or manner to pursue, hunt, take, capture [or] kill" any migratory birds except as permitted by regulations issued by the US Fish and Wildlife Service. The unauthorized take of migratory birds is a strict liability criminal offense that does not require knowledge or specific intent on the part of the offender. As such, even when engaged in an otherwise legal activity where the intent is not to kill or injure migratory birds, violations can occur if bird death or injury results. The US Fish and Wildlife Service has enforced the Migratory Bird Treaty Act with discretion, focusing on individuals or organizations that take birds with disregard for the law, particularly where no valid conservation measures have been employed. In doing so, the Service has been able to focus its limited resources on working cooperatively with various industries, agencies, and individuals to reduce impacts on migratory birds.

The Laboratory incorporated best management practices (BMPs) for protecting migratory birds into its Job Hazard Analysis Tool. Personnel from LANL received training for migratory bird protection measures at the annual New Mexico Avian Protection Workshop.

13. Cultural Resources

The goal of the National Historic Preservation Act is to have federal agencies act as responsible stewards of the nation's resources when their actions affect historic properties. Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effects their projects may have on historic properties and to allow for comment by the Advisory Council on Historic Preservation. The Section 106 regulations outline a project review process that is conducted on a project-by-project basis.

In 2005, the Laboratory conducted 33 projects that required some field verification of previous survey information. In addition to the seven new archaeological sites identified this fiscal year, we identified 19 historic buildings. Forty-one archaeological sites and 10 historic buildings were determined eligible for the National Register of Historic Places.

The Laboratory began the fourth year of a multiyear program of archaeological excavation in support of the Land Conveyance and Transfer project. The DOE/NNSA is in the process of conveying to the County of Los Alamos approximately 2,000 acres of Laboratory lands. Thirty-nine archaeological sites have been excavated during the four field seasons, with more than 200,000 artifacts and 2,000 samples being recovered. Together, these sites provide new insights into past lifeways on the Pajarito Plateau from 5000 BC to AD 1943. From a compliance perspective, these excavations resolve the anticipated adverse effects to archaeological sites from the future development of lands to be acquired by Los Alamos County. These sites are also ancestral places to the Pueblo people. Therefore representatives from the Pueblos of San Ildefonso and Santa Clara acted as tribal consultants and monitors on the project.

In support of LANL's fiscal year 2005 decontamination and decommissioning program, the Laboratory conducted historic building assessments and other documentation work related to eight proposed projects as required under the provisions of the National Historic Preservation Act. (Buildings include TA-3-31; TA-9-35 and -43; TA-15-8; TA-15-46, -138, and -141; TA-16-467, -477, and -478; TA-28-1 through -5; TA-49-23 and -121; and TA-40-4 and -19). This work included field visits to historic properties (including interior and exterior inspections), digital photography, and architectural documentation (using standard LANL building recording forms). Additional documentation included the production of location maps for each of the evaluated projects. Historical research was also conducted using source materials from the LANL archives and records center, historical photography, the Laboratory's Environmental Characterization and Remediation reading room, and previously conducted oral interviews.

The long-term monitoring program at the ancestral pueblo of Nake'muu continued as part of the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility Mitigation Action Plan (USDOE 1996). Nake'muu is the only pueblo at LANL that still contains its original standing walls. During the eight-year monitoring program, the site has witnessed a 0.9 percent displacement rate of chinking stones and 0.3 percent displacement of masonry blocks. Statistical analyses indicate that these displacement rates are significantly correlated with annual snowfall, but not with annual rainfall or shots from the DARHT facility.

Native American consultation is ongoing with respect to identifying and protecting Traditional Cultural Properties, human remains, and sacred objects in compliance with the National Historic Preservation Act of 1990 and Native American Graves Protection and Repatriation Act. Work for the Land Conveyance and Transfer Project included consultation with San Ildefonso and Santa Clara Pueblos for project monitoring, the implementation of a Native American Graves Protection and Repatriation Act intentional excavation agreement, identification of potential reburial locations, protection of Traditional Cultural Properties, and student internships. Other projects include the Nake'muu noise vibration study, the development of a draft management plan for the TA-3 University House Traditional Cultural Properties, and the Cerro Grande Rehabilitation project.

C. CURRENT ISSUES AND ACTIONS

1. New Mexico Hazardous Waste Management Notice of Violation

In April 2005, NMED's Hazardous Waste Bureau issued the UC and DOE a Notice of Violation identifying four alleged violations noted during the 2004 inspection and four alleged violations noted during the 2005 inspection. The initial penalty assessed was $63,578. UC and DOE provided information to the NMED and admitted five of the allegations. UC, DOE, and NMED agreed to settle the matter for $60,328, which was paid in October 2005.

D. UNPLANNED RELEASES

1. Air Releases

There were no reportable unplanned airborne releases from LANL in 2005.

2. Water Releases

There were no unplanned releases of radioactive liquids in 2005. There were 10 unplanned releases of non-radioactive liquids in 2005:

- Approximately 100,000 gallons of potable water from a broken water main near Building 21-346 to a Solid Waste Management Unit (SWMU) and upper DP Canyon
- Approximately two gallons of diesel fuel to surface water streams from a leaking vehicle that impacted TA-3, TA-15, TA-16, and TA-40
- Approximately 700 gallons of raw sewage to an excavated area at Building 16-340
- Approximately 7,000 gallons at Building 60-175 from a ruptured line carrying treated wastewater for recycle use to the TA-3 Power Plant
- Approximately 10 gallons of boiler steam condensate from Building 3-22 Power Plant to upper Sandia Canyon
- Approximately 36,000 gallons of condensate over a period of time from an HVAC unit at Building 21-152
- Approximately one-half gallon of diesel at Building 3-30 and TA-54 to storm water drains from a leaking vehicle
- Approximately 18,000 gallons to Ten-Site Canyon of storm water that had collected at TA-50 Pump House construction site
- Approximately 10 gallons of overflowed recycled vegetable oil from a storage bin near Building 3-261 (Otowi Complex)
- Approximately 50 gallons of raw sewage from a plugged line from Building 60-175

The Laboratory investigated all unplanned releases of liquids as required by the NMWQCC Regulations 20.6.2.1203 NMAC. Upon cleanup, personnel from NMED and NMED's DOE Oversight Bureau inspected the unplanned release sites to ensure adequate cleanup. As of mid-2006, the Laboratory is in the process of administratively closing out all releases for 2005 with the NMED Oversight Bureau and anticipates these unplanned release investigations will be closed out after final inspections.

E. REFERENCES

USDOE 1996: USDOE (US Department of Energy), "Dual-Axis Radiographic Hydrodynamic Test Facility Final Environmental Impact Statement Mitigation Action Plan," United States Department of Energy report USDOE/EIS-0228 (1996).

LANL 1998: Water Quality and Hydrology Group, "Hydrogeologic Workplan," Final Version, Los Alamos National Laboratory (May 1998).

NMEIB 2002: New Mexico Environmental Improvement Board, State of New Mexico, "Drinking Water Regulations" (as amended through December 2002).

Shaull et al. 2006: D. A. Shaull, D. Ortiz, M. R. Alexander, and R. P. Romero, "Surface Water Data at Los Alamos National Laboratory: 2005 Water Year," Los Alamos National Laboratory report LA-14239-PR (May 2006).