National Nuclear Security Administration
Sandia Site Office
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

AUG 26 2009

To Distribution:

Enclosed is a copy of the Calendar Year (CY) 2008 Annual Site Environmental Report for the U. S. Department of Energy (DOE), National Nuclear Security Administration (NNSA), Sandia National Laboratories/New Mexico (SNL/NM) for your use as appropriate. This report has recently been approved for public distribution.

The DOE NNSA Sandia Site Office is committed to presenting valid and accurate monitoring data. This report provides a summary of environmental monitoring information and compliance activities that occurred at SNL/NM for CY 2008. In addition, DOE views this document as a valuable tool for maintaining a dialogue with our community about the environmental health of this site. If there are any questions pertaining to the report, please contact me at (505) 845-6036 or Karen Agogino, of my staff, at (505) 845-6100 for assistance.

Sincerely,

Patty Wagner

Patty Wagner
Manager

Enclosure

SANDIA REPORT
SAND2009-4738P
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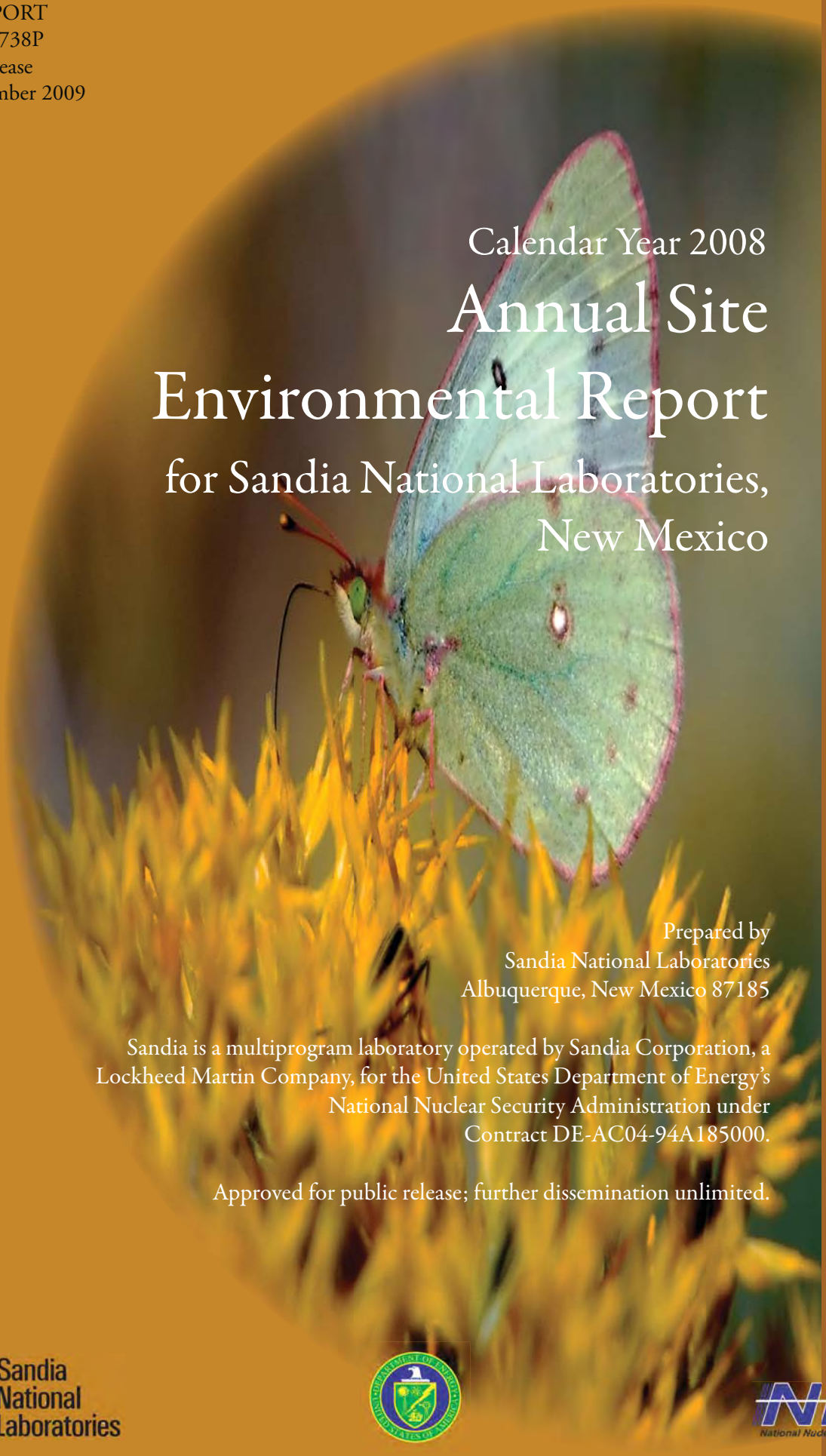

Calendar Year 2008

Annual Site Environmental Report

for Sandia National Laboratories, New Mexico

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94A185000.

Sandia National Laboratories

National Nuclear Security Administration

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Calendar Year 2008
Annual Site Environmental Report
Sandia National Laboratories, Albuquerque, New Mexico

Produced By:
Sandia National Laboratories
P.O. Box 5800
Albuquerque, New Mexico 87185-1042

ABSTRACT

Sandia National Laboratories, New Mexico (SNL/NM) is a government-owned/contractor-operated facility. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates the laboratory for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). The DOE/NNSA Sandia Site Office (SSO) administers the contract and oversees contractor operations at the site. This annual report summarizes data and the compliance status of Sandia Corporation's environmental protection and monitoring programs through December 31, 2008. Major environmental programs include air quality, water quality, groundwater protection, terrestrial surveillance, waste management, pollution prevention (P2), environmental restoration (ER), oil and chemical spill prevention, and implementation of the National Environmental Policy Act (NEPA). Environmental monitoring and surveillance programs are required by DOE Order 450.1A, *Environmental Protection Program* (DOE 2008) and DOE Manual 231.1-1A, *Environment, Safety, and Health Reporting* (DOE 2007).

Calendar Year 2008 Annual Site Environmental Report
Sandia National Laboratories, Albuquerque, New Mexico
Final Approval date: August 2009

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Prepared For:
U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA),
Sandia Site Office, Albuquerque, New Mexico

Prepared By:
Sandia Corporation, Albuquerque, New Mexico
ES&H and Emergency Management Center

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NOTE TO THE READER

The goal for SNL/NM Annual Site Environmental Report is to present summary environmental data regarding environmental performance, compliance with environmental standards and requirements, and to highlight significant facility programs. In addition, the U.S. Department of Energy views this document as a valuable tool for maintaining a dialogue with our community about the environmental health of this site.

We are striving to improve the quality of the contents as well as include information that is important to you. Please provide feedback, comments, or questions to:

U.S. Department of Energy
National Nuclear Security Administration
Sandia Site Office
P.O. Box 5400
Albuquerque, NM 87185-5400
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The SNL/NM Annual Site Environmental Report can be found at the following website:
http://www.sandia.gov/news/publications/environmental/index.html

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NOTE: Appendices are located on attached CD at the end of this report.

FIGURES

TABLES

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ACRONYMS AND ABBREVIATIONS

A	ABC/AQCB	Albuquerque-Bernalillo County/Air Quality Control Board
	ABCWUA	Albuquerque Bernalillo County Water Utility Authority
	ACRR	Annular Core Research Reactor
	ACE	Army Corps of Engineers
	AEA	Atomic Energy Act
	AFV	alternative fuel vehicles
	AHCF	Auxiliary Hot Cell Facility
	AIRFA	American Indian Religious Freedom Act
	ALARA	as low as reasonably achievable
	ALT	annual limits on intake
	AMPF	Advanced Manufacturing Prototype Facility
	AMPL	Advanced Manufacturing Process Laboratory
	ANOVA	Analysis of Variance
	APPDL	Advanced Pulse Power Development Laboratory
	AQC	Air Quality Compliance
	AOC	area of concern
	ARCOC	Analysis Request and Chain-of-Custody
	ARPA	Archaeological Resources Protection Act
	ASER	Annual Site Environmental Report
	AST	above-ground storage tank
	ATC	authority-to-construct
	AT&T	American Telephone and Telegraph Company
	AWN	Acid Waste Neutralization
B	BGS	below ground surface
	BMP	Best Management Practice
	BSG	Burn Site Groundwater
	BTU	British Thermal Units
	BV	Background Volume
C	C&D	Construction and Demolition
	CA	Compliance Agreement
	CAA	Clean Air Act
	CAAA	Clean Air Act Amendments
	CAC	Corrective Action Complete
	CAMU	Corrective Action Management Unit
	CAN	Clean Air Network
	CAP	Consolidated Audit Program
	CAP88	Clean Air Act Assessment Package-1988
	CARA	Concrete and Asphalt Recycling Area
	CCCL	Cleaning and Contamination Control Laboratory
	CEARP	Comprehensive Environmental Assessment and Response Program
	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
	CFCs	Chlorofluorocarbons
	CFR	Code of Federal Regulations
	CFRC	Customer Funded Records Center
	CINT	Center for Integrated Nanotechnologies
	CMS	Corrective Measures Study
	CMI	Corrective Measures Implementation
	COA	City of Albuquerque
	COC	Contaminants of Concern
	COD	Chemical Oxygen Demand
	COOC	Compliance Order on Consent
	CPMS	Criteria Pollutant Monitoring Station
	CPR	Corporate Process Requirements
	CPV	Compliance Plan Volume

	CRIO	Community Resources Information Office
	CWA	Clean Water Act
	CWL	Chemical Waste Landfill
	CWP	Corporate Work Process
	CY	Calendar Year
D	D&D	decontamination and demolition
	DCG	Derived Concentration Guide
	DESIGN	Design Engineering and Science Integration for Generating Neutrons
	DI	de-ionized
	DoD	U.S. Department of Defense
	DOE	U.S. Department of Energy
	DQO	data quality objective
	DSO	Disassembly Sanitization Operation
	DSS	Drain and Septic Systems
	DSSI	Diversified Scientific Services, Inc.
E	EA	Environmental Assessment
	ECF	Explosive Components Facility
	ECO	energy conservation opportunities
	EDE	effective dose equivalent
	EEANM	Environmental Education Association of New Mexico
	EFM	Ecological Footprint Model
	EID	Environmental Information Document
	EIS	Environmental Impact Statement
	EHD	Environmental Health Department
	EM	Environmental Management
	EMS	Environmental Management System
	EO	Executive Order
	EPA	U.S. Environmental Protection Agency
	EPEAT	Electronic Product Enviromental Assessment Tool
	EPCRA	Emergency Planning and Community Right-to-Know Act
	EPP	Environmentally Preferable Purchasing
	ER	Environmental Restoration
	ES&H	Environment, Safety, and Health
	ESA	Endangered Species Act
F		
	FEC	Federal Electronics Challenge
	FFCA	Federal Facilities Compliance Act
	FFCO	Federal Facility Compliance Order
	FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
	FLAME	Fire Laboratory used for the Authentication of Modeling and Experiments
	FONSI	finding of no significant impact
	FOP	field operating procedures
	FY	Fiscal Year
G	GEL	General Engineering Laboratories
	GIF	Gamma Irradiation Facility
	GPP	General Plant Projects
	GSA	General Services Administration
	GSF	Gross Square Footage
	GWPP	Groundwater Protection Program
	GWS	groundwater system
H	HAP	hazardous air pollutant
	HAZWOPER	Hazardous Waste Operations and Emergency Response
	HBWSF	High-Bay Waste Storage Facility

	HCECs	Hydrochlorofluorocarbons
	HCF	Hot Cell Facility
	HDRV	Historical Disposal Requests Validation
	HE	high explosives
	HF	hydrofluoric
	HERMES-III	High Energy Radiation Megavolt Electron Source-III
	HLW	high-level radioactive waste
	HPML	High Power Microwave Laboratory
	HSWA	Hazardous and Solid Waste Amendments
	HWB	Hazardous Waste Bureau
	HWMF	Hazardous Waste Management Facility
I	IC	Institutional Control
	ICM	Interim Corrective Measure
	IGPP	Institutional General Plant Projects
	ILMS	Integrated Laboratory Management System
	IPOC	International Programs Building, and the Innovation Parkway Office Center
	IRP	Installation Restoration Program
	ISMS	Integrated Safety Management System
	ISO	International Organization for Standardization
J	JCEL	Joint Computational Engineering Laboratory
	JIT	Just-In-Time
K	KAFB	Kirtland Air Force Base
	KTF	Kauai Test Facility
L	LANL	Los Alamos National Laboratory
	LCBS	Lurance Canyon Burn Site
	LDR	Land Disposal Restrictions
	LE	Landfill Excavation
	LECS	Liquid Effluent Control System
	LEED	Leadership in Energy and Environmental Design
	LEED-CI	LEED for Commercial Interiors
	LEED-EB	LEED for Existing Buildings: Operations and Maintenance
	LEED-NC	LEED New Construction and Major Renovations
	LLRI	Lovelace Respiratory Research Institute
	LLW	low-level waste
	LTES	Long-Term Environmental Stewardship
	LTS	Long-Term Stewardship
	LTTD	Low-Temperature Thermal Desorption
	LWDS	Liquid Waste Disposal System
M	MAC	maximum allowable concentration
	MAPEP	Mixed Analyte Performance Evaluation Program
	MBTA	Migratory Bird Treaty Act
	MCL	maximum contaminant level
	MDA	minimum detectable activities
	MDL	Micorelectronics Development Laboratory (Chapters 1, 5, 6)
	MDL	minimum detection limit (Chapters 4, 7)
	MEI	maximally exposed individual
	MESA	Microsystems and Engineering Sciences Application
	MicroFab	Microsystems Fabrication facility
	MicroLab	Microsystems Integration Laboratory
	MIPP	Medical Isotope Production Project
	MNA	monitored natural attenuation
	MOC	Management and Operating Contract

	MP	monitoring point
	mrem/yr	millirems per year
	MSB	Manzano Storage Bunkers
	MSDS	Material Safety Data Sheet
	MW	mixed waste
	MWL	Mixed Waste Landfill
N	N/A	not available or not applicable
	NAAQS	National Ambient Air Quality Standards
	NARAC	National Atmospheric Release Advisory Center
	NDWS	National Drinking Water Standard
	NELAC	National Environmental Laboratory Accreditation Conference
	NEPA	National Environmental Policy Act
	NESHAP	National Emission Standards for Hazardous Air Pollutants
	NFA	No Further Action
	NGF	Neutron Generator Facility
	NGPF	Neutron Generator Production Facility
	NHPA	National Historic Preservation Act
	NISAC	National Infrastructure Simulation and Analysis Center
	NMAC	New Mexico Administrative Code
	NMSA	New Mexico Statutes Annotated
	NMAAQS	New Mexico Ambient Air Quality Standards
	NMED	New Mexico Environment Department
	NMHWA	New Mexico Hazardous Waste Act
	NMWQCC	New Mexico Water Quality Control Commission
	NNSA	National Nuclear Security Administration
	NOD	Notice of Disapproval
	NON	Notification on Non-compliance
	NOV	Notice of Violation
	NPDES	National Pollutant Discharge Elimination System
	NPL	National Priorities List
	NPN	nitrate plus nitrite
	NRC	National Response Center (Chapter 6)
	NRC	U.S. Nuclear Regulatory Commission (Chapter 2)
	NSPS	New Source Performance Standards
	NSR	New Source Review
	NWS	National Weather Service
O	ODS	Ozone-depleting substance
	OEM	Original Equipment Manufacturer
	OR	Occurrence Reporting
	ORPS	Occurrence Reporting Processing System
P	P2	Pollution Prevention
	PA/SI	Preliminary Assessment/Site Inspection
	PCB	polychlorinated biphenyl
	PCCP/PA	Post-Closure Care Plan/Permit Application
	PDWS	Primary Drinking Water Standard
	PEP	Performance Evaluation Plan
	PER	Performance Evaluation Report
	PETL	Processing and Environmental Technology Laboratory
	PGWS	perched groundwater system
	pH	potential of Hydrogen
	PM	particulate matter
	PM_{10}	respirable particulate matter (diameter equal to or less than 10 microns)
	$PM_{2.5}$	respirable particulate matter (diameter equal to or less than 2.5 microns)
	POTW	Publicly-owned Treatment Works

	PPOA	Pollution Prevention Opportunity Assessment
	PQL	Practical quantitation limit
	PRD	Process Research Development
	PSL	Primary Subliner
	PVC	polyvinylchloride
Q	QA	quality assurance
	QAP	Quality Assurance Program
	QAPP	Quality Assurance Project Plan
	QC	quality control
	QNR	Qualified NEPA Reviewers
	QSAS	Quality Systems Analytical Services
R	RAP	Remedial Action Proposal
	RCRA	Resource Conservation and Recovery Act
	R&D	research and development
	RFP	Request for Proposals
	RHEPP	Repetitive High Energy Pulsed Power (an accelerator facility)
	RITS	Radiographic Integrated Test Stand
	RMMA	Radioactive Material Management Areas
	RMWMF	Radioactive and Mixed Waste Management Facility
	ROD	Record of Decision
	RPSD	Radiation Protection Sample Diagnostics
	RQ	reportable quantity
	RSI	Request for Supplemental Information
	RWNMDD	Radioactive Waste/Nuclear Material Disposition Department
S	Sandia	Sandia Corporation
	SAP	Sampling and Analysis Plan
	SARA	Superfund Amendments and Reauthorization Act
	SD	sustainable design
	SDWA	Safe Drinking Water Act
	SEIS	Supplement Environmental Impact Statement
	SER	Sandia Engineering Reactor
	SGWS	shallow groundwater system
	SHPO	State Historic Preservation Officer
	SIC	Standard Industrial Classification
	SMO	Sample Management Office
	SNL/CA	Sandia National Laboratories, California
	SNL/NM	Sandia National Laboratories, New Mexico
	SOP	Standard Operating Procedure
	SOW	statement of work
	SPEIS	Supplemental Programmatic Environmental Impact Statement
	SPCC	Spill Prevention Control and Countermeasures (plan)
	SPHINX	Short Pulse High Intensity Nanosecond X-Radiator (an accelerator facility)
	SSO	Sandia Site Operations
	ST	stabilization treatment
	START	Sandia Tomography and Radionuclide Transport Laboratory
	STP	Site Treatment Plan
	SURF	Sandia Underground Reactor Facility
	SUWCO	Sewer Use and Wastewater Control Ordinance
	SVOC	Semi Volatile Organic Compound
	SWEIS	Site-Wide Environmental Impact Statement
	SWMU	Solid Waste Management Unit
	SWP3	Storm Water Pollution Prevention Plan
	SWTF	Solid Waste Transfer Facility

T	TA	Technical Area
	TAG	Tijeras Arroyo Groundwater
	TAL	Target Analyte List
	TCE	trichloroethylene
	TCLP	toxicity characteristic leaching procedure
	TDS	total dissolved solids
	TESLA	Tera-Electron Volt Energy Superconducting Linear Accelerator
	TLD	Thermoluminescent Dosimeter
	TLV	threshold limit value
	TMDL	Total Maximum Daily Load
	TNMHC	total non-methane hydrocarbon
	TOC	Total Organic Carbon
	TOMP	Toxic Organic Management Plans
	TOP	Technology and Operations Prototype
	TOX	total halogenated organics
	TPH	Total Petroleum Hydrocarbons
	TRI	Toxic Release Inventory
	TRU	transuranic (radioactive waste)
	TSCA	Toxic Substances Control Act
	TSD	treatment, storage, and disposal
	TSP	total suspended particulate
	TSS	total suspended solids
	TTC	Thermal Test Complex
	TTF	Thermal Treatment Facility
	TTR	Tonopah Test Range
U	UAW	unaccounted for water
	UNM	University of New Mexico
	USAF	U.S. Air Force
	USDA	U.S. Department of Agriculture
	USFS	U.S. Forest Service
	USGBC	U.S Green Building Council
	USGS	U.S. Geological Survey
	UST	underground storage tank
V	VCA	Voluntary Corrective Action
	VCM	Voluntary Corrective Measure
	VCP	Voluntary Correction Plan
	VOC	volatile organic compound
	VSA	Vertical Sensor Array
	VZMS	Vadose Zone Monitoring System
W	WERC	a consortium for environmental education and technology development established through a cooperative agreement with DOE
	WFO	work for others
	WIF	Weapons Integration Facility
	WIPP	Waste Isolation Pilot Plant
	WQG	Water Quality Group
Z	Z-Machine	Z Accelerator

UNITS OF MEASURE

bgs	below ground surface
°C	degrees Celsius
cm	centimeter
°F	degrees Fahrenheit
fasl	feet above sea level
ft	feet
g	gram
gal	gallon
gpcd	gallons per capita per day
kg	kilogram
km	kilometer
kW	kilowatt
L	liter
lb	pound
mb	millibar
m/s	miles per second
mg	milligram
mm	million
mph	miles per hour
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
scf	standard cubic feet
tpy	tons per year
yr	year

RADIOACTIVITY MEASUREMENTS

rem	roentgen equivalent man	Sv	Sievert
mrem	millirem (unit of radiation dose)	Ci	curie
person-Sv	person-Sievert (unit of radiation dosage)	pCi	picocurie
person-rem	radiation dose to population (also man-rem)	µg	microgram
mSv	millisievert (unit of radiation dosage)	mR	milliroentgen
µR/hr	microroentgen per hour	Std Dev	standard deviation

APPROXIMATE CONVERSION FACTORS FOR SELECTED SI (METRIC) UNITS

Multiply SI (Metric) Unit	By	To Obtain U.S. Customary Unit
Cubic meters (m^3)	35.32	Cubic feet (ft^3)
Centimeters (cm)	0.39	Inches (in.)
Meters (m)	3.28	Feet (ft)
Kilometers (km)	0.61	Miles (mi)
Square kilometers (km^2)	0.39	Square miles (mi^2)
Hectares (ha)	2.47	Acres
Liters (L)	0.26	Gallons (gal)
Grams (g)	0.035	Ounces (oz)
Kilograms (kg)	2.20	Pounds (lb)
Micrograms per gram (mg/g)	1	Parts per million (ppm)
Milligrams per liter (mg/L)	1	Parts per million (ppm)
Celsius (°C)	9/5 °C+ 32=°F	Fahrenheit (°F)
Sievert (Sv)	100	roentgen equivalent man (rem)

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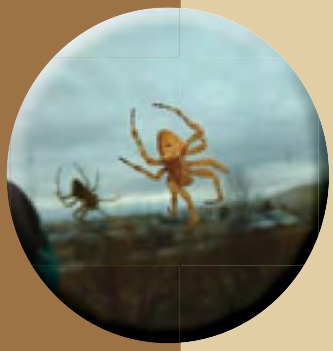
Executive Summary

This chapter includes an overview of the environmental programs at Sandia National Labs, New Mexico.

The programs mentioned in the Executive Summary are covered in more detail in the other chapters in this Annual Site Environmental Report (ASER).



Sandia National Laboratories, New Mexico (SNL/NM) is one of the nation's premier multi-program national security laboratories. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin (LM) Corporation, manages and operates the laboratory for the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA). The DOE/NNSA Sandia Site Office (SSO) administers the contract and oversees contractor operations at the site. This Annual Site Environmental Report (ASER) was prepared in accordance with and as required by DOE Order 450.1A Environmental Protection Program (DOE 2008) and DOE Manual 231.1-1A, Environment, Safety, and Health Reporting (DOE 2007). This ASER summarizes the environmental protection, restoration, and monitoring programs in place at SNL/NM for Calendar Year (CY) 2008. It also discusses Sandia's compliance with environmental statutes, regulations, DOE Directives and permit provisions, and it highlights significant environmental program efforts and accomplishments. This ASER is a key component of DOE's effort to keep the public informed about environmental conditions throughout the DOE/NNSA nuclear weapons complex.

Environmental Programs

Sandia's methodology for managing and implementing its Environment, Safety, and Health (ES&H) Program is outlined in the Integrated Safety Management System (ISMS). The ISMS is centered upon five safety management functions that provide processes to guide management in identifying and controlling hazards. Furthermore, Sandia implemented an Environmental Management System (EMS) to enhance the ISMS. The EMS is the component of ISMS that addresses the environmental aspects and impacts of SNL/NM's activities, products, and services. In 2008, SNL/NM continued to improve environmental management by utilizing best management practices (BMPs), benchmarking, and process improvements. Further information about EMS and ISMS can be found in Chapters 3 and 8.

In December 2005, Sandia informed the DOE/NNSA/SSO that it had fully implemented its EMS in accordance with the requirements outlined in DOE Order 450.1A. Thus, the EMS fully serves as Sandia's proactive approach to managing environmental risks and protecting the environment.

While all 2008 program activities are performed continuously, they are reported in this ASER on a calendar year basis, unless otherwise noted (programs based on the Fiscal Year [FY] run from October 1st through September 30th, annually). A summary of the primary environmental programs in place at SNL/NM are summarized in the following sections.

Waste Management and Pollution Prevention (P2)

Waste at SNL/NM is processed at five facilities: the Hazardous Waste Management Facility (HWMF), the Thermal Treatment Facility (TTF), the Radioactive and Mixed Waste Management Facility (RMWMF), the Manzano Storage Bunkers (MSB), and the Solid Waste Transfer Facility (SWTF). In addition, the Reapplication Services Yard processes material and equipment for recycling, after it is determined that it cannot be reapplied or sent for auction.

The P2 program provides assessment, guidance and assistance to the line to implement measures that reduce resource use and generated waste and to enhance the overall efficiency of processes and organizations within SNL/NM. Additionally, the P2 Program works with several of the above facilities to continue or initiate new recycle avenues for waste. In 2008, SNL/NM received several awards for P2 accomplishments (see section 3.5.2).

Environmental Restoration (ER) Project

The ER Project collects groundwater samples at five general project areas: the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), Technical Area (TA)-V, Tijeras Arroyo Groundwater (TAG), and Burn Site Groundwater (BSG). Water quality results reported by the ER Project were consistent with past years' results.

At the close of CY 2008, there were 33 regulated ER sites remaining to be completed at SNL/NM; 28 sites were granted final regulatory approval for a Class III Permit modification by the New Mexico Environment Department (NMED). Of the 33 remaining sites, 31 have received Corrective Action Complete (CAC) determinations from NMED. These 31 sites are currently in the public comment process with Class III Permit modifications anticipated in 2010. The two remaining sites consist of the CWL, which is on a separate regulatory path requiring a stand-alone permit, and the MWL where the final remedy (soil cover) will be completed during 2009. Final remedies are pending for three groundwater Areas of Concern (AOCs) – TA-V, TAG, and BSG.

Long-Term Environmental Stewardship (LTES)

The SNL/NM LTES Program provides environmental stewardship for past, present, and future activities at SNL/NM. LTES "*promotes the long-term stewardship of a site's natural and cultural resources throughout its*

operational, closure, and post-closure life cycle." (DOE/SNL 2006). The environmental programs referred to in this document support that stewardship.

Long-Term Stewardship (LTS)

A major component of the LTES Program is LTS of legacy sites. Stewardship of legacy sites is defined as activities necessary to maintain long-term protection of human health, the environment, and natural and cultural resources from hazards associated with residual radioactive and hazardous contamination at former ER sites. Sandia's LTS activities are increasing as remedial activities required by ER sites are completed. The LTS Program conducts compliance oversight activities, including long-term monitoring, to comply with NMED's requirements. A monitoring well network of more than 50 wells is sampled for presence of constituents of concern at various intervals during the year. The data from this sampling activity are evaluated on an ongoing basis and kept in a comprehensive database. The groundwater wells were initially installed for the ER Project, but are now maintained and sampled under the LTS Program (see Chapter 7.0). The LTS Program also conducts institutional control and community outreach to keep the public informed of the LTS Program activities (see Section 3.3). Compliance Oversight Activities, Institutional Control (IC) Activities and Community Liaison and Stakeholder Involvement Activities for 2008 are summarized in Section 3.3. Additional information can be obtained on the Long-Term Stewardship website:

http://ltes.sandia.gov/

Terrestrial Surveillance

The terrestrial surveillance sampling objectives are conducted to detect any potential releases or migration of contaminated material to off-site locations. Soil, sediment, and vegetation are collected from on-site, perimeter, and off-site locations (community locations outside Kirtland Air Force Base [KAFB] boundaries). In 2008, there were no terrestrial sample results indicating concerns that further investigation or corrective action was warranted.

In addition to routine sampling at all planned locations for non-radiological parameters, a special sampling campaign and summary report of non-radiological results was prepared for several locations on the Thunder Range Complex. These results serve as a baseline for future reference regarding non-radiological results in nearby soils. Furthermore, in the future, routine sampling for non-radiological parameters at fixed locations will be reduced, and more emphasis will be placed on sampling specific areas of interest with potential environmental impact. The total number of samples collected annually, however, should remain approximately the same.

Water Quality

Wastewater – Wastewater from SNL/NM is discharged from six on-site outfalls permitted by the Albuquerque Bernalillo County Water Utility Authority (ABCWUA). Wastewater monitoring is conducted to ensure that all discharges meet the standards set by the ABCWUA's publicly owned treatment works (POTW). During CY 2008 there were no reportable events, and all discharge parameters were met; this resulted in SNL/NM receiving six "Gold Pre-Treatment Awards" from the ABCWUA for the 2007-2008 treatment year.

Wastewater / Surface Discharge – All water that will be discharged to the ground surface, either directly or to lined containments, must meet State of New Mexico surface discharge standards. There were 33 internal requests made for individual discharges to the surface in 2008. All requests met the NMED / New Mexico Water Quality Control Commission (NMWQCC) standards, and were approved by Sandia. Additionally, routine surface discharges are made to two evaporation lagoons that service the Pulsed Power Facility under an existing discharge permit. During CY 2008, all permit requirements for both lagoons were met, however, there were two unplanned surface releases reported to NMED. These reportable releases are documented in Sections 2.2.2 and 6.2.2 of this report.

Storm Water Runoff – In CY 2008, the only analytical monitoring that was required under SNL/NM's National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit (MSGP) for Storm Water Discharges Associated with Industrial Activities (Multi-Sector General) was for an annual fecal coliform analysis required by the State of New Mexico. A fecal coliform sample was collected in October 2008 at SNL/NM's primary outfall to Tijeras Arroyo. The lab reported a positive result for fecal coliform. The current NPDES permit requires that quarterly analytical sampling be conducted in the second and fourth year of the five-year permit, weather permitting. FY 2004 was the fourth year of the permit, and the last year that analytical monitoring was required. The permit also requires that visual observations be performed every quarter, weather permitting. One visual observation of storm water was performed due to the lack of adequate runoff during normal business hours.

MSGP 2000 was issued for a five-year term, and was administratively extended by the U.S. Environmental Protection Agency (EPA) until eligible for coverage under the new MSGP issued September 29, 2008. The existing SWPPP was updated to comply with the new MSGP requirements to include adding new storm water monitoring points. The 2003 EPA Construction General Permit (CGP) expired on July 1, 2008 and EPA issued a two-year permit that became effective on June 30, 2008.

Oil Storage and Spill Control – A Spill Prevention Control and Countermeasures (SPCC) Plan is required under the Clean Water Act (CWA). Sandia's SPCC Plan describes the oil storage facilities and the mitigation controls in place to prevent inadvertent discharges of oil. The facilities at SNL/NM that are subject to regulations include oil storage tanks (aboveground storage tanks [ASTs] and underground storage tanks [USTs]), bulk storage areas (multiple containers), and temporary or portable tanks. SNL/NM currently operates 51 ASTs and five USTs.

Groundwater Protection

The Groundwater Protection Program (GWPP) conducts general surveillance of water quality from a network of wells not directly associated with ER Project sites. Annual sampling was conducted from 14 wells and one spring. Analyses were conducted for metals, volatile organic compounds (VOCs), inorganics (including nitrate and cyanide), phenolics, alkalinity, total halogenated organics (TOXs), gross alpha, gross beta, and selected radionuclides. Groundwater samples in six wells (CTF-MW2 & 3, SFR-2S, SWTA3-MW3 & 4, and TRE-1) were analyzed for high explosives (HE). The designated wells are used to establish background concentrations of HE at the Dynamic Explosives Test Site east and south of TA-III and to monitor potential groundwater impacts from explosive testing. The HE compound, RDX, was detected in the sample from CTF-MW2 at a concentration of 0.183 µg/L. This value is below the reporting limit. Naturally occurring fluoride concentrations in excess of the NMWQCC standard of 1.6 milligrams per liter (mg/L) were detected in five monitoring wells and Coyote Springs. None of the wells exceeded the National Drinking Water Standard (NDWS) of 4 mg/L. A beryllium concentration of 7.21 µg/L in the Coyote Springs sample exceeded the EPA Primary Drinking Water Standard (PDWS) maximum contaminant level (MCL) of 4.0 µg/L. Elevated beryllium levels have been consistently detected at similar levels in the springs and is believed to be of natural origin. Arsenic concentrations in groundwater samples from CTF-MW2 exceeded the MCL of 0.010 mg/L and are also assumed to be of natural origin. Groundwater samples from four wells had corrected gross alpha activities that exceeded the 15 picocuries per liter (pCi/L) MCL.

ER – The ER Project collects groundwater samples at five general project areas: the CWL, the MWL, TA-V, TAG, and BSG. Water quality results reported by the ER Project were consistent with results from past years. For the samples from the CYN-MW6 well, located at the Burn Site, the perchlorate concentration was above the 4 µg/L action level. The highest value was 7.25 µg/L. No maximum concentration limit or maximum allowable concentration currently exists for perchlorate. All quarterly perchlorate reports were submitted in accordance with the Compliance Order of Consent (COOC).

Air Quality

Ambient Air Monitoring – Sandia measures ambient air quality at six locations throughout SNL/NM, and compares results with National Ambient Air Quality Standards (NAAQS) and local ambient air regulations. The network monitors criteria pollutants and Volatile Organic Compounds (VOCs).

Air Quality Compliance (AQC) – Air quality standards are implemented by regulations promulgated by local and federal governments in accordance with the Clean Air Act (CAA) and the CAA Amendments (CAAA) of 1990. The Albuquerque Bernalillo County Air Quality Control Board (ABC/AQCB), the State of New Mexico and the EPA determine applicable air quality standards for non-radiological pollutants.

The AQC program currently maintains 15 issued authority-to-construct (ATC) New Source Review (NSR) permits; and ten issued NSR registrations from the City of Albuquerque (COA). Currently, there is one ATC NSR permit and 4 NSR source registrations pending issuance with the COA.

Radiological National Emission Standards Hazardous Air Pollutants (NESHAP) Compliance – Subpart H of NESHAP regulates radionuclide air emissions from DOE/NNSA facilities, with the exception of naturally occurring radon. In 2008, there were 15 SNL/NM facilities reporting NESHAP regulated emissions. Of these 15 sources, 14 were point sources and one a diffuse source. In 2008, the primary radionuclides released were tritium and argon-41. In 2008, the on-site maximally exposed individual (MEI) was located on KAFB. The on-site MEI dose of 2.25E-03 millirems per year (mrem/yr) at the Honeywell Systems Support Site resulted primarily from releases

of tritium and increased operations at the Neutron Generator Facility (NGF) in TA-I. The off-site MEI was located at the Eubank Gate Area. The MEI of 2.29E-03 mrem/yr at the Eubank Gate Area resulted also primarily from releases of tritium from the NGF in TA-I. Both doses are well below the 10 mrem/yr EPA standard.

National Environmental Policy Act (NEPA) Activities

The Site-Wide Environmental Impact Statement (SWEIS) update process continued to undergo revision during CY 2008 to better track and evaluate environmental operational limits at both the facility and site level.

The NEPA Team participated in the completion of the following environmental documents:

(1) the *Final Environmental Assessment for the Expansion of Permitted Land and Operations at the 9940 Complex and Thunder Range at SNL/NM (DOE/EA-1603)* (DOE 2008a);

(2) the *Final Complex Transformation Supplemental Programmatic Environmental Impact Statement (Complex Transformation SPEIS)* (DOE/EIS-0236-S4F) (DOE 2008b), for Operations Involving Plutonium, Uranium, and the Assembly and Disassembly of Nuclear Weapons, and for Tritium Research and Development, Flight Test Operations, and Major Environmental Test Facilities;

(3) an *Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for the Hawaii Range Complex (HRC), Hawaii* (DoD 2008);

(4) a draft SAND report for SNL/NM Existing Environmental Analyses Bounding Environmental Test Facilities; and

(5) two white papers on facility upgrades, one for Red Storm scientific computing, and the other for Center for Integrated Nanotechnologies (CINT) biological nanomaterials laboratories.

The NEPA Team reviewed a total of 1,587 proposed projects in the ISMS NEPA module and other corporate applications. In 2008, 70 NEPA checklists were transmitted to the DOE/NNSA/SSO for review and determination.

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1.0 Introduction

This chapter introduces the reader to Sandia Corporation's History, Mission, and Operations Contract for Sandia National Laboratories, New Mexico (SNL/NM). An overview of the site includes:

- Environmental Safety and Health, and Environmental Management
- Regional Characteristics including topography, geology, water, climate, ecology and site maps.
- Summary of SNL/NM's Ecological Footprint

This Annual Site Environmental Report (ASER) is prepared in accordance with the requirements set forth for all large U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) facilities, which includes Sandia National Laboratories, Albuquerque, New Mexico (SNL/NM). This ASER describes the environmental protection programs currently in place at SNL/NM. The report is made available to the general public in printed and electronic media.

1.1 SANDIA CORPORATION'S (SANDIA) HISTORY AND MISSION

Sandia, a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates the laboratory for the DOE/NNSA. DOE/NNSA Sandia Site Office (SSO) administers the contract and oversees contractor operations at the site. Sandia has developed technologies for nuclear weapons, nonproliferation, homeland security, energy and infrastructure, defense systems and assessments, and research and development (R&D) programs to support all national security missions.

1.1.1 History

SNL/NM began operations in 1945 as Z Division, the ordnance design, testing, and assembly arm of Los Alamos National Laboratory., NM The division moved to Sandia Base (now merged into the Kirtland Air Force Base [KAFB]) on the perimeter of the City of Albuquerque (COA), to be near an airfield and to work closely with the military. Due to its growth, Z Division became a separate branch of Los Alamos in 1948, and was renamed "Sandia Laboratory." On November 1, 1949, Sandia, a wholly owned subsidiary of Western Electric, began managing SNL/NM. In 1979, Congress recognized the facility as a national laboratory. In 1993, Sandia became a wholly owned subsidiary of Martin Marietta, now Lockheed Martin Corporation.

1.1.2 Mission

Sandia's enduring mission is to provide science and engineering support for the nation's nuclear weapons stockpile. Today, that mission has grown to include other critical aspects of national security such as preventing the spread of nuclear, chemical, and biological weapons; developing technologies and strategies for responding to emerging threats such as terrorism; and protecting and preventing the disruption of critical infrastructures such as the nation's energy supply and financial networks. Sandia also collaborates with representatives from the industrial sector, universities, and other government agencies to develop and commercialize new technologies. Information about recent technologies developed at SNL/NM can be found at this web site:

http://www.sandia.gov/LabNews

1.1.3 Sandia's Operations Contract

Sandia, like all regulated industries, complies with specific environmental regulations used by local, state, and federal agencies. The Management and Operating Contract (MOC) between Sandia and the DOE defines the primary contractual obligations for operating SNL/NM. This contract also drives Sandia's Environmental Safety and Health (ES&H) standards and requirements.

The MOC states that Sandia must comply with DOE directives that establish specific requirements for environmental programs. The six primary DOE directives currently on the contract baseline that pertain to environmental protection and management, starting with the most recent, are listed below:

- DOE Order 450.1A, Environmental Protection Program (DOE 2008).
- DOE Manual 231.1-1A, Environment, Safety, and Health Reporting (DOE 2007).
- DOE Manual 231.1-2, Occurrence Reporting and Processing of Operations Information (DOE 2003).
- DOE Order 435.1, Chg 1, Radioactive Waste Management (DOE 2001).
- DOE Order 5400.5, Chg 2, Radiation Protection of the Public and the Environment (DOE 1993).
- SEN-22-90, DOE Policy on Signatures of RCRA Permit Applications (DOE 1990).

1.2 SNL/NM'S SITE LOCATION AND CHARACTERISTICS

1.2.1 General Site Characteristics

KAFB is a 51,559 acre military installation that includes 20,486 acres withdrawn from the Cibola National Forest through an agreement with the U.S. Forest Service (USFS). Located at the foot of the Manzanita Mountains, it has a mean elevation of 5,384 feet and a maximum elevation of 7,986 feet. KAFB is

host to more than 150 tenant groups, with over 27,000 vehicles (mostly single occupancy) passing through its secured check points each week day (based on data from 2002). Estimated number of vehicles entering KAFB is shown below:

Gate	Estimated Number of Cars per Day
Eubank	10,000
Wyoming	8,250
Gibson	7,500
Carlisle	500
Truman	500
South Gate	250
DAILY TOTAL	**27,000**
YEARLY TOTAL	**6,615,000**

The total area of DOE/NNSA owned property dedicated to SNL/NM facilities and operations is 8,685 acres. Sandia conducts operations within 2,841 acres of that land. An additional 5,817 acres in remote areas are owned by DOE/NNSA. An additional 9,000 acres serve as a buffer zone near the southwest boundary of KAFB. This buffer zone, leased from the State of New Mexico and Isleta Pueblo, provides margins of safety and sound buffers for SNL/NM testing activities.

Borders

KAFB and SNL/NM are located adjacent to the COA, which borders KAFB on its north, northeast, west, and southwest boundaries. The Albuquerque International Sunport (airport) and Mesa del Sol, an emerging 12,500 acre mixed-use urban development, are just beyond the base's western borders, as is the Rio Grande. The development's master plan projects that the community will ultimately reach 90,000 residents. To date, several business and industrial facilities have been completed, however, no residential development has begun.

Mountains on the east and plains on the west create a diverse range of geological, hydrological, climatic, and ecological settings, and are further detailed in this chapter.

Areas within Borders

SNL/NM consists of five secured technical areas (TAs), buildings in non-secured areas, and several remote testing areas. These test areas are collectively known as the Coyote Test Field and are located in the canyons on the west side of the Manzano Mountains. The Burn Site is located in the northeast region of KAFB and the Thermal Test Complex (TTC) is located within TA-III. The Solar Tower, southeast of TA-III, provides the campus with a portion of its electricity needs. See Figure 1-1 for an illustration of the area.

1.2.2 Technical Areas (TAs)

In 2008, SNL/NM conducted operations on 5,817 acres of DOE/NNSA property, and 2,841 acres of Sandia property, yielding a total of 8,685 acres of landholdings. The site housed 9,530 staff who operated in approximately 5.4 million gross square feet of on-site building space, and an additional 300,000 gross square feet of off-site building space leased by SNL/NM. Most operations are within five TAs (TA-I,-II,-III,-IV, and -V see Figure 1-1).

TA-I

TA-I is the focus of SNL/NM's operations and houses the main administrative center and a close grouping of laboratories and offices. A majority of activities performed in TA-I are dedicated to design, R&D of weapon systems, the limited production of weapon systems components, and energy research programs. Facilities in TA-I include the main technical library, several assembly/manufacturing areas, the Steam Plant, and various laboratories such as the Advanced Manufacturing Processes Laboratory (AMPL), the Neutron Generator Production Facility (NGPF), the Processing and Environmental Technology Laboratory (PETL), the Joint Computational Engineering Laboratory (JCEL), and the Microsystems and Engineering Sciences Applications (MESA) Complex. The MESA Complex consists of the MESA Microelectronics Development Lab, the MESA Office and Light Lab, the Microsystems Fabrication facility (MicroFab), the Microsystems Integration Laboratory (MicroLab), and the Weapons Integration Facility (WIF). The MESA Complex provides the systems designers, component designers, processes, and equipment to design and prototype qualified microsystem-based components for maintaining a national nuclear deterrent.

TA-II

TA-II includes facilities and lands south of the TA-I boundary at Hardin Boulevard and extends to the northern boundary of TA-IV. The Explosive Components Facility (ECF), the Hazardous Waste Management Facility (HWMF), the Facilities Command Center, the Solid Waste Transfer Facility (SWTF), the Construction and Demolition (C&D) Recycle Center, and the National Infrastructure Simulation & Analysis Center (NISAC) are all within TA-II.

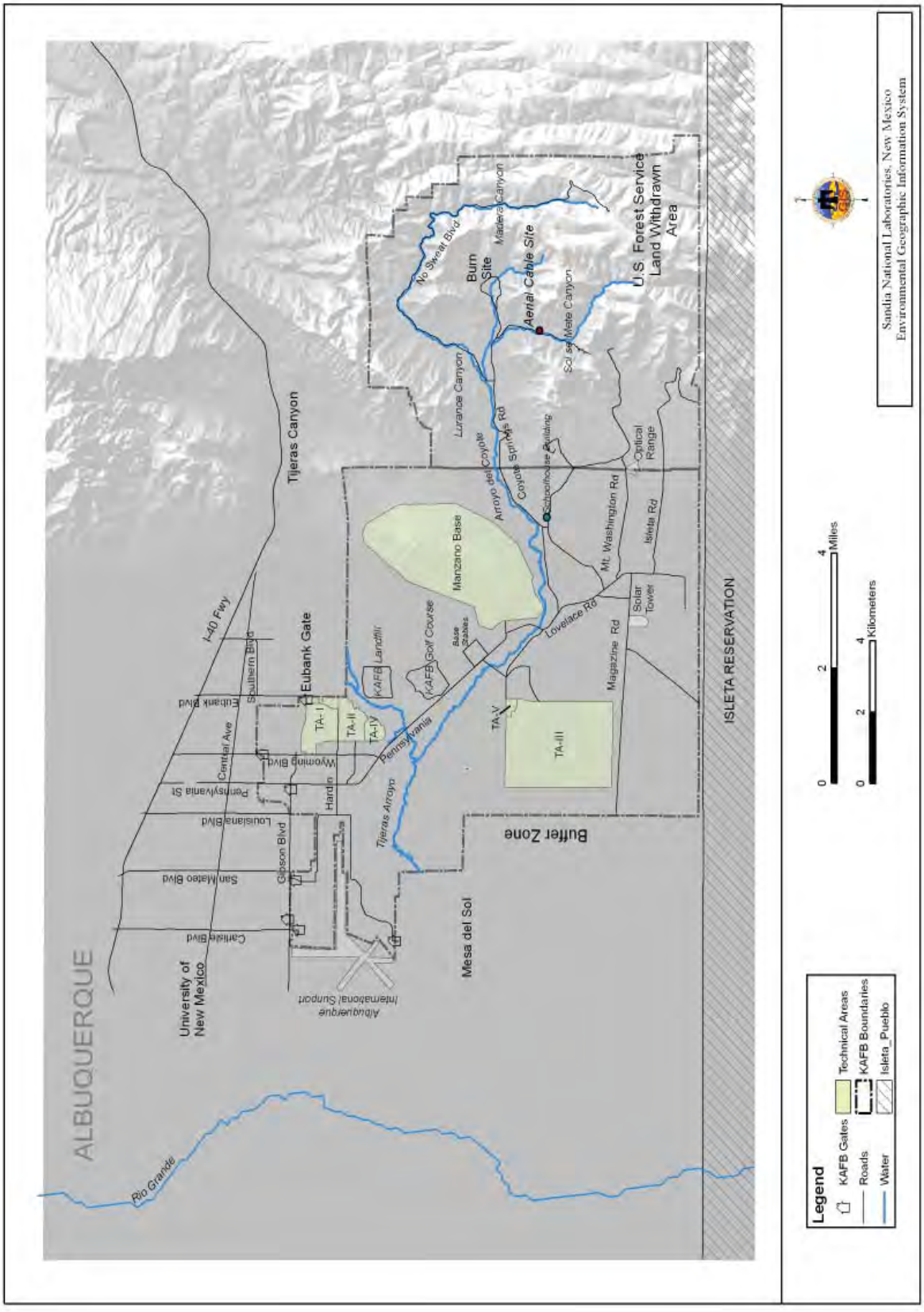


FIGURE 1-1. SNL/NM Technical Areas and the U.S. Forest Service Land Withdrawn Area

TA-III

TA-III is the largest and most remote area of all the TAs ,and is characterized by facilities separated by extensive undeveloped areas. TA-III is used to accommodate large-scale engineering test activities requiring large safety and/or security area buffers such as collision testing sled tracks, centrifuges, and the TTC. Other facilities include the Radioactive and Mixed Waste Management Facility (RMWMF), the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), and the Corrective Action Management Unit (CAMU).

TA-IV

TA-IV, located south of TA-II, houses facilities used to conduct R&D activities in inertial-confinement fusion, pulsed power, and nuclear particle acceleration. Accelerators located in TA-IV include the Z Accelerator (Z-Machine), the Advanced Pulsed Power Research Module, the Radiographic Integrated Test Stand (RITS), the Tera Electron Volt Energy Superconducting Linear Accelerator (TESLA), the High Energy Radiation Megavolt Electron Source III (HERMES-III), the Saturn Accelerator, the Repetitive High Energy Pulsed Power I (RHEPP I) Accelerator, the High Power Microwave Laboratory (HPML), and the Short-Pulse High Intensity Nanosecond X Radiator (SPHINX).

TA-V

TA-V, located adjacent to the northeast corner of TA-III, includes facilities that routinely handle radioactive materials used in experimental R&D programs. TA-V houses the Gamma Irradiation Facility (GIF), the Annular Core Research Reactor (ACRR), the Hot Cell Facility (HCF), and the Auxiliary Hot Cell Facility (AHCF).

1.2.3 Other Facilities

Remote Test Areas

Several remote test areas are located east and southeast of TA-III and within the canyons and foothills of the U.S. Forest Service (USFS) withdrawn area (Arroyo del Coyote, and Lurance, Madera, and Sol se Mete Canyons). These areas are used for explosive ordnance testing, rocket firing experiments, and open burn thermal tests.

Facilities Outside of KAFB's Boundaries

Some of the facilities utilized by SNL/NM personnel, are outside the boundaries of KAFB. The Center for Integrated Nanotechnologies (CINT), the MESA Technology and Operations Prototype (TOP), the International Programs Building, the Innovation Parkway Office Center (IPOC), and the new National Museum of Nuclear Science & History are all located on Eubank Boulevard SE (within a mile of KAFB). There are any other small-scale, off-site SNL/NM projects including the Advanced Materials Laboratory (AML) at the University of New Mexico (UNM).

1.3 ES&H AT SNL/NM

Sandia's ES&H Program has grown and progressed, as detailed in the ES&H Manual (SNL 2009b), a dynamic online resource available to all Sandia personnel. The manual clearly describes ES&H requirements for conducting all levels of work at SNL/NM.

http://www.sandia.gov/esh-manuals/mn471001/m001toc.htm

Improved waste management practices have been implemented, and state-of-the-art waste handling facilities have been constructed to handle and properly dispose of hazardous, radioactive, and solid waste. Waste minimization and recycling practices have been very successful in reducing SNL/NM's environmental impact. Several audits have been conducted in recent years by the U.S. Environmental Protection Agency (EPA), various DOE/NNSA offices, COA, the ABCWUA, and the State of New Mexico. The results of these audits, as well as SNL/NM internal audits, support Sandia's ongoing commitment to ES&H practices at SNL/NM.

Implementing ES&H

Sandia's strategy for managing and implementing its ES&H Program is described by the Integrated Safety Management System (ISMS) which is structured around five safety-based management functions:

(1) Plan the work,

(2) Analyze the work hazards,

(3) Control those hazards,

(4) Perform the work, and

(5) Get feedback and make improvements.

The ISMS provides processes that guide line management to identify and control hazards. For further information on audits and appraisals, refer to Section 2.3.

Environmental Management Programs

As part of its mission, Sandia addresses ES&H issues through its environmental management (EM) programs. EM programs include waste management, pollution prevention (P2), environmental restoration

(ER), long-term environmental stewardship (LTES), terrestrial surveillance, water quality (surface and waste water), oil storage, spill prevention, groundwater, air quality, National Environmental Policy Act (NEPA), chemical inventory management, and quality assurance (QA).

Environmental Management System
Sandia strives to be a leader in environmental stewardship through the implementation of an Environmental Management System (EMS). P2 goals were added to strengthen the EMS and reduce the environmental impacts of work performed at SNL/NM. The EMS is utilized to plan, review, execute, and improve work processes, with the intent of improving upon the environmental elements in the ISMS. ES&H considerations are incorporated into each element of all work processes conducted by Sandia. For additional information on the EMS, refer to Section 3.1.

1.3.1 Managing a Legacy of Contamination

SNL/NM was ranked as one of the least contaminated DOE facilities. Corrective action is complete at all but 4 of 265 ER sites, based on determinations by the New Mexico Environmental Department (NMED). Permit modifications for 31 of the completed sites are awaiting NMED approval. Corrective action will not be completed at three of the remaining four sites until test operations are completed. In December 2008, NMED granted approval of the Corrective Measures Implementation Plan for the remaining site, the Mixed Waste Landfill (MWL). Final corrective action is expected to be completed in 2009.

Some sites require long-term monitoring to ensure that any residual contamination does not migrate from the site. Detailed information about EM cleanup efforts throughout DOE can be found at DOE's website, and at Sandia's LTES website:

http://www.em.doe.gov/pages/emhome.aspx
http://www.sandia.gov/ltes

1.4 REGIONAL CHARACTERISTICS

SNL/NM is set in a high desert region in central NM. The adjacent land areas are the most densely populated area in New Mexico. Refer to Figure 1-1 and 1-2 for illustrations of the regions described below.

1.4.1 Regional Topography and Layout

KAFB has a widely varied topography, ranging from rugged mountains on the east to flat plains on the west. The maximum elevation of 7,986 ft. occurs on the eastern edges of KAFB, which includes 20,486 acres withdrawn from the Cibola National Forest (through an agreement with the USFS).

The mean elevation of 5,384 feet (ft) is typical of the remainder of KAFB, which is situated on gently west-sloping foothills that grades into wide, flat areas; this topology is where the majority of SNL/NM facilities are situated.

The Mountains
The most spectacular topographic feature in the Albuquerque region is the Sandia Mountains, which form an impressive backdrop to the east of the COA and KAFB. The Sandias form a 13-mile long escarpment distinguished by steep cliffs, pinnacles, and narrow canyons; the tallest point is Sandia Crest at 10,678 ft. At sunset, the mountains are often bathed briefly in a pinkish glow, which is how the Sandias got their name ("sandia" is Spanish for "watermelon").

The Sandia Mountains are divided from the Manzanita and Manzano Mountains (to the south) by Tijeras Canyon, which is traversed by Interstate 40. KAFB is located a few miles south of I-40 (see Figure 1-1).

Tijeras Arroyo
At approximately ¾ of a mile wide, Tijeras Arroyo is a significant topographic feature that cuts diagonally northeast to southwest across KAFB. The watershed drained by Tijeras Arroyo includes the southern Sandia Mountains, the Manzanita Mountains, and the north end of the Manzano Mountains. The arroyo is normally dry except during heavy downpours, which can cause significant flash floods. The arroyo originates in Tijeras Canyon and runs coincident with the Tijeras Fault for several miles before deviating to the southwest, where it discharges to the Rio Grande about eight miles from the west boundary of KAFB.

Rio Grande
The Rio Grande flows to the west of the KAFB's boundaries. A new water treatment plant was recently completed which includes 40 miles of new pipeline.

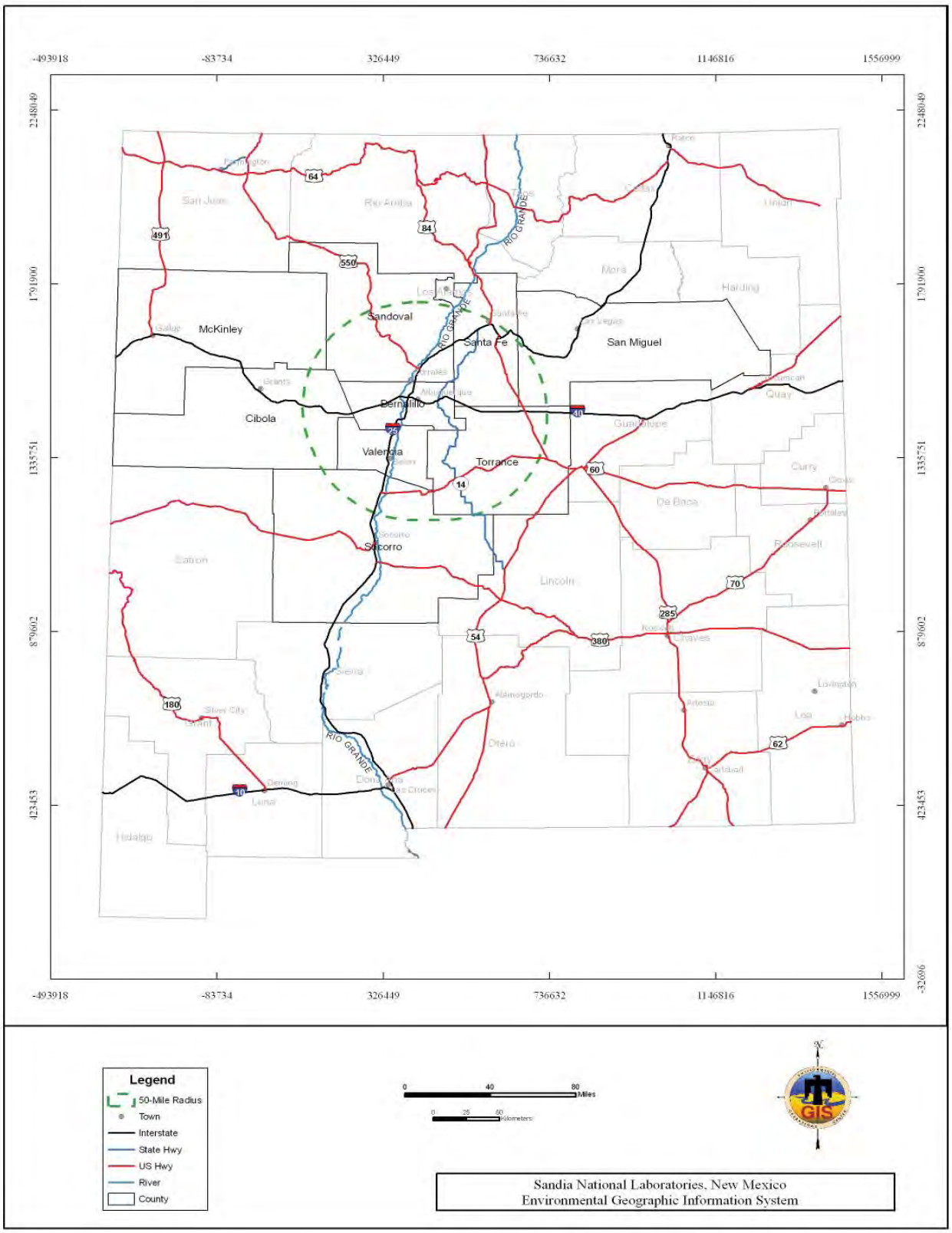


FIGURE 1-2. State of New Mexico Map

The overlay shows major roads, cities, and county lines.

The dashed circle encompasses the 50-mile radius from SNL/NM facilities.

Water testing for the San Juan Chama Drinking Water Project was completed by the Water Utility Authority and water from the new water treatment plant began flowing to customers in December 2008 (refer to the Albuquerque Bernalillo County Water utility Authority website).

http://www.abcwua.org.

1.4.2 Population

New Mexico (NM) is the fifth largest state in the U.S. comprising 121,000 square miles. The 2007 population estimate for NM is just under two million (1,969,915 – nearly a nine percent increase since the 2000 census); the US Census projects 2,099,709 by 2030. The largest city in NM is Albuquerque with about half a million metro-area residents; other neighboring metro areas, including the City of Rio Rancho, raise that total to over 700,000 residents.

The population within an 80-kilometer/ 50 mile radius of SNL/NM is over 850,000 residents (DOC 2009); nine counties are contained or partially included in that radius (see Figure 1-2). Hispanic (44%), White (42%) and Native American people are the most prevalent races in NM.

http://www.census.gov/population/projections/SummaryTabA1.pdf

1.5 REGIONAL GEOLOGIC SETTING

The regional geologic setting in which SNL/NM and KAFB are situated has been subjected to relatively recent episodes of basaltic volcanism and ongoing regional rifting (crustal extension). The Rio Grande Rift has formed a series of connected down-dropped basins filled with sediment deposits. The Rio Grande Rift extends for about 450 miles from Leadville, Colorado into New Mexico; Albuquerque and the KAFB are within a rift valley.

1.5.1 Albuquerque Basin

The Albuquerque Basin is one of several north south trending sediment-filled basins formed by the Rio Grande Rift. This major structural feature is approximately 30 miles wide, 100 miles long, and 3,000 square miles in area (Grant 1982). On the east, uplifted fault blocks manifested by the Sandia, Manzanita, and Manzano Mountains bound the basin. The western side of the basin is bound by the Lucero Uplift to the south, the Rio Puerco Fault Belt, and the Nacimiento Uplift at its northern end. There is relatively little topographic relief along the Rio Puerco Fault Belt on the northwestern side of the basin. Two rivers flow to the south drain the basin — the Rio Puerco to the west, and the Rio Grande to the east.

1.5.2 Regional Fault Systems

Several major faults are located on KAFB (see Figure 1-3). Tijeras Fault, which has been traced as far north as Madrid, New Mexico, trends southwesterly through Tijeras Canyon and across KAFB. Tijeras Canyon was formed by preferential erosion along the fault. The system of faults connecting with the Tijeras Fault on KAFB is collectively referred to as the Tijeras Fault Complex. The Tijeras Fault Complex marks a distinct geologic boundary between the uplifted blocks on the east and the sediment-filled basin to the west. This geologic boundary also forms a boundary between the two major groundwater regimes at KAFB. For further information on hydrological settings, see Section 1.6.

The Sandia Fault is thought to be the primary boundary between the Sandia Mountains and the Albuquerque Basin. The Sandia Fault converges with the Tijeras Fault and the Hubbell Springs Fault. Both the Sandia Fault and Hubbell Springs Fault are north-south trending, down-to-the-west, enechelon normal faults, which are Tertiary in age (63 million to 1.8 million years ago). (Lozinsky et al. 1991; Woodward 1982; Kelley 1977).

1.6 HYDROLOGICAL SETTING

The hydrogeological system is divided into two areas separated by the Tijeras Fault Complex, which marks a distinct geological boundary (see Figure 1-4). To the east of the Tijeras Fault Complex, the geology is characterized by fractured and faulted bedrock covered by a thin layer of alluvium and shallow groundwater 45 to 300 ft deep. On the west side of the Tijeras Fault Complex, within the basin, groundwater levels range from 295 ft to 570 ft below ground surface (bgs) at KAFB.

A perched groundwater system (PGWS) overlies the regional aquifer in the north portion of KAFB. The PGWS extends southward from TA-I to the KAFB Golf Course. The western extent of the PGWS is somewhere midway between Wyoming Boulevard and the Albuquerque Sunport's east-west runway. The eastern extent is just east of the KAFB landfill and may be bounded by the West Sandia Fault. The groundwater gradient within the PGWS is to the southeast with the depth to water approximately 270 ft bgs in the western part and 420 ft bgs in the east.

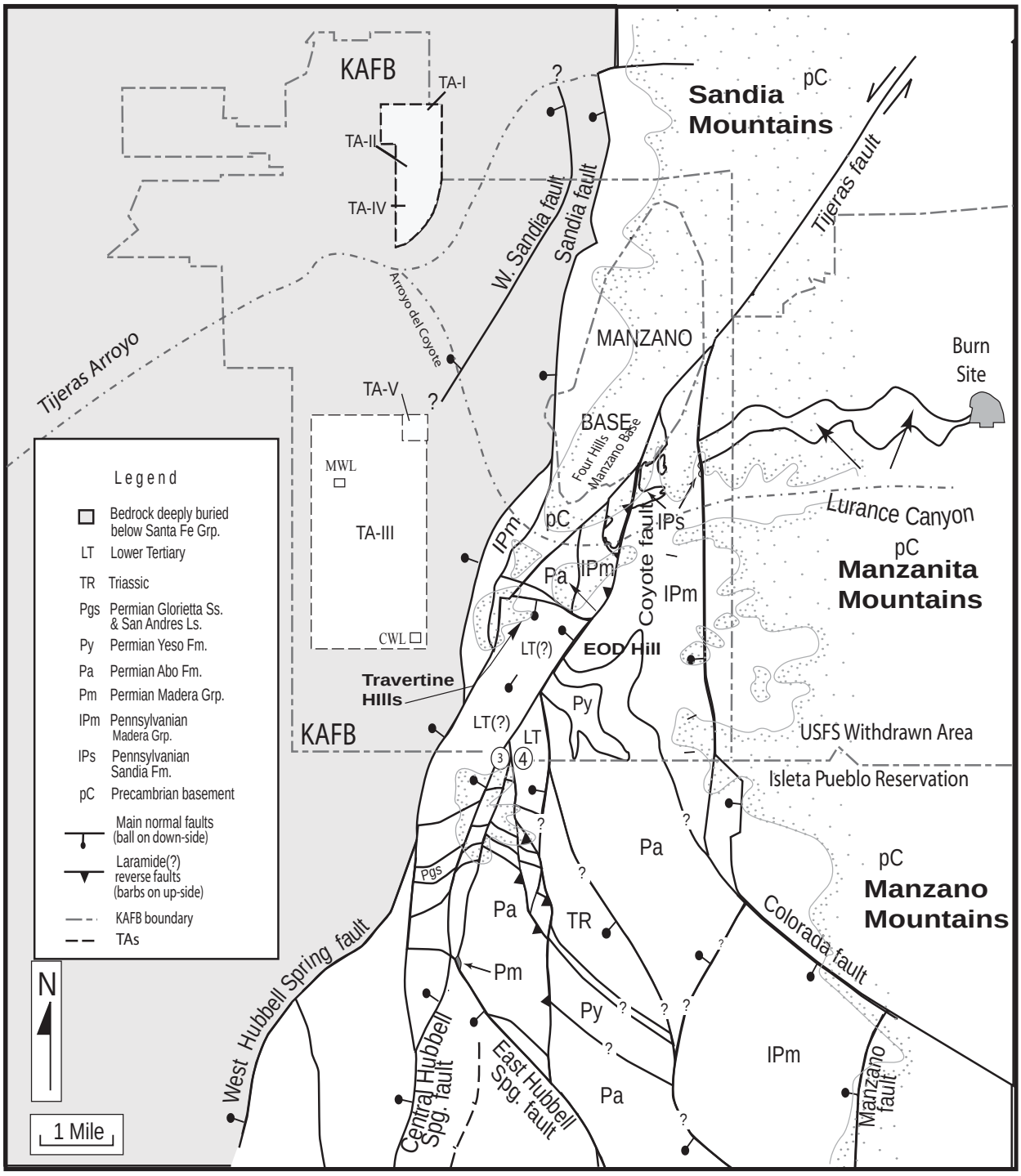


FIGURE 1-3. Generalized Geology in the Vicinity of SNL/KAFB.

Shows major faults on KAFB (July 2004).

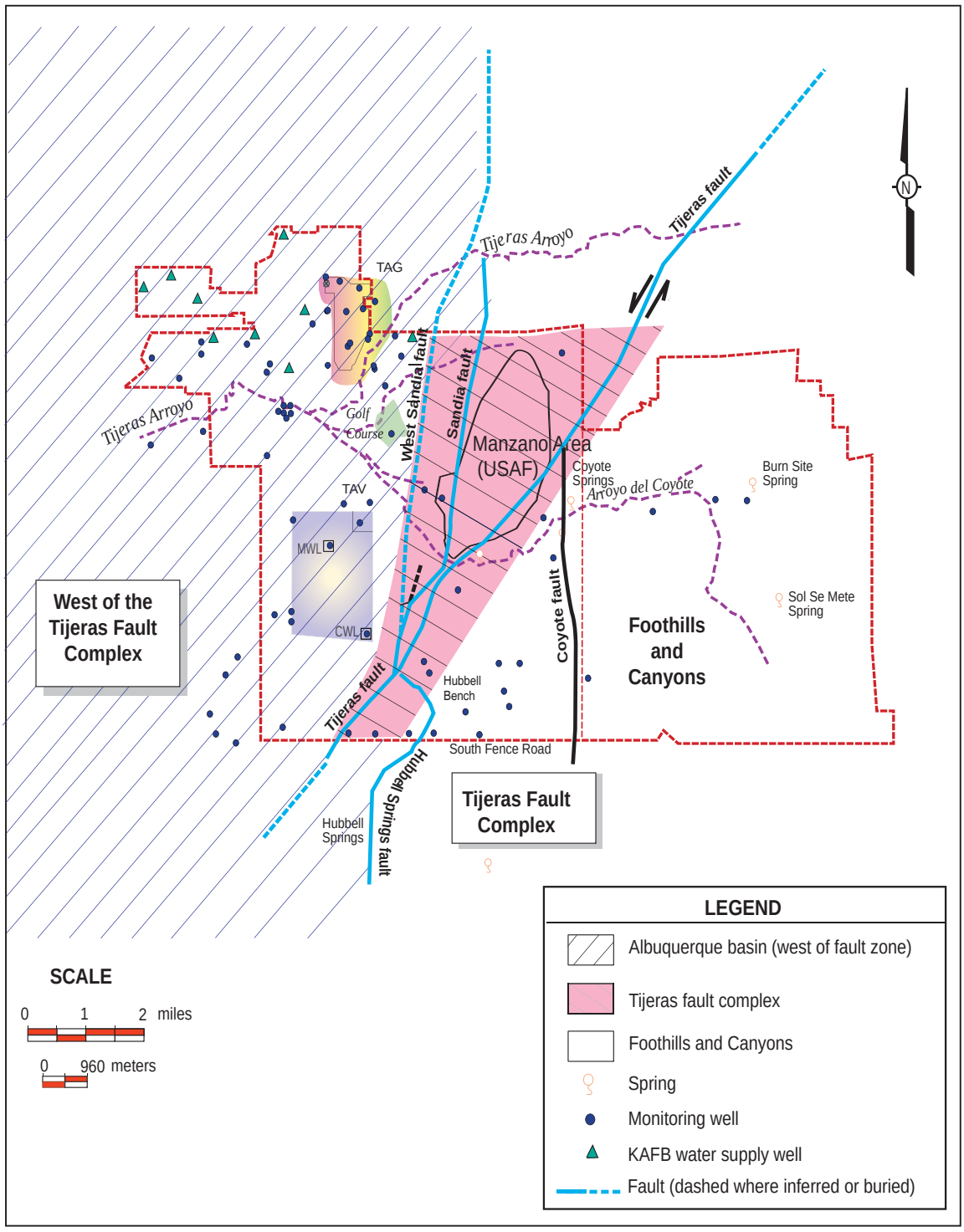


FIGURE 1-4. Hydrogeologically Distinct Areas at KAFB

1.6.1 Natural Springs

Two perennial springs are located on KAFB — Coyote Springs and Sol Se Mete Spring. Additionally, there is one perennial spring (Hubbell Spring) located immediately south of the KAFB boundary on Isleta Pueblo. Numerous ephemeral springs occur within the foothills and in the eastern reach of Arroyo del Coyote.

1.6.2 Groundwater Production

The primary regional aquifer in the Albuquerque Basin is within the upper unit and, to a lesser degree, the middle unit of the Santa Fe Group Aquifer System. Most COA water supply wells are located on the east side of the Rio Grande, which is the most productive portion of the aquifer. The highest yield wells are screened in the sediments associated with the ancestral river channel. Prior to extensive urban development in the Albuquerque area beginning in the 1950s, the direction of regional groundwater flow in the area of KAFB was primarily to the southwest. As a result of groundwater withdrawal, the local water table has dropped by as much as 141 ft (Thorn et al. 1993). Groundwater withdrawal from KAFB and COA wells at the north end of KAFB have created a trough-like depression in the water table, causing flow to be diverted northeast in the direction of the well fields.

1.7 REGIONAL CLIMATE

Large diurnal temperature ranges, summer monsoons, and frequent drying winds are characteristic of the regional climate in the Albuquerque Basin and the Sandia, Manzanito, and Manzano Mountains.

1.7.1 Temperature

Temperatures are typical of mid-latitude dry continental climates with summer high temperatures in the basin in the 90s° F (degrees Fahrenheit) and winter high temperatures around 50° F. Daily low temperatures range from around 60° F in the summer to the low 20s° F in the winter. The dry continental climate also produces low average humidities in the late spring and summer prior to the onset of the monsoon season. Daytime relative humidities can be between 10 and 20 percent in the spring and early summer, with an average humidity near 30 percent. Winter relative humidity averages near 50 percent.

1.7.2 Precipitation

Precipitation varies across the region with many locations in the higher elevations of the mountains receiving twice the annual rainfall of locations in the Albuquerque Basin. Most precipitation falls between July and October mainly in the form of brief, heavy rain showers. Average annual precipitation, based on 10 years of data collected between 1995 and 2004, is approximately 8.5 inches at SNL/NM, with 10.9 inches in the lower foothills. Annual precipitation recorded at the National Weather Service (NWS) cooperative stations in mountain elevations varies between 10 and 23 inches. The winter season in the Albuquerque Basin and around SNL/NM is generally dry, with an average of less than 1.5 inches of precipitation falling between December and February.

1.7.3 Climate

While the regional climate is described by the atmospheric state variables of temperature and humidity, site-specific meteorology at SNL/NM is influenced by the proximity to topographic features such as mountains, canyons, and arroyos. These features influence local wind patterns across the site. Canyons and arroyos tend to channel or funnel wind, whereas mountains create an upslope /downslope diurnal pattern to wind flows. Winds tend to blow toward the mountains or up the Rio Grande Valley during the day, and nocturnal winds tend to blow down the mountain towards the Rio Grande Valley. These topographically induced wind flows can be enhanced or negated by weather systems that move across the southwestern United States (U.S.). The strongest winds occur in the spring when monthly wind speeds average 10.3 miles per hour (mph). Wind gusts commonly reach 50 mph.

1.8 REGIONAL ECOLOGY

The SNL/NM facilities area is influenced by two major physiographic provinces -- mesa and plains, and mountains. The various elevations in these provinces provide a varied range of life zones on KAFB.

1.8.1 Physiographic Provinces

Mesa and Plains

A significant portion of central New Mexico, including the middle Rio Grande and much of SNL/NM, is comprised of this physiography. Major landforms include valleys, lowlands, outwash plains, and alluvial fans and terraces. Grama and galleta grasses, four-wing saltbush, and sand sage cover lower elevations, with piñon pine and juniper species characterizing the higher elevations. Riparian areas grow in strips along water courses and include cottonwood, willow and non-native salt cedar trees.

Mountains
The Sandia and Manzano Mountains are south of (but not part of) the Rocky Mountains. The eastern portion of SNL/NM is located in, and bordered by, the Manzano Mountains. Vegetation in these steep, rugged mountains varies greatly on the basis of elevation and aspect. Forests tend to be patchy due to topography, weather, fire, insect outbreaks, and disease. The landscape is a complex mosaic of open meadows, composed of forest stands of varying ages and species.

These physiographic provinces each have an influence on the typical landforms, flora, and fauna predominant within the SNL/NM area. The topography at KAFB ranges from lowland grasslands to high elevation coniferous forests. With much of the area undeveloped, there is great diversity in plant and animal communities living on KAFB. At least 267 plant species and 195 animal species are found on KAFB (DOE 1999). Table 1-1 lists the most common species of birds, mammals, reptiles, amphibians, and plants that have been identified on-site.

1.8.2 Regional Life Zones Occurring on KAFB

Ponderosa Pine Forest or Transition Life Zone (7,000 to 8,000 ft) – a closed canopy of ponderosa pine, piñon-pine, juniper, scrub oak, grassy meadows, streams, marshes, and canyons are typical of this zone. The USFS withdrawn area in the eastern portion of KAFB reaches an elevation of just over 7,900 ft.

TABLE 1-1. Common Plants and Animals Identified at KAFB

BIRDS			
American robin	*Turdus migratorius*	Horned lark	*Eremophila alpestris*
American kestrel	*Falco sparverius*	Killdeer	*Charadrius vociferus*
Black-chinned hummingbird	*Archilochus alexandris*	Loggerhead shrike	*Lanius ludovicianus*
Black-headed grosbeak	*Pheucticus melanocephalus*	Mountain bluebird	*Sialia currucoides*
Broad-tailed hummingbird	*Selasphorus platycercus*	Red-tailed hawk	*Buteo jamaicensis*
Dark-eyed junco	*Junco hyemalis*	Rufous-sided towhee	*Pipiloerythro melanocephalus*
MAMMALS			
Black bear	*Ursus americanus*	Deer mouse	*Peromyscus maniculatus*
Bobcat	*Felis rufus*	Gunnison's prairie dog	*Cynomys gunnisoni*
Banner-tailed kangaroo rat	*Dipodomys spectabilis*	Gray fox	*Urocyon cinereoargenteus*
Black-tailed jackrabbit	*Lepus californicus*	Mule deer	*Odocoileus hemionus*
Desert cottontail	*Sylvilagus audubonii*	- - -	- - -
REPTILES AND AMPHIBIANS			
Collared lizard	*Crotaphytus collaris*	Great plains skink	*Eumeces obsoletus*
Chihuahuan spotted whiptail	*Aspidoscelis exsanguis*	Great plains toad	*Bufo cognatus*
Round-tailed horned lizard	*Phrynosoma modestum*	Western diamondback rattlesnake	*Crotalus atrox*
Prairie lizard	*Sceloporus consobrinus*	Side-blotched lizard	*Uta stansburiana*
Gopher snake	*Pituophis catenifer*	Short-horned lizard	*Phrynosoma hernandesi*
PLANTS			
Apache plume	*Fallugia paradoxa*	Goathead	*Tribulus terrestris*
One-seed juniper	*Juniperus monosperma*	India ricegrass	*Achnatherum hymenoides*
New Mexico needlegrass	*Hesperostipa neomexicana*	Ring muhly	*Muhlenbergia torreyi*
Purple three-awn	*Aristida purpurea*	Bush muhly	*Muhlenbergia porteri*
Shrub live oak	*Quercus turbinella*	Soapweed yucca	*Yucca glauca*
Spectacle pod	*Dithyrea wislizenii*	Black grama	*Bouteloua eriopoda*

Piñon-Juniper Woodland Zone (6,000 to 7,000 ft) – a mostly open canopy of piñon-pine and juniper sparsely populate this zone of foothills and mesas. Animals typical of this woodland include the piñon mouse and piñon jay. Much of the rolling terrain in the withdrawn area is comprised of this zone.

Upper Sonoran Life Zone (below 6,000 ft) – this short grass prairie zone occurs on alluvial fans, mesas, and gently rolling or sloping plains. Pioneer plants include tumbleweed, goathead, and spurge; intermediate plants include galleta and burro grass, cactus, and mixed weeds; climax vegetation is grama grass. Animals include prairie dogs, burrowing owls, and kangaroo rats. The non-withdrawn area of KAFB land falls within this zone (see Figure 1-1).

1.9 BASELINE ECOLOGICAL FOOTPRINT OF SNL/NM

The SNL/NM Ecological Footprint Model (EFM) quantifies the environmental impacts associated with energy, transportation, waste, and land use at SNL/NM for FY05 by incorporating local emission factors, when applicable and available, and data derived from SNL/NM operations (see inset on next two pages).

Wright's Fishhook Cactus

Each year, the ASER highlights certain programs and environmental activities. "Sandia's Ecological Footprint at SNL/NM" this year's feature.

The EMS team recently calculated the ecological footprint of Sandia's New Mexico campus, to quantify the environmental impact of energy use, transportation, waste, land use, and water consumption. The analysis was completed for Fiscal Year 2005 (FY05), which was the most complete set of data available at the time, by incorporating local emission factors and data derived from SNL/NM operations. The EFM will help Sandia identify and evaluate environmental aspects and impacts and will aid in developing objectives and measurable targets to mitigate those impacts. The EFM is ultimately designed to gauge the environmental consequences associated with the numerous and diverse operations at SNL/NM.

An ecological footprint is the summation of the carbon footprint and the land use footprint. All greenhouse gas emissions are normalized to a carbon dioxide equivalent (CO^2E), based on their global warming potential. The carbon footprint is then determined by calculating how much land is required to sequester the CO^2E emissions from SNL/NM operations. The land use footprint is determined by summing the total developed land area under SNL/NM control.

The EFM expresses the carbon and ecological footprints of SNL/NM in global hectares (gha) of the world's average biologically productive land, as well as local hectares (lha) of the regional landscape. The units of lha are unique to the Pinyon-Juniper woodland and desert grassland landscape. The EFM also accounts for the carbon dioxide (CO^2) sequestration capacity of undeveloped land, giving Sandia credit for keeping the natural landscape in tact.

In FY05, SNL/NM emitted a net 429,000 metric tons (tonnes) of CO^2E greenhouse gases, generating a carbon footprint of 96,396 gha, or 889,234 lha. The SNL/NM campus had 353 lha of developed land, considered to be the land use footprint, and 3,116 lha of undeveloped land, capable of sequestering 1,504 tonnes of CO^2. The EFM generated a total ecological footprint of 96,434 gha, or 889,588 lha. The large difference in the global and local footprints reflects the lower productivity of the Pinyon-Juniper woodland and desert grassland landscape.

As illustrated in Figure 1-4, energy use has the largest impact on SNL/NM's ecological footprint at 89 percent. Transportation makes up the next largest component at 10 percent. Waste is responsible for 2 percent, and land use has a negligible effect. To mitigate further environmental impact, efforts should be focused on energy efficiency, reduction, and the incorporation of renewable energy alternatives.

Path Forward

The baseline FY05 ecological footprint incorporates mainly on-site data; commuting is the only category that accounts for off-site employee contributions. Future analyses will integrate more data from SNL/NM operations outside the main campus such as electricity use and waste generation, to make the model more inclusive. The FY05 baseline accounts for CO^2, methane (CH4), and nitrous oxide (N2O) emissions. Eventually, the model will be expanded to account for sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). These are more powerful greenhouse gases than CO^2, and could contribute considerably to the carbon and ecological footprints. The Baseline Ecological Footprint of SNL/NM for FY05 has recently been published and can be found at *http://environment.sandia.gov/new/footprint.shtml*. FY06, FY07, and FY08 ecological footprint analyses will be completed and used to evaluate trends and to measure progress towards targeting effective environmental mitigation strategies. So far, there is nothing to report for these subsequent years.

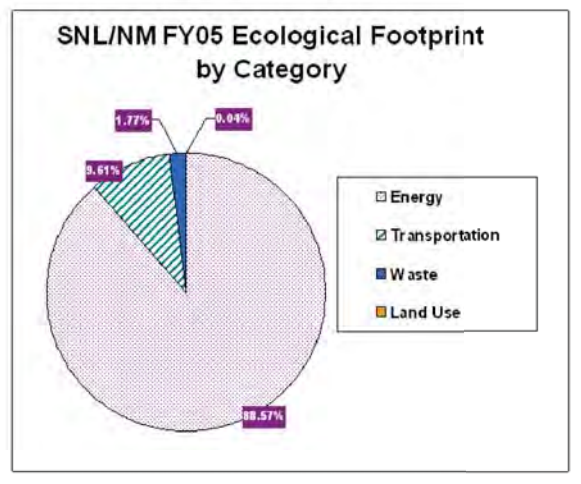
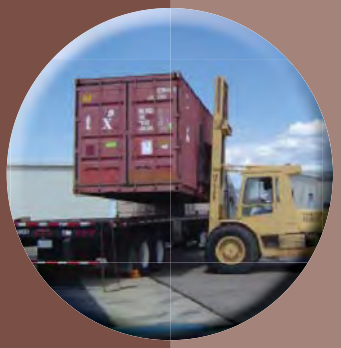


FIGURE 1-5. SNL/NM Eco Footprint by Category

2.0 Compliance Summary

This chapter provides a summary of the following:

- Sandia's compliance status with major environmental regulations, statutes, and DOE Directives that are applicable to operations conducted at SNL/NM.



Sandia Corporation (Sandia) conducts operations based on environmental regulations, statutes, and U.S. Department of Energy (DOE) directives through a variety of programs at Sandia National Laboratories, New Mexico (SNL/NM) that work together to pursue complete compliance with applicable regulations. As a part of these federal, state, and local mandates, Sandia adheres to strict reporting and permitting requirements.

This chapter summarizes Sandia's compliance status with major environmental regulations, statutes, and DOE directives that are applicable to operations conducted at SNL/NM (see page 2-4 and Section 2.1.16). Compliance issues, corrective actions, environmental occurrences, and environmental audits and appraisals are also discussed in this chapter.

Current permits held by Sandia, DOE, the National Nuclear Security Administration (NNSA), and the Sandia Site Office (SSO) are listed in Chapter 9.

Compliance Order on Consent (COOC)
On April 29, 2004, the New Mexico Environment Department (NMED), DOE, and Sandia entered into the COOC. The COOC provides requirements and establishes schedules and deliverables for corrective action pursuant to the New Mexico Hazardous Waste Act (NMHWA) and the New Mexico Solid Waste Act (NMSWA).

Compliance Agreement (CA)
A CA was signed by the City of Albuquerque (COA) and DOE in 2005 that requires and establishes schedules and deliverables for Steam Plant testing and reporting. The CA is mandated by and through the Environmental Health Department (EHD), which is authorized by the COA, Bernalillo County, and the Albuquerque Bernalillo County Air Quality Control Board (ABC/AQCB). In 2009, the boilers in the Steam Plant are scheduled to be dismantled. Once this occurs the CA will no longer apply.

Federal Facilities Compliance Order (FFCO)
On October 4, 1995, NMED, DOE, and Sandia entered into the FFCO, which was developed pursuant to the Federal Facilities Compliance Act. The FFCO provides requirements for achieving compliance with the requirements of Title 40 of the Code of Federal Regulations (CFR), Part 268.50 for mixed hazardous/radioactive waste at SNL/NM.

2.1 COMPLIANCE STATUS WITH FEDERAL REGULATIONS

Most environmental regulations and statutes applicable to SNL/NM are shown on page 2-4 including links to associated web sites. The following subsections detail the regulations.

2.1.1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The CERCLA, commonly referred to as the "Superfund," provides cleanup funds and/or assessment requirements for inactive waste sites at all federal facilities. A Preliminary Assessment/Site Inspection (PA/SI), as required by CERCLA, was performed at SNL/NM in 1988. This inspection confirmed that Sandia does not own any sites that would qualify for the National Priorities List (NPL), which lists the nation's high priority cleanup or "Superfund" sites. Therefore, with respect to inactive hazardous waste sites, Sandia has no CERCLA reporting requirements. Amendments under the Superfund Amendments and Reauthorization Act (SARA) require additional reporting in the event of a reportable quantity (RQ) release. Sandia was in full compliance with CERCLA/SARA in 2007, as illustrated in this chapter.

2.1.2 Emergency Planning and Community Right-to-Know Act (EPCRA)

The EPCRA, also known as SARA Title III, establishes emergency planning requirements for federal, state, and local governments and industry.

EPCRA ensures that communities have the right to know about and be informed of potential hazards including the type and location of large quantities of toxic chemicals used and stored by facilities in or near the community. EPCRA specifically mandates that chemical information be made available to local emergency response organizations, such as fire departments and hospitals. Any inadvertent release must be reported to appropriate state and local authorities. All subsequent reports must be made accessible to the public. The four major reporting requirements designated by specific sections of EPCRA are shown in Table 2-1.

Information on EPCRA can be found at the following U.S. Environmental Protection Agency (EPA) website:

http://www.epa.gov/emergencies/content/epcra

TABLE 2-1. 2008 SARA Title III (or EPCRA) Reporting Requirements Applicable to SNL/NM

Section	SARA Title III Section Title	Requires Reporting?		Description
		Yes	No	
302 - 303	Emergency Planning	Yes		Sandia submits an annual report listing chemical inventories above the reportable Threshold Planning Quantities listed in 40 CFR Part 355 Appendix B, the location of the chemicals, and emergency contacts. The report is prepared for the DOE/NNSA/SSO, which distributes it to the required entities.
304	Emergency Notification		No	There was no reportable RQ release in 2008.
311-312	Hazardous Chemical Storage Reporting Requirements	Yes		There are two "Community Right-to-Know" reporting requirements: (a) Sandia completes the EPA Tier II forms for all hazardous chemicals present at the facility at any one time in amounts equal to or greater than 10,000 lb and for all extremely hazardous substances present at the facility in an amount greater than or equal to 500 lb or the Threshold Planning Quantity, whichever is lower; (b) Sandia provides MSDSs for each chemical entry on a Tier II form unless it decides to comply with the EPA's alternative MSDS reporting, which is detailed in 40 CFR Part 370.21.
313	Toxic Chemical Release Forms	Yes		Sandia was above the reporting thresholds for CY 2008 for submitting a TRI Report for lead. A majority of the lead was from the use of lead-containing solders for laboratory benchmark solders.

NOTES:
SARA = Superfund Amendments and Reauthorization Act
CFR = Code of Federal Regulations
DOE = U.S. Department of Energy
NNSA = National Nuclear Security Administration
SSO = Sandia Site Office
MSDS = Material Safety Data Sheets
(gives relevant chemical information)
RQ = reportable quantity
Sandia = Sandia Corporation
EPA = U.S. Environmental Protection Agency
lb = pounds
CY = Calendar Year
TRI = Toxic Release Inventory

Toxic Release Inventory (TRI) Reporting

EPCRA regulations require that facilities with activities described in the Standard Industrial Classification (SIC) Codes 20 through 39 that use toxic chemicals listed in SARA Title III over a threshold value must submit a TRI report. The threshold value for listed chemicals requiring a TRI report is 10,000 pounds per year (lb/yr), unless otherwise specified.

Each year, nearly 23,000 facilities report to the EPA under the TRI Program. The proposed TRI Reporting Forms Modification Rule (1674 Federal Register/ Vol. 70, No. 6/ Monday, January 10, 2005) sought comment on eliminating certain information from the reports, simplifying other reporting data, and, in some cases, reducing duplicate data collection efforts. The options being proposed reduce the cost of compiling and submitting TRI reports, while maintaining the quality and practical utility of the TRI data. This rule became effective on September 12, 2005. The first reports with the revised reporting requirements have been incorporated into the 2006 submissions.

In 2008, chemical use at SNL/NM was above the reporting threshold for submitting a TRI report for lead. Sandia continues to document its toxic chemical use in the Chemical Inventory Report Calendar Year (CY) 2008 (SNL 2008b), which documents all purchases of chemicals at SNL/NM, Tonopah Test Range (TTR), and Kauai Test Facility (KTF) for CY 2008. This chemical inventory supports compliance with SARA Title III, as well as reporting for COA inventory requirements.

2.1.3 Resource Conservation and Recovery Act (RCRA)

RCRA regulates the generation, transportation, treatment, storage, and disposal of hazardous chemical waste and non-hazardous solid wastes, and the storage of hazardous or petroleum products in underground storage tanks (USTs). Under the authority of the NMHWA, and with delegated authority from the EPA under RCRA, the NMED administers hazardous and solid waste regulatory programs in New Mexico.

Major Environmental Regulations & Statutes Applicable to SNL/NM

Regulation/Statute	Description	Where to go for more information
Atomic Energy Act (AEA)	Directs U.S. Department of Energy (DOE) and the U.S. Nuclear Regulatory Commission (NRC) in the management of nuclear materials and radioactive waste	http://www.hss.energy.gov/nuclearsafety/nsea/oepa/
Clean Air Act (CAA) and CAA Amendments (CAAA)	Provides standards to protect the nation's air quality	http://www.epa.gov/air/caa/
Clean Water Act (CWA)	Provides general water quality standards to protect the nation's water sources and byways	http://www.epa.gov/region09/water/
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Provides federal funding for cleanup of inactive waste sites on the National Priorities List (NPL) and mandates requirements for reportable releases of hazardous substances	http://www.epa.gov//lawsregs/laws/cercla.html
Cultural Resources Acts	Includes various acts that protect archeological, historical, religious sites, and resources	http://recreation.usgs.gov/env_guide/cultural.html
Endangered Species Act (ESA)	Provides special protection status for federally listed endangered or threatened species.	http://www.epa.gov//lawsregs/laws/esa.html
Executive Orders (EOs)	Several EOs provide specific protection for wetlands, floodplains, environmental justice in minority and low-income populations, and encourages greening the government through leadership in EM	http://www.archives.gov/federal-register/executive-orders/disposition.html
Federal Facility Compliance Act (FFCA)	Directs federal agencies regarding environmental compliance	http://www.hss.energy.gov/nuclearsafety/nsea/oepa
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	Controls the distribution and use of various pesticides	http://www.epa.gov//lawsregs/laws/fifra.tml
Migratory Bird Treaty Act (MBTA) of 1918	Prevents the taking, killing, possession, transportation and importation of migratory birds, their eggs, parts, and nests	http://tis.eh.doe.gov/oepa/laws/mbta.html
National Emission Standards for Hazardous Air Pollutants (NESHAP)	Specifies standards for radionuclide air emissions and other hazardous air releases under the CAA	http://www.epa.gov/radiation/neshaps/
National Environmental Policy Act (NEPA)	Requires federal agencies to review all proposed activities so as to include environmental aspects in agency decision-making	http://tis.eh.doe.gov/NEPA/
Resource Conservation and Recovery Act (RCRA)	Mandates the management of solid and hazardous waste and certain materials stored in underground storage tanks (USTs).	http://www.epa.gov//lawsregs/laws/rcra.html
Safe Drinking Water Act (SDWA)	Enacts specific health standards for drinking water sources	http://www.epa.gov/safewater/sdwa/sdwa.html
Superfund Amendments and Reauthorization Act (SARA)	SARA, Title III, also known as the Emergency Planning and Community-Right-to-Know Act (EPCRA), mandates communication standards for hazardous materials over a threshold amount that are stored or used in a community	http://www.epa.gov//lawsregs/laws/epcra.html
Toxic Substance Control Act (TSCA)	Specifies rules for the manufacture, distribution, and disposal of specific toxic materials such as asbestos and polychlorinated biphenyls (PCBs)	http://www.epa.gov/compliance/civil/tsca/index.html

Hazardous and solid waste management activities at SNL/NM are conducted under NMED regulations. Some additional RCRA requirements and EPA regulations also apply. Applicable regulations are listed in Chapter 9.

The hazardous component of hazardous/radioactive mixed waste (MW) is regulated as hazardous waste and subject to the requirements of state and federal regulations. The radioactive component of MW is regulated under the Atomic Energy Act (AEA) of 1946.

Sandia generates hazardous waste and MW through normal operations and through its ongoing environmental restoration (ER) project, which is responsible for the cleanup of sites that were formerly used for operations such as testing and disposal. Sandia currently implements an active and successful program to minimize hazardous waste and MW through product substitutions, process changes, material re-use, and recycling. For a summary of Sandia's hazardous waste management activities during 2008 see Chapter 3 and specifically Section 3.3 - Waste Management.

Operating Permits – Sandia and DOE operate hazardous waste management units at SNL/NM under the following permits issued by NMED:

- Hazardous Waste Management Facility (HWMF), Permit NM5890110518-1,
- Thermal Treatment Facility (TTF), Permit NM5890110518-2, and
- Corrective Action Management Unit (CAMU), Permit NM5890110518-1, Module IV.

On February 6, 2002, Sandia and DOE submitted a comprehensive RCRA Part B request to renew the operating permits for these units. The request included updated permit applications for nine MW management units: the Radioactive and Mixed Waste Management Facility (RMWMF), the High Bay Waste Storage Facility (HBWSF), the seven Manzano Storage Bunkers (MSB) and new application request for operation of the Auxiliary Hot Cell Facility (AHCF). Sandia and DOE continue to operate under the existing permits and under interim status during the permit application and renewal process. The HBWSF and two of the seven MSB were withdrawn from the permit application in 2003, and closure of those units was completed in 2006. Treatment operations were completed at the CAMU in 2003. Closure of the unit was completed later that year, and DOE and Sandia currently conduct post-closure care and maintenance, as detailed in Section 3.2.2.

On August 20, 2007, NMED issued a draft operating permit to DOE and Sandia and invited public comments for 60 days. The draft permit includes requirements for operations or post-closure care at each of the waste management units, together with requirements for investigating and remediating releases of hazardous wastes and hazardous constituents at SNL/NM. The comment period was extended three times — once at the request of DOE and Sandia, and twice at the request of interested citizens. DOE and Sandia prepared extensive comments and submitted them to the NMED on January 23, 2008.

Post-Closure Care Permit, Chemical Waste Landfill (CWL) – The CWL was used for hazardous waste disposal under interim status until 1985. From 1981 to 1989, the CWL was also used for storage of hazardous wastes in drums. Waste management operations ceased and closure activities began in 1989. Closure included two voluntary corrective measures: extraction of solvent vapors (primarily trichloroethylene) and excavation of the entire landfill. Sandia and DOE submitted a post-closure care plan in 2005, and submitted additional permit materials in March 2007. Details about closure and post-closure care activities are in Section 3.2.2.

On May 21, 2007, NMED issued a draft permit to DOE and Sandia and invited public comments. DOE, Sandia and several citizens submitted comments. During 2008, NMED met with interested commenters to discuss their comments and propose modifications to the draft permit.

2.1.4 Federal Facility Compliance Act (FFCA)

The FFCA requires federal facilities to comply with all federal, state, and local requirements for hazardous and solid waste, including full compliance with the restrictions and prohibitions on extended storage of wastes that do not meet the applicable hazardous waste treatment standards. On October 4, 1995, NMED, DOE, and Sandia entered into a FFCO for management of MW in extended storage at SNL/NM. A general Site Treatment Plan (STP) (SNL 2007d, SNL 2007c) and a schedule for processing the waste were developed. In 2008, Sandia continued to characterize and treat MW and to package wastes for shipment to permitted off-site treatment, storage, and disposal (TSD) facilities. Sandia met all of the milestones outlined in the STP.

2.1.5 Atomic Energy Act (AEA)

In 1946, the AEA was enacted to encourage the development and use of nuclear energy for general welfare, common defense, and security. The purpose of the AEA is to assure the proper management of nuclear materials and radioactive waste. The AEA, as amended, delegates control of nuclear energy and nuclear materials primarily to DOE, the U.S. Nuclear Regulatory Commission (NRC) and the EPA. Federal regulations control radioactive emissions and the transportation of nuclear materials. The authority for controlling radioactive waste is retained by DOE and governed by DOE directives.

2.1.6 Clean Air Act (CAA) and Clean Air Act Amendments (CAAA) of 1990

The objectives of the CAA and the CAAA are to protect and enhance the nation's air quality. The EPA is responsible for describing and regulating air pollutants from stationary and mobile sources and for setting ambient air quality standards. The COA has direct delegation from EPA Region VI to locally administer these standards as well as specific air emission permits and registrations, as shown in Chapter 9, Table 9-1.

The CAA requires the EPA to develop a list of air pollutants from all sources that could harm public health or the environment. The EPA identified six substances as "criteria pollutants" and subsequently developed National Ambient Air Quality Standards (NAAQS) for these pollutants.

The EPA program for the attainment and maintenance of NAAQS requires local agencies to develop a comprehensive permitting program. The Air Quality Control Board (AQCB) has developed a set of regulations governing mobile and stationary sources of air pollution.

In addition to the regulations for criteria pollutants, the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) program prescribes emission limitations for hazardous air pollutants (HAPs).

Radiological NESHAP

Subpart H of 40 CFR 61 specifically regulates radionuclide emissions (other than radon) from DOE facilities. As required by the regulation, Sandia calculates an annual dose from actual or calculated emissions to potentially exposed members of the public. The regulation requires that Sandia determine the maximum possible dose that could be delivered to an individual residing at a nearby location 24 hours-per-day. The result is the effective dose equivalent (EDE) to the maximally exposed individual (MEI). The dose is compared to the EPA standard of 10 millirem per year (mrem/yr) allowed from radioactive air emissions from a DOE facility.

In 2008, the on-site MEI was located at the Honeywell Systems Support Site. The dose at this location was 2.25E-03 mrem/yr, primarily the result of releases of H-3 from the Neutron Generator Facility (NGF) and the RMWMF. The off-site MEI was located at the Eubank Gate Area. The dose at this location was 2.29E-03 mrem/yr, primarily the result of releases of tritium from the Neutron Generator Facility (NGF) in TA-I. Both doses are well below EPA standards. For perspective, the annual radiation dose from natural background radiation is approximately 360 mrem/yr. Sandia met all NESHAP compliance requirements in 2008.

Fugitive Dust Permitting

The COA enforces 20.11.20 New Mexico Administrative Code (NMAC) to ensure that all persons conducting active operations that result in disturbed surface areas, or that involve bulk material handling, use reasonably available control measures (or other effective measures) on an ongoing basis to prevent or abate injury to human health, animal and plant life, and to prevent or abate unreasonable interference with public welfare, visibility, and the reasonable use of property.

National Emissions Inventory (NEI)

As required by the Consolidated Emission Reporting Rule (CERR), 67 Federal Register (FR) 3960, the emission inventory requests annual emissions of volatile organic compounds (VOCs), nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), lead (Pb), ammonia (NH_3), particulate matter with a diameter of equal to or less than 10 microns (PM_{10}), particulate matter with a diameter of equal to or less than 2.5 microns ($PM_{2.5}$), and HAPs.

New Source Review (NSR) Requirements

The NSR permitting program was established as part of the 1977 CAAA.

NSR requirements provide assurance to the public that any large, new, or modified industrial source in their neighborhood will be as clean as possible, and that advances in pollution control occur concurrently with industrial expansion.

New Source Performance Standard (NSPS) Requirements

As part of an effort to control pollution in the U.S., the EPA provides NSPS requirements that dictate the level of pollution that a new stationary source may produce. These standards are authorized by Section 111 of the CAA, and the regulations are published in

40 CFR Part 60. An NSPS has been established for a number of individual industrial or source categories, including boilers and generators.

Open Burn Permitting
The COA enforces 20.11.21 NMAC to ensure that all persons conduct open burning in a manner that prevents or abates emissions that are visible and that produce noxious by-products of combustion.

Ozone Depleting Substances (ODS) Requirements
Based on the requirements of the CAA, the EPA has established regulations that affect many aspects of the refrigeration industry.

Title V Operating Permit
The CAAA of 1990 contained provisions under Title V requiring all existing major air emission sources to obtain an operating permit. A major source is defined as the combined emissions from any facility with the potential to emit:

- 100 tons per year (tpy) or greater of any criteria pollutant,
- 10 tpy of any HAP, or
- 25 tpy of any combination of HAPs.

Details on the applicability of Title V to SNL/NM and activities are in Section 5.2.

2.1.7 Clean Water Act (CWA)

The CWA establishes guidelines to protect the "Waters of the U.S." by regulating the discharge of pollutants. At SNL/NM, the CWA applies to sanitary and septic system wastewater effluents, storm water runoff, and surface water discharges.

The CWA is implemented through local, state, and federal water quality standards as follows:

(1) the Albuquerque Bernalillo County Water Utilities Authority (ABCWUA) administers regulations for sanitary sewer discharges based on federal pretreatment standards,

(2) the EPA and the NMED administer regulations concerning oil storage and surface discharges,

(3) the NMED administers regulatory authority over storm water discharges and mandates requirements for oil storage and secondary containment, and

(4) the EPA has authority over NPDES.

New Mexico Stream Standards
EPA Region VI is the permitting agency for discharges under the National Pollutant Discharge Elimination System (NPDES). NMED is currently seeking primacy over NPDES, but the delegation of authority from the EPA has been held up because there is some opposition to New Mexico primacy. New Mexico has enacted 20.6.4 NMAC Standards for Interstate and Intrastate Surface Waters to protect the quality of surface waters in the state.

ABCWUA Sewer Discharge Regulations
There are six wastewater monitoring stations, or outfalls, operating under the ABCWUA permits at SNL/NM. Four of these stations discharge directly to the ABCWUA's public sewer; the two remaining are categorical pre-treatment stations located upstream of the general outfalls. During 2007, there were no reported events that exceeded permitted limits established by the ABCWUA.

Surface Discharge
All discharges made to the ground or to containment areas must be evaluated for compliance with regulations implemented through the New Mexico Water Quality Control Commission (NMWQCC) standards for the protection of ground waters and surface waters prior to discharge. Sandia reviewed and approved 33 one-time internal surface discharge permits in 2008. Sandia also investigated one reportable environmental release that met NMED reporting standards. Detailed information regarding the release can be found in Section 2.2.2 below and Section 6.2.2. Sandia maintains two evaporation lagoons in TA-IV which are permitted by NMED Discharge Permit (DP-530). The TA-IV lagoons are used to contain and evaporate accumulated storm water pumped from the secondary containment areas around seven oil tanks that support the pulsed power accelerators. All permit conditions for the TA-IV permitted lagoons were met in 2008. The current permit for DP-530 was re-issued on September 12, 2007 and will expire on September 12, 2012.

NPDES
NPDES implements the requirements that are specific to all discharges made to "Waters of the U.S." as defined in the CWA and "Surface Waters of the State" and as defined in New Mexico's *Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC). At SNL/NM, all point sources discharge to either state or federal waters and are evaluated for compliance with their respective regulations.

Historically, collecting visual and analytical samples at SNL/NM has been a challenge due to Albuquerque's climate. Analytical sampling was not required in

CY 2008, but visual assessments are conducted every quarter, sufficient runoff permitting (see Section 6.3.4).

2.1.8 Safe Drinking Water Act (SDWA)

The SDWA authorizes the EPA to set national standards for drinking water sources, treatment systems, and water distribution. These standards are promulgated by the EPA as primary and secondary drinking water regulations. Specific drinking water quality criteria are established to protect human health, which limits the maximum contaminant level (MCL) of specific organic and inorganic chemical substances and biological organisms in potable water.

Drinking Water Supply at SNL/NM

Potable water for most facilities on Kirtland Air Force Base (KAFB) (including SNL/NM) is provided by the KAFB Water System. The system derives its water from deep groundwater wells (discussed in Section 7.3, Groundwater Levels). KAFB routinely samples its water and conducts analyses to establish that its water quality conforms to EPA standards. In support of KAFB compliance with NMED Drinking Water Standards, DOE/NNSA/SSO and Sandia operates the water distribution system on their property in conformance with the Safe Drinking Water Act regulations. DOE/NNSA/SSO and Sandia provide KAFB with an annual certification that all backflow preventers installed in the potable water distribution system have been properly tested and maintained.

Information on the KAFB Water System is located on the EPA's SDWA website, which details the compliance status for all drinking water systems in the U.S. :

http://www.epa.gov/safewater

Specific water quality data and system performance are published by KAFB in the Annual Consumer Confidence Report on the Quality of Drinking Water.

2.1.9 Toxic Substances Control Act (TSCA)

TSCA provides regulations regarding the import, export, use, and disposal of specifically listed toxic chemicals. At SNL/NM, compliance with TSCA primarily involves the handling and disposal of polychlorinated biphenyls (PCBs) and asbestos. Sandia was in full compliance with TSCA in 2008. Details related to TSCA are in Section 3.4.1.

2.1.10 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

FIFRA regulates pesticide use and is enforced under the New Mexico Pesticide Control Act. Sandia's Biological Control Activity compiles information on pesticide use at SNL/NM, as discussed in Section 3.6. Sandia was in full compliance with FIFRA in 2008.

2.1.11 National Environmental Policy Act (NEPA)

NEPA requires federal agencies (and other organizations that perform federally sponsored projects) to consider environmental issues associated with proposed actions, be aware of the potential environmental impacts associated with these issues, and include this information in early project planning and decision making. Additionally, if a proposed action is not within a class of actions previously determined to have environmentally "insignificant" impacts, the agency must prepare an environmental assessment (EA) or an environmental impact statement (EIS) before making an irretrievable commitment of resources or funding. Although a major objective of NEPA is to preserve the environment for future generations, the law does not require an agency to choose a course of action with the least environmental impacts. Details are provided in Section 3.7.

2.1.12 Endangered Species Act (ESA)

The ESA ensures that any action authorized, funded, or carried out by a party will not jeopardize the continued existence of a "threatened or endangered species" or result in adverse modifications to its habitat. At SNL/NM, ESA compliance is coordinated with NEPA compliance reviews and the Ecology Program. Table 2-2 lists the threatened and endangered species potentially occurring in Bernalillo County.

2.1.13 Migratory Bird Treaty Act (MBTA)

The MBTA of 1918 put the 1916 Convention for the Protection of Migratory Birds into effect. The original statute implemented the agreement between the U.S. and Great Britain (for Canada), and later amendments implemented treaties between the U.S. and Mexico, the U.S. and Japan, and the U.S. and Russia. The MBTA prevents the taking, possession, killing, transportation, or importation of migratory birds, their eggs, parts, or nests. At SNL/NM, the MBTA is coordinated with NEPA compliance reviews and the Ecology Program.

2.1.14 Cultural Resources Acts

The three primary cultural resources acts applicable at SNL/NM include:

- *National Historic Preservation Act* (NHPA),
- *Archaeological Resources Protection Act* (ARPA)
- *American Indian Religious Freedom Act* (AIRFA)

At SNL/NM, cultural resources compliance is coordinated through the NEPA Program. Actions that could adversely affect cultural resources are initially analyzed in a NEPA checklist. Historical properties, as defined by NHPA and other implementing regulations, include archaeological sites and historic buildings and structures. Historic buildings and structures may include those over 50 years of age that are historically significant or younger structures of exceptional significance. There are historic buildings on property owned by DOE/NNSA. Planning assists in avoiding potential impacts to these sites, and appropriate historic documentation is undertaken to mitigate effects when necessary.

There are no known archaeological sites located on DOE/NNSA owned property. However, cultural and historic sites do exist on and in close proximity to DOE/NNSA permitted property and ER sites. These areas are located on U.S. Air Force (USAF) property and on portions of the Cibola National Forest land withdrawn area. Sandia's activities are planned to avoid potential impacts to these sites. It is DOE/NNSA's responsibility to ensure that impacts to cultural resources are assessed and appropriate actions taken to mitigate any impact.

Historical Building Assessment

In 2008, Sandia, DOE/NNSA/SSO completed consultation with the New Mexico State Historic Preservation Office (SHPO) on actions at eight individual buildings. None of the specific actions were found to have an adverse effect on cultural resources. Documentation continued on the environmental test facilities included in the Test Capabilities Revitalization Project, which includes one building and four districts eligible for the National Register of Historic Places. In addition, a documentation of Building 892 was begun. The building is eligible for the National Register; however, the military liason

TABLE 2-2. Threatened and Endangered Species Potentially Occurring in Bernalillo County, New Mexico CY08

Species		Federal Status	State Status	Observed at KAFB
Mammals				
Spotted Bat	*Euderma maculatum*	--	Threatened	
New Mexican Jumping Mouse	*Zapus hudsonius luteus*	Candidate	Endangered	
Fish				
Rio Grande Silvery Minnow	*Hybognathus amarus*	Endangered	Endangered	
Birds				
Baird's sparrow	*Ammodramus bairdii*	---	Threatened	
Common black-hawk	*Buteogallus anthracinus anthracinus*	---	Threatened	
Yellow-billed cuckoo	*Coccyzus americanus*	Candidate	---	
Broad-billed hummingbird	Cynanthus latirostris magicus	---	Threatened	
Southwest willow flycatcher	*Empidonax traillii extimus*	Endangered	Endangered	
Aplomado falcon	*Falco femoralis septentrionalis*	Endangered	Endangered	
American peregrine falcon	*Falco peregrinus anatum*	---	Threatened	x
Arctic peregrine falcon	*Falco peregrinus tundrius*	---	Threatened	
Bald eagle	*Haliaeetus leucocephalus*	---	Threatened	
White-eared hummingbird	*Hylocharis leucotis borealis*	---	Threatened	
Brown pelican	*Pelecanus occidentalis carolinensis*	---	Endangered	
Neotropic Cormorant	*Phalacrocorax brasilianus*	---	Threatened	
Mexican Spotted owl	*Strix occidentalis lucida*	Threatened	---	
Bell's Vireo	*Vireo bellii*	---	Threatened	x
Gray Vireo	*Vireo vicinior*	---	Threatened	x

NOTE: There are no listed endangered or threatened plant, reptile, or amphibian species in Bernalillo County for CY08.

function that contributes to its eligibility is moving out of the building. Documentation will mitigate this adverse effect.

2.1.15 Environmental Compliance Executive Orders (EOs)

Floodplain Management (EO 11988), as amended, as minimal impact for SNL/NM since all active SNL/NM facilities are located outside the 500 year floodplain as described by the U.S. Army Corps of Engineers (ACE) (USACE 1979). This applies to both major on-site drainages: Tijeras Arroyo and Arroyo del Coyote.

Protection of Wetlands (EO 11990), as amended. Wetlands are areas inundated by surface or groundwater with a frequency sufficient to support a prevalence of aquatic plant and/or animal life. Wetlands generally include swamps, bogs, potholes, ponds, mud flats, and areas around natural springs. There are several natural springs on KAFB with a limited wetland setting. These springs, located on lands withdrawn from Cibola National Forest, are managed by the USAF and the U.S. Forest Service (USFS). These springs provide an important source of drinking water for wildlife and create a unique biological niche in an otherwise arid habitat.

Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898), as amended. To the greatest extent practicable and permitted by law, consistent with the principles set forth in the Report on the National Performance Review (Gore 1993), each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the U.S. and its territories and possessions. DOE/NNSA/SSO and Sandia perform a periodic analysis to assess whether their existing or proposed operations cause any disproportionate impacts on minority or low-income populations within the area of influence of Sandia operations.

Strengthening Federal Environmental, Energy, and Transportation Management (EO 13423), was issued in January 2007, Executive Order 13423, sets goals in the areas of energy efficiency, acquisition, renewable energy, toxin reductions, recycling, sustainable buildings, electronics stewardship, fleets, and water conservation. EO 13423 also requires more widespread use of Environmental Management Systems as the framework in which to manage and continually improve these sustainable practices. EO 13423 incorporates the requirements of and cancels Executive Orders 13101, 13123, 13134, 13148, and 13149, which were implemented through DOE Order 450.1 in January 2003. DOE revised Order 450.1 to include the requirements of EO 13423 in June 2008. Anticipating this change, Sandia established new EMS objectives and targets starting in fiscal year 2008 to support upcoming requirements.

2.1.16 DOE Directives

DOE directives on the contract baseline that pertain to environmental protection and management are discussed in Chapter 1, "Operations Contract." In 2008, Sandia met all requirements stated in these DOE directives.

2.1.17 Summary of Radiological Releases

A summary of radiological releases and public doses resulting from Sandia operations is provided in Table 2-3. Additional detailed information is found in Sections 5.3 and 5.4 of this report.

2.2 2008 RELEASES, COMPLIANCE ISSUES, AND ENVIRONMENTAL OCCURRENCES

Under DOE Manual 231.1-2, an *occurrence* is defined as "one or more (i.e., recurring) events or conditions that adversely affect, or may adversely affect, DOE (including NNSA) or contractor personnel, the public, property, the environment, or the DOE mission." Events or conditions meeting criteria thresholds identified in DOE M 231.1-2, or determined to be recurring through performance analysis, are considered occurrences. There are environmental releases that may not meet DOE M 231.1-2 reporting thresholds, however, they are still reportable to outside agencies (see chapters 2 and 6).

2.2.1 Occurrence Tracking

DOE Occurrence Reporting (OR) is tracked by the Environment, Safety, and Health (ES&H) Assurance, Strategic Planning, ISM, and Behavior Based Safety (BBS) Department. All SNL/NM occurrences are entered into DOE's Occurrence Reporting Processing System (ORPS) database, which also tracks corrective actions and closure of occurrence reports.

For all categories, during 2008 there were 64 occurrences, eight of these were environmentally related at SNL/NM.

TABLE 2-3. SNL/NM Radiological Dose Reporting for Calendar Year 2008

Pathway	Dose to Off-Site MEI		Dose to On-Site MEI		Percent of DOE 100 mrem/yr Limit	Estimated Population Dose (80 km radius)		Population within 80-km radius of site	Estimated Background Radiation Population Dose	
	mrem	mSv	mrem	mSv		Person-rem	Person-Sv		Person-rem	Person-Sv
Air	2.29E-03	2.29E-05	2.25E-03	2.25E-05	0.002 percent	1.9E-01	1.9E-03	793,740	-	-
Water	0	0	0	0	0	0	0	0	-	-
Other Pathways	0	0	0	0	0	0	0	0	-	-
All Pathways	2.29E-03	2.29E-05	2.25E-03	2.25E-05	0.002 percent	1.9E-01	1.9E-03	793,740	2.9E+05	2.9E+03

Radiological Atmospheric Releases for 2008 (in Curies)							
Tritium	Noble Gases ($t_{1/2}$ <40 days)	Fission and Activation Products ($t_{1/2}$ <3 hr)	Fission and Activation Products ($t_{1/2}$ >3 hr)	Total Radio-strontium	Total U	Other Actinides	Other
123.9	3.90	1.35E-03	5.16E-08	4.18^{E}-07	0	1.06E-05	0

Liquid Effluent Releases of Radioactive Material for 2008						
Tritium	Fission and Activation Products ($t_{1/2}$ <3 hr)	Fission & Activation Products ($t_{1/2}$ >3 hr)	Total Radio-iodine	Total Radio-strontium	Total U	Pu
0	0	0	0	0	0	0

NOTES:

MEI = maximally exposed individual
mSv = millisievert
Pu = Plutonium
DOE = U.S. Department of Energy
km = kilometer
U = Uranium
mrem = millirem
km = kilometer

DOE Manual 231.1-2 2008 Reportable Environmental Occurrences

Table 2-4 lists the DOE Manual 231.1-2 environmental and environmentally related occurrences for the five year period from 2004 to 2008. The table shows all occurrences for which the "nature of occurrence" (pre-August 25, 2003) and "reporting criteria" (post-August 25, 2003) included "environmental." As stated previously, there were eight reportable environmental occurrences in 2008 — One was categorized as Significance Category 2, four were categorized as Significance Category 3 and three were categorized as Significance Category 4 (the lowest level occurrence).

Table 2-5 summarizes each DOE Manual 231.1-2 2008 Reportable Environmental Occurrence.

2.2.2 Environmental Release Tracking

Environmental releases include notifications that are not tracked through ORPS, as well as notifications to outside agencies.

2008 Environmental Releases

In 2008, there were two Surface Discharge Releases that were reportable to NMED. These releases are summarized in Section 6.2.2.

2.3 2008 AUDITS AND APPRAISALS

Operations at SNL/NM and DOE/SSO are routinely subjected to audits by external regulatory agencies. Sandia also conducts its own self-assessments and appraisals. Environmental audits and appraisals conducted by external agencies in 2008 are listed in Table 2-6. During 2008, the ABCWUA performed inspections of the wastewater discharges. No findings or observations resulted from these inspections.

2.4 SUMMARY OF REPORTING REQUIREMENTS

External reporting requirements (other than to DOE) are necessary for both routine and non-routine releases of pollutants or hazardous substances. Release information may be used to evaluate facility operation compliance, waste handling activities, and emergency response programs. Table 2-7 summarizes the primary reporting requirements for releases applicable to SNL/NM.

2.5 SUMMARY OF ENVIRONMENTAL PERMITS

Table 9-1 in Chapter 9 lists all environmental permits and registrations that were in effect in 2008. It includes pending permit applications under review by various agencies.

2.6 ENVIRONMENTAL PERFORMANCE MEASURES

Environmental performance at SNL/NM is tracked through performance measures and indicators. It is reported through management reports and annual summaries (such as this report).

SNL/NM executive management has established the following performance excellence objectives:

- Zero job-related injuries and illnesses,
- Zero environmental incidents, and
- Zero operations fines, violations, or penalties.

In support of these objectives, seven key ES&H measures have been adopted that have specific numerical expectations for each. Four of these regard environmental performance measures, and are listed in Table 2-8.

Environmental performance is also assessed through performance measures in the Performance Evaluation Plan (PEP) agreement between DOE/NNSA/SSO and Sandia. On the basis of the PEP, DOE/NNSA/SSO prepares an annual Performance Evaluation Report (PER) that assesses Sandia's performance for the FY. For FY 2008, the overall score for Sandia was listed as "Outstanding."

TABLE 2-4. Environmentally-related Occurrences for Five Years (2004-2008)

Nature of Occurrence or Reporting Criteria	2004	2005	2006	2007	2008
Group 2 - Personnel Safety and Health					
Environmental - Radionuclide Releases - 2A NOTE: This is a pre-August 2003 Nature of Occurrence.					
Personal exposure to chemical, biological, or physical hazards above limits - 2A(5) (Post-August 2003 Reporting Criteria).			4	2	2
Environmental - Release of Hazardous Substance/Regulated Pollutants/Oil - 2B NOTE - this is a pre-August 2003 Nature of Occurrence.					
Group 5 - Environmental					
Environmental releases above permitted levels and exceeds report quantities specified in 40 CFR 302 or 40 CFR 355 - 5A(1).			1		
Any discharge that exceeds 100 gallons in any form - 5A(2).		1			
Release of Hazardous Substance, Material or Waste above permitted levels and exceeds percent of report quantities specified in 40 CFR 302 or 40 CFR 355 - 5A(3).					
Release of Hazardous Substance, Material, or Waste that must be reported to outside agencies in a format other then routine periodic reports (oil spills <10 gal need not be reported) - 5A(4).	4	2	1	1	
Group 7 - (Pre-August 2003 Nature of Occurrence - does not exist in post-2003 Reporting Criteria)					
Value Basis Reporting - Cost Based Occurrences - 7A.					
Group 9[1] - Noncompliance Notifications					
Any enforcement action (other than associated with the Price Anderson Amendment Act) involving ten or more cited violations, and/or an assessed fine of $10,000 or more - 9(1).			3		
Any written notification from an outside regulatory agency that a site/facility is considered to be in noncompliance with a schedule or requirement - 9(2).	1	1	1	1	
Group 10 - Management Concerns					
Any event, condition, or series of events that does not meet any of the other reporting criteria, but is determined by the Facility Manager or line management to be of safety significance or of concern to other facilities or activities in the DOE complex - 10(2).	3	1	1	6	4
A near miss, where no barrier or only one barrier prevented an event from having a reportable consequence - 10(3).			1	3	2
An event that results in a significance concern by affected state, tribal, or local officials, press, or general population; that could damage the credibility of the Department or that may result in inquiries to Headquarters - 10(4).		1			

TABLE 2-5. DOE Manual 231.1-7 Reportable Environmental Occurrences, 2008

Month	Occurrence Significance Category	Reporting Criteria	Description
January	3	2A(5)	A painting subcontractor was exposed to organic solvents while prepping and painting the floor of Building 984. The painters had applied two quarts of the sealer containing thinner and sealed 200 square feet of the floor. Work was suspended when odors were reported in an adjacent building. An investigation identified that the thinner which had been added to the epoxy contained toluene (21%), butanol (19%), and methyl ethyl ketone (60%). SNL Industrial Hygienist identified that the half-face respiratory protection worn by workers, which has a protection factor of 10, combined with the building ventilation, was adequate to control worker exposure below regulatory limits, but controls may not have been adequate if work had not been suspended before the workers had sealed the entire 1,235 sq. ft of flooring.
January	4	10(2)	During cleanup of a stormwater retention pond in TA-III, a small cable cutter containing possible explosives was discovered in the debris. The cable cutter was secured by TA-III personnel and the work was stopped.
April	3	10(3)	On April 2, 2008, a backhoe operator struck and damaged a 4 in. high-density polypropylene natural gas line at the corner of G Avenue and 7th Street in TA-1. The damaged area where the backhoe had scraped the pipe was approximately 3 ft long. The pipe thickness is $^{1}/_{2}$ in in depth and the scrape ranged from $^{1}/_{16}$ in to $^{3}/_{16}$ in. There was an excavation permit issued for the excavation activity, and the line was clearly identified on prints and marked in the field. Initial investigation identified that the operator did not reference the permit or drawings prior to performing the excavation activity. The damage did not result in a release of gas, and no one was injured.
June	3	2A(5)	While performing oversight compliance monitoring of a subcontract floor resurfacing project, an Industrial Hygienist identified that three of four subcontract workers were exposed to respirable silica dust that exceeded the assigned protection factor of the half-face air purifying respirator (10 times TLV) they wore while performing grinding operations (grinding, vacuuming, and vacuum filter cleaning). Floor grinding operations were suspended until further evaluation and improved controls are developed.
July	3	10(2)	On July 8, 2008, the programmable logic controller (PLC) central processing unit (CPU) associated with the 858N hazardous gas monitoring system registered a maintenance fault. Appropriate notifications were made, and personnel associated with process gas systems visually confirmed that all gases were automatically shut down into fail-safe mode and all associated tools were operating properly. There was no damage to the PLC system. Upon reset, the PLC performed its self diagnostic tests and was restored to normal functionality. Normal operations were resumed.

Table 2-5. DOE Manual 231.1-7 Reportable Environmental Occurrences, 2008 (Concluded)

Month	Occurrence Significance Category	Reporting Criteria	Description
July	4	10(2)	A bottle of diethyl ether with a slightly rocky bottom was discovered in a flammables storage cabinet. Because of the concern for peroxides formation, arrangements were made to have the Kirtland Explosive Ordnance Department transport the material to the Kirtland explosives site for detonation. The material was disposed of uneventfully.
July	4	10(3)	While preparing a 50-mL sample bottle of tritium in a fume hood for mass spectrometry, a worker removed the wrong cover allowing tritium to be released into the fume hood. The worker immediately realized the error, shut the sash to the fume hood and checked the room tritium monitor. The tritium monitor was not alarming. The worker made notifications and secured the bottle. A critique was held.
September	2	10(2)*	On September 17, 2008, a millwright craftsperson died of complications associated with mesothelioma while being hospitalized for pneumonia. SNL Medical first became aware of the craftsperson's condition on September 9, 2008, when informed of a workers compensation claim. SNL Medical was informed that the sequence of events initiated with the craftsperson becoming sick in January 2008 and diagnosed with pneumonia by their personal physician. In July 2008, the craftsperson was then diagnosed by their personal physician with mesothelioma.

NOTES:
% = percent
SNL = Sandia National Labs
sq ft = square feet
TA = Technical Area (I through IV)
ft = feet/foot
in = inch
TLV = threshold limit value
mL = milliliter
POTW = Publicy-Owned Treatment Works
*Chronic exposure illness, not representing a 2008 environmental media release.

TABLE 2-6. Environmental Program Audits and Appraisals Conducted In 2008

Appraising Agency	Title	Date	Summary
External Audits and Appraisals			
ABCWUA	ABCWUA inspected facilities within Flow Basins 2069A, 2069F, 2069G, 2069I, 2069K and 2238A.	Inspected during February, April, June, August and October of 2008.	No findings or observations resulted from these inspections.
EPA Region VI	USTs.	September 2007.	No findings or observations resulted from these inspections.
Internal Audits and Appraisals			
Sandia	Surface water containment lagoons.	The lagoons are inspected monthly by Sandia and the information collected is included in the Annual Report submitted to NMED prior to December 31 of the current reporting year.	No findings or observations resulted from these inspections.
LESA 1890	Chemical Spills "Groundwater"	July 29, 2008	1 Acceptable Practice
LESA 1889	CAN	August 21, 2008	1 Observation 1 Noteworthy Practice
LESA 3927	Feeding Wildlife Site Visits	Sept. 8, 2008	1 Minor Finding 2 Observations

NOTES:
NMED = New Mexico Environment Department
ABCWUA = Albuquerque Bernalillo County Water Utility Authority
EPA = U.S. Environmental Protection Agency
LESA = Laboratory ES&H Self-Assessments (LESA database)
UST = Underground Storage Tank
CINT = Center for Intengrated Nanotechnologies
COA = City of Albuquerque

TABLE 2-7. Summary of Sandia Reporting Requirements to Outside Agencies (Other than DOE) for Releases of Pollutants or Hazardous Substances

Report Title	Description	Agency
Annual NESHAP Dose Assessment Report	A dose assessment of the calculated EDE to the MEI is based on the assumption that an exposed individual resides 24 hours-per-day at an area of highest incident radiation. Dose assessment is discussed in Section 5.4 of this report.	EPA 40 CFR 61, Subpart H
RQ Accidental Release Reporting	RQ release reporting is required by CERCLA and SARA Title III, or EPCRA to the NRC. CERCLA and EPCRA are discussed in Section 2.1.1 and 2.1.2 of this report. There were no reportable releases in 2008.	NRC 40 CFR 302
TRI Report	EPCRA, Sections 302, 311, 312, and 313, requires a TRI report to be filed by facilities conducting specifically listed industrial activities and using listed toxic chemicals. As discussed in Section 2.1.2, Sandia is currently required to submit a TRI report because its chemical use is above the reporting threshold.	EPA 40 CFR 372, Subpart B
Notification of Discharge	NMED requires reporting of oil or other water contaminant, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or use of the property shall make oral notification as soon as possible after learning of such a discharge, but in no event more than 24 hours thereafter to the NMED. Within one week, the owner and/or operator shall send written notification to the appropriate Bureau Chief verifying the prior oral notification. Within 15 days, the owner and/or operator shall send written notification to the appropriate Bureau Chief describing any corrective actions taken and/or to be taken relative to the discharge. Two surface discharge releases occurred in 2008 Details of these events are summarized in Section 6.2.2.	NMED 20.6.2.1203 NMAC
Accidental Slug Discharge Notification	The Albuquerque Bernalillo County Water Utility Authority ABCWUA requires immediate notification to the Wastewater Utility Division of any accidental/slug discharge that may cause potential problems for the POTW. Within five days following such occurrence, the user is required to provide the Industrial Waste Engineer with a detailed written report describing the cause of the dangerous discharge and measures to be taken to prevent similar future occurrences. During CY 2008 there were no reportable events to the ABCWUA.	Bernalillo County Water Utility Authority *Sewer Use and Wastewater Control Ordinance*

NOTES:
NESHAP = National Emission Standards for Hazardous Air Pollutants
EDE = Effective Dose Equivalent
MEI = Maximally Exposed Individual
EPA = U.S. Environmental Protection Agency
CFR = Code of Federal Regulations
RQ =ReportableQuantity
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
SARA = Superfund Amendments and Reauthorization Act
EPCRA = Emergency Planning and Community Right-to-Know Act
NRC = U.S. National Response Center
TRI = Toxic Release Inventory
Sandia = Sandia Corporation
NMED= New Mexico Environment Department
NMAC = New Mexico Administrative Code
COA = City of Albuquerque
ABCWUA - Albuquerque Bernallillo County Water Utility Authority
POTW = Publicly-Owned Treatment Works
CY = Calendar Year

TABLE 2-8. Environmental Performance Measures for SNL/NM only

Measure	2006 Goal	2006 Actual	2007 Goal	2007 Actual	2008 Goal	2008 Actual	2009 Goal
Hazardous Waste Generated (metric tons)	NA	27.5	5 % reduction	23.4	< 23	23.4	Determine top 5 Hazardous Waste streams
Percent (%) of Solid Waste Recycled	52 %	46 %	50 %	48 %	50 %	50%	55%
Number of Notices of Violation (NOV)	0	3	0	1	0	0	0
Amount of fines or penalties	$0	$20,000 Air Quality NOV' $40,820 Waste NOV	$0	$4,504 for 2005 NMED RCRA	$0	$0	$0

NOTES: % = percent
< = less than

"Steam Plant Temporary Boiler Installation, SNL/NM" 2008 Photo Contest, photo by Kelsey Curran

3.0 Environmental Programs

This chapter provides a summary of the following:

- Environmental Management System (EMS)
- Environmental Restoration (ER) Project
- Waste Management
- Pollution Prevention (P2) Program
- Biological Control Activities
- National Environmental Policy Act (NEPA) Compliance Activities
- Environmental Outreach Program

Environmental programs carried out by Sandia Corporation (Sandia) are in place to protect the environment, safety, and health (ES&H) of its employees and the community. These environmental programs meet or exceed the requirements of federal, state, and local environmental regulations, as well as U.S. Department of Energy (DOE) directives in the Prime Contract between Sandia and DOE. Presidential Executive Orders (EOs) and DOE guidance documents are also used to establish program criteria.

The environmental programs are part of Sandia's Environmental Management System (EMS). Sandia's EMS is its primary management approach for addressing environmental aspects of operations and activities, including energy and transportation functions.

Environmental Monitoring History
Environmental monitoring began at Sandia National Laboratories, New Mexico (SNL/NM) in 1959 when the principle objective was to monitor radioactive effluents and determine any associated environmental impacts. Since then, environmental programs, along with other ES&H activities, have greatly expanded at SNL/NM.

ES&H Policy
Sandia's ES&H policy is implemented to protect and preserve the environment and to ensure the safety and health of its employees, contractors, visitors, and the public while maintaining the corporate vision and mission. Sandia's corporate ES&H Program mandates compliance with all applicable laws, regulations, and DOE directives included in the Prime Contract between DOE and Sandia, internal Corporate Process Requirements (CPR), and permit requirements. As such, Sandia has committed to the following:

- Plan work incorporating safety awareness, protective health practices, environmental management, pollution prevention (P2), and the long-term stewardship (LTS) of resources;
- Identify hazards and evaluate, monitor, and manage risks with effective ES&H systems;
- Implement controls that prevent injury, exposure to hazardous materials, and the release of materials that could be hazardous to the environment;
- Perform quality work while protecting people, the environment, and our nation's security;
- Continually improve ES&H performance by establishing, meeting, and assessing measurable ES&H goals, objectives, targets, and milestones; and
- Regularly communicate ES&H issues to the Members of the Workforce, the community, regulators, and our stakeholders.

Integrated Safety Management System (ISMS)
Sandia's methodology for managing and implementing its ES&H Program is outlined in the ISMS. The ISMS is centered on five safety management functions, which provide processes to guide management in identifying and controlling hazards. These include:

(1) plan work,

(2) analyze hazards,

(3) control hazards,

(4) perform work, and

(5) seek feedback and improvement.

3.1 ENVIRONMENTAL MANAGEMENT SYSTEM

In accordance with DOE Order 450.1A, *Environmental Protection Program*, Sandia implemented an EMS as part of the ISMS. The EMS is the framework by which SNL/NM manages, and continually improves, its environmental compliance and sustainability practices. The EMS identifies the environmental consequences of SNL/NM's activities, products, and services and develops objectives and measurable targets to mitigate potential impacts to the environment.

SNL/NM implemented its EMS in December 2005. Since that time, Sandia has worked to fully implement and establish the EMS in conjunction with ISMS in all site operations. Some major accomplishments of the EMS for Fiscal Year (FY) 2008 include:

- Corporate- and division-level EMS objectives and targets were established and tracked quarterly to survey progress;
- Internal and external outreach events were conducted to increase environmental awareness;
- Corporate- and division-level EMS self-assessments were conducted, and any identified deficiencies were addressed;
- Environmental program plans that detail requirements, roles and responsibilities, schedules, deliverables, and budgets were updated;

- EMS benchmarking exercises were conducted to determine how DOE and other facilities designed and implemented their EMS;
- Chemical Exchange Program (CEP) was implemented, reapplying over 400 chemicals, reducing 3,000 kilograms (kg) of hazardous waste and savings $100,00;
- A gap analysis was conducted according to DOE Order 450.1A (DOE 2008) and funding was obtained to gain ISO 14001 certification in FY09;
- A report on the Baseline Ecological Footprint Report of SNL/NM was produced based on data collected in 2005; and
- A High Performance Sustainable Building Assessment was conducted for 13 buildings to determine compliance with the High Performance Sustainable Buildings Guiding Principles, per DOE Order 430.2B (DOE 2008c).

The EMS is a continuous improvement system that includes all environmental programs in an integrated approach to effectively minimize the impact of SNL/NM's operations on the environment. Each year, SNL/NM's work processes are reviewed, and new environmental objectives and measurable targets are set to ensure continual improvement in our environmental performance. Additional information can be found on the external EMS website:

http://environment.sandia.gov/new/index.shtml

3.2 ENVIRONMENTAL RESTORATION (ER) PROJECT

Sandia's ER Project was created under the DOE Office of Environmental Management (EM) to identify, assess, and remediate sites potentially contaminated by past spill, release, or disposal activities in accordance with the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984. HSWA requirements apply to ER sites or Solid Waste Management Units (SWMUs) at SNL/NM. A SWMU is any unit "from which hazardous constituents might migrate, irrespective of whether the units were intended for the management of solid and/or hazardous waste" (EPA 1985).

There are additional areas of concern (AOC) at SNL/NM that are not regulated as SWMUs (primarily closed-out septic systems) that have also been investigated as a part of the ER Project. These AOCs were not identified at the time of the issuance of Module IV of the RCRA Part B Operating Permit; however, they were identified by the New Mexico Environment Department (NMED) as requiring investigation. Consequently, they were investigated and addressed as if they had been SWMUs listed on the permit.

The Chemical Waste Landfill (CWL) was closed under interim status as discussed in Section 2.1.3. Closure activities, including two voluntary corrective measures (VCMs), were conducted under Sandia's ER Project. One of the VCMs involved excavation of the entire landfill; the soil was treated as needed and placed in an on-site Corrective Action Management Unit (CAMU) containment cell constructed for long-term management.

Sandia, DOE, and NMED negotiated a Compliance Order on Consent (COOC) that was signed in April 2004. The COOC governs corrective action for releases of hazardous waste or hazardous constituents at SNL/NM. The COOC will terminate upon the completion of its requirements, with the exception of record preservation, and the Hazardous Waste Facility Permit will remain as the enforceable document.

3.2.1 Cleanup and Site Closures

Waste generated from SNL/NM ER sites include hazardous waste, radioactive low-level waste (LLW), mixed hazardous/radioactive waste (MW), Toxic Substances Control Act (TSCA) waste (primarily polychlorinated biphenyls [PCB] with some asbestos), and industrial solid waste. This chapter discusses the waste volumes generated by the ER Project in Section 3.4.

ER Project History

The initial identification of ER sites at SNL/NM was completed in 1987. At that time, there were 117 identified sites under Sandia's jurisdiction in the initial Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment (DOE 1987).

Since then, a total of 500 individual sites, potential sites, or individual historical activities have been identified for investigation. Many of these sites were confirmed to contain little or no contamination of concern. In 1992, the ER Project at SNL/NM was officially initiated to implement assessment and remediation activities for sites that had been contaminated or potentially contaminated because of past Sandia operations. In addition to the SNL/NM site, other sites included

TABLE 3-1. Summary of ER Project Status, 1992 - 2008

	A	B	C	D	E	F[2]
Year	Total ER Sites Remaining at Start of FY	ER Sites Proposed for CAC	Sites Approved for CAC	Corrective Actions Completed by End of Year	New ER Sites Identified During Year	Total ER Sites Remaining at End of FY
2008	61	0	28	0	0	33
2007	61	1	0	0	0	61
2006	110	6	49	3	0	61
2005	126	21	18	51	+2[3]	110
2004	125	41	0	1	+1[4]	126
2003	126	15	0	5	-1	125
2002	158	3	30	2	-2	126
2001	87	7	0	4	71	158
2000	146	10	64	10	5	87
1999	146	4	0	20	0	146
1998	146	16	0	0	0	146
1997	153	30	7	4	0	146
1996	155	35	2	29	0	153
1995	191	61	36	34	0	155
1994	219[5]	48	28	3	0	191
1993	219[5]	0	0	0	0	219
1992	172	0	0	0	47	219

NOTES:
ER = Environmental Restoration FY = Fiscal Year CAC = Corrective Action Complete
Column A = Total ER Sites remaining to be removed from the Resource Conservation and Recovery Act (RCRA) Permit
Column B = ER Sites submitted for CAC including reinvestigations per New Mexico Environment Department (NMED)
Column C = ER Sites receiving final regulatory approval (Class III Permit Mod) by NMED
Column D = fieldwork completed including reinvestigations
Column E = newly identified sites or sites reopened by NMED
Column F = Total Sites remaining on the RCRA Permit at the end of the FY
[1] Includes all final submittals of CAC documentation including RSEs and Notice of Disapproval (NODs)
[2] Column totals: F = A - C + E
[3] Two Drain and Septic Systems (DSS) sites determined inactive in FY05 were submitted for CAC
[4] One DSS Area of Concern (AOC) was determined to be inactive in FY04 and submitted for CAC
[5] Some of the original 219 sites included Tonopah Test Range (TTR), Kauai Test Facility (KTF), and other off-site areas

in the original scope of Sandia's ER Project were Sandia National Laboratories, Livermore, California (SNL/CA), the Kauai Test Facility (KTF), and the Tonopah Test Range (TTR). There were also a number of miscellaneous sites located in other areas, nationwide and internationally.

Corrective Action Complete (CAC) Status
DOE and Sandia propose ER sites to NMED for CAC status when they meet NMED criteria, either before or after remediation; the criteria include acceptable levels of risk to human health and the environment presented by the contaminants at the site.

After NMED grants CAC status, DOE and Sandia submit a request for a Class III modification to the HSWA Module (Module IV) of Permit NM5890110518-1 (the Permit) requesting that the site be deleted from Table A.1 "*List of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) Requiring Corrective Action*" and added to Table A.2 "*List of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) not currently requiring Corrective Action.*"

The majority of ER sites are granted CAC status under a risk-based scenario. Risks to human health and the ecosystem are calculated for sites with residual contamination according to U.S. Environmental Protection Agency (EPA) and NMED guidelines. The level of contamination remaining, and the appropriate land-use category (i.e., industrial, residential, or recreational use) are used, together with the available information and conceptual model for each site, to determine the risk to human health and the ecosystem.

In February 2008, NMED issued a Class III modification to the Permit addressing 28 sites for which corrective action is complete. At the close of 2008, there were 33 ER sites remaining on the list of sites requiring corrective action. DOE and Sandia have submitted a request for a Class III permit modification to address 31 of the remaining sites. All CAC proposals and Class III Permit modifications are available for review at the University of New Mexico (UNM) Zimmerman Library.

3.2.2 Selected Units at SNL/NM

CWL

The CWL, an interim status landfill, is approximately 1.9 acres and is located in the southeast corner of Technical Area (TA)-III. From 1962 through 1985, the CWL was used for disposal of hazardous wastes, chemicals, and solid wastes generated by SNL/NM research activities. The CWL was also used as a hazardous waste drum storage facility from 1981 to 1989.

The permitting and closure processes for the CWL were initiated during the 1980s. NMED approved the closure plan in 1993. Closure activities were conducted through the ER Project and included two voluntary corrective measures (VCMs): soil vapor extraction (SVE) and landfill excavation (LE). Excavation of the landfill began September 30, 1998. Over 52,000 cubic yards (yd^3) of soil and debris were excavated from the landfill between 1998 and 2002. Except for the area around one verification sampling grid point that was excavated in January 2003, all excavation was completed in February 2002. The excavation process, waste management activities, final verification soil sampling analytical results, and final risk assessment were presented in the LE VCM Final Report (SNL 2003), which was approved by NMED on December 16, 2003 (Moats 2003). The primary contaminants of concern (COC) at the CWL are volatile organic compounds (VOC) and metals.

The majority of the soils excavated from the CWL were managed at the CAMU, which is located adjacent to the CWL. The soils were treated as needed and placed into the CAMU containment cell for long-term management. Sampling and final cleanup of the CWL site was completed in February 2004 and documented in an addendum to the LE VCM Final Report approved by NMED in October 2005.

As part of the CWL closure process defined in the amended Closure Plan, DOE and Sandia submitted a compilation of documents to NMED on May 20, 2003 that included the CWL Corrective Measures Study (CMS) Report, Remedial Action Plan (RAP), and Post-Closure Care Plan (PCCP), with a request that NMED select the remedy through approval of the CMS Report and RAP, and approve the PCCP for post-closure care. A revised CMS Report was submitted in December 2004, as requested by NMED; the revised RAP was included as an annex. A revised PCCP was submitted to NMED as a permit application in September 2005. In May 2004, DOE and Sandia requested NMED approval of an Interim Corrective Measure (ICM) to allow construction of the at-grade evapotranspirative landfill cover; the design for this cover was originally presented in the May 2003 RAP. NMED approved the ICM in September 2004. Backfilling of CWL to four feet (ft) below ground surface (bgs) was completed in February 2004. The CWL cover installation began in March 2005 and was completed in September 2005.

On May 21, 2007, NMED issued a draft CWL Post Closure Care Permit for public comment, together with a notice of intent to approve the RAP and CMS Report, and the remedy selected for the CWL. DOE and Sandia submitted comments on the draft permit to NMED and requested a public hearing. Several citizens also submitted comments and requested a public hearing. Informal negotiations were initiated by the NMED in August 2008 with all interested parties requesting a public hearing. These negotiations were still in progress at the end of 2008.

CAMU

The CAMU (located in TA-III near the CWL) is permitted under RCRA and TSCA for the management of remediation waste (primarily contaminated soil) generated during the LE VCM at the CWL. Storage, treatment, and containment activities are authorized under the CAMU permit (EPA 1997). Two treatment processes, Low Temperature Thermal Desorption (LTTD) for organic compounds and stabilization treatment (ST) for metals, were used as needed to treat soil wastes before they were placed in the containment cell. LTTD treatment operations were completed in December 2002, and ST treatment activities were completed in January 2003.

The staging, treatment, and support areas at the CAMU were clean-closed under the RCRA and TSCA provisions outlined in the closure plan (SNL 2002). The CAMU containment cell cover was installed in July 2003, which encapsulated the CWL remediation waste in place. The CAMU was certified closed on October 15, 2003 in compliance with the closure requirements documented in the RCRA Closure Report (SNL 2003a). The CAMU containment cell,

where the treated waste remains, will continue to be monitored and maintained in accordance with post-closure requirements.

The CAMU containment cell consists of engineered barriers, a final cover system, and incorporates a bottom liner system with a leachate collection system and a vadose zone monitoring system (VZMS). The VZMS provides information on soil conditions under the cell for early detection of leaks. The VZMS consists of three subsystems that include the primary subliner (PSL), a vertical sensor array (VSA), and the CWL and sanitary sewer line (CSS) monitoring subsystems. The PSL, VSA, and CSS monitoring subsystems are monitored for the composition of soil gases and soil moisture content.

In 2008, 761 gallons (gal) of leachate were removed from the collection system; 1,043 gal of leachate were removed during 2007. The leachate is pumped from the containment cell leachate collection system on a weekly basis. The leachate is a listed hazardous waste (F039 - Leachate [liquids that have percolated through land disposed wastes] resulting from the disposal of more than one restricted waste classified as hazardous under subpart D of this part). The pumped leachate is containerized in 55-gal poly drums and stored in a RCRA 90 Day Storage Area. The waste is characterized by drawing a composite sample which is sent to an off-site laboratory for analysis. The waste is transported to the SNL/NM Hazardous Waste Management Facility (HWMF). The waste is subsequently shipped to and disposed by an off-site hazardous waste treatment facility.

Monitoring results for 2008 were consistent with baseline data established between October 2003 and September 2004. Baseline is defined as data collected monthly for one year after the closure of the containment cell in October 2003. VZMS monitoring results are compiled and reported on an annual basis; the most recent report was submitted in September 2008 (SNL 2008). The annual VZMS monitoring reports are submitted to NMED as required by the CAMU permit (EPA also receives a copy).

Groundwater Management Units

In 2008, SNL/NM ER personnel performed groundwater monitoring at CWL, MWL, Burnsite Groundwater (BSG), Tijeras Arroyo Groundwater (TAG), and TA-V. SNL/NM personnel will continue groundwater monitoring as a part of CMI and LTES. The Corrective Measures Evaluation (CME) report for TA-V was submitted to NMED in July 2005 and a Notice of Disapproval was received from NMED in July 2008. The CME report for TAG was submitted in September 2005, but no comments have been received from NMED. After regulatory selection and public review of the preferred remedy, CMI Plans can be prepared for TAG and TA-V. Revised monitoring under the CMI plan for TAG and TA-V cannot begin until NMED reviews and approves the CME reports and CMI plans.

MWL

The MWL was established in 1959 as a disposal area for radioactive waste and MW generated at SNL/NM research facilities. The landfill accepted approximately 100,000 cubic feet (ft^3) of LLW and minor amounts of mixed waste from March 1959 through December 1988. Tritium is the contaminant of primary concern at the MWL. It has been detected in surface and subsurface soils in and around the classified area of the landfill. However, there is no indication that tritium or other contaminants have migrated to groundwater, which is approximately 500 feet bgs at the MWL. Tritium is released from MWL soils to the atmosphere at low levels, which do not pose a threat to human health or the environment.

The monitoring network at the MWL consists of seven wells. During 2008, three down gradient wells and one background monitoring well were plugged and abandoned, and replaced by four new wells: MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9. These wells are required to be sampled for eight quarterly sampling events for numerous compounds, including an extensive list of metals, VOCs, water quality parameters, and radiochemical analysis. Perchlorate analysis is also performed for the newly installed wells for a minimum of four quarters. If perchlorate is detected above the screening level of 4 µg/L in a specific well perchlorate monitoring will continue (NMED 2004). Additional information on the analytical results for MWL well network can be found in Section 7.2.2.

On October 11, 2001, NMED directed Sandia and DOE National Nuclear Security Administration, (NNSA), Sandia Site Office (SSO) to conduct a CMS for the MWL. The MWL CMS Report was submitted to NMED on May 21, 2003. In the CMS, DOE and Sandia identified, developed, and evaluated corrective measures alternatives and recommended the corrective measures to be taken at the MWL. Based upon detailed evaluation and risk assessment, using guidance provided by EPA and NMED, DOE and Sandia recommended that a vegetative soil cover be deployed as the preferred corrective measure for the MWL.

NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy and issued a draft Class III modification to the Permit to incorporate corrective measure for the MWL. Following a public comment period, NMED conducted public hearings on December 2-3 and 8-9, 2004. On May 26, 2005, the Secretary of NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy for the MWL, based on the information in the administrative record and the hearing officer's report. The Secretary requested that a CMI Plan incorporating the final remedy be developed within 180-days following the selection of the remedy. The MWL is subject to a Final Order for Corrective Measures (FOCM) for the MWL issued by the Secretary of NMED.

On November 9, 2005, DOE/NNSA/SSO and Sandia submitted a CMI Plan to NMED documenting the plans for construction of a cover for the MWL. The document contains a description of the selected remedy, the objectives for the remedy, detailed engineering design drawings and construction specifications, a construction quality assurance (QA) plan, and a health and safety plan. The cover design consists of a vegetated 3-ft thick soil cover overlying a 1-ft thick rock bio-intrusion barrier. The design will rely upon soil thickness and evapotranspiration to provide long-term performance and stability.

The CMI Plan also included the results of a comprehensive fate and transport model that was used to assess the performance of the MWL and monitoring triggers for future action. The triggers identify and detail specific monitoring results that would initiate an evaluation process to determine whether corrective action was necessary.

In June 2006, the DOE/NNSA/SSO and Sandia began clearing and grubbing the subgrade at the MWL in preparation for eventual cover construction activities. NMED submitted a Notice of Disapproval (NOD) for the MWL CMI Plan in November 2006, requesting additional information regarding landfill construction plans and performance modeling. The MWL NOD also requested additional and more restrictive triggers for corrective action in the event that the proposed remedy designs fail to protect human health and the environment. DOE/NNSA/SSO and Sandia responses to the MWL NOD were submitted to NMED in December 2006 and January 2007. The third NOD was sent to NMED in December 2008. NMED granted approval of the CMI Plan the same month, which initiated the process of implementing the final remedy by installing the landfill cover. Construction is expected to be complete by the end of 2009.

In September 2007, DOE/NNSA/SSO and Sandia submitted to the NMED a Long-Term Monitoring and Maintenance Plan (LTMMP) to address monitoring, maintenance, and physical and institutional controls for the MWL. The LTMMP is currently under review and NMED has solicited public comment.

3.3 LONG TERM ENVIRONMENTAL STEWARDSHIP (LTES) ACTIVITIES

The SNL/NM LTES involves stewardship for past, present, and future activities at SNL/NM. The LTES program's purpose is to "promote the long-term stewardship of a site's natural and cultural resources throughout its operational, closure, and post-closure life cycle" (DOE/SNL 2006). The environmental programs mentioned in this document support that stewardship.

LTS of legacy sites is one component of the LTES program. Stewardship of legacy sites is defined as "activities necessary to maintain long-term protection of human health, the environment, and natural and cultural resources from hazards associated with residual radioactive and hazardous contamination at former ER sites." Sandia's LTS activities are increasing as remedial activities at ER sites are completed. The LTS Program conducts compliance oversight activities, including long-term monitoring, to meet NMED requirements, conducts institutional control (IC) activities, and outreach activities to keep the public apprised of the LTS Program. This increase in activity led to the completion of an LTES Implementation Plan in 2006 (DOE/SNL 2006).

Compliance Oversight Activities

More than 50 groundwater monitoring wells associated with former ER sites are monitored to meet NMED requirements. Water levels and water quality data are ascertained during this monitoring, and the data is reported in detail in SNL/NM's Annual Groundwater Monitoring Report. Monitoring wells are maintained or replaced as necessary. This year, one well in TA-V was replaced as part of the LTS Program. The LTS Program also conducts the long-term monitoring of the CAMU. Leachate is pumped weekly, and periodically sampled and disposed. This program produces the CAMU Vadose Zone Monitoring System Annual Monitoring Results Report, which contains more details on activities conducted, and sampling results. A comprehensive information management system is used to manage data from past sampling activities and currently generated monitoring data.

This system ensures that legally defensible monitoring data are created to ensure protection of human health and the environment.

IC Activities
Former ER sites that have not been cleaned up to residential risk standards are periodically inspected and maintained when necessary. An IC tracking system has been created to help manage site IC information.

Community Liaison and Stakeholder Involvement Activities
It is important that the public be made aware of the work being conducted to maintain long-term protection of human health, the environment, and natural and cultural resources from hazards associated with residual radioactive and hazardous contamination at former ER sites. A previously developed LTES exhibit at the National Atomic Museum has been updated this year to reflect changes with the LTES Program. Bi-annual newsletters and an Annual Site Environmental Report (ASER) summary pamphlet are published and distributed to the public. An LTES website was created for public access. It contains key environmental regulatory decision documents for all former ER sites and a map with site locations. The LTES website is continually updated as new regulatory documents are submitted by DOE/NNSA/SSO and Sandia to the NMED. Stakeholders participate in semi-annual DOE/Department of Defense (DoD) meetings on environmental activities, as well as periodic LTES/LTS working groups and meetings. These meetings drive community input regarding LTES/LTS and offer the opportunity for progress reports on the current status of LTES/LTS. The LTES/LTS Program has also completed work on the Community Checklist, which was compiled by Sandia's Members of the Workforce and community members who have an interest in LTES/LTS at SNL/NM. The Community Checklist contains the community members' questions about LTES/LTS. The questions were addressed with Members of the Workforce and posted to the LTES website. The Community Checklist will be updated annually with new concerns or questions from the community. Please visit the LTES website for more information:

http://ltes.sandia.gov/

Click on "Legacy" for information about LTS sites.

3.4 WASTE MANAGEMENT

Waste at SNL/NM is managed at ten facilities: the HWMF, the Thermal Treatment Facility (TTF), the RMWMF, five Manzano Storage Bunkers (MSB), the Auxiliary Hot Cell Facility (AHCF), and the Solid Waste Transfer Facility (SWTF). The primary waste types handled by these waste management facilities are shown below.

3.4.1 Hazardous and Chemical Waste

The HWMF packages, segregates, stores, and ships hazardous and chemical wastes. A lined catchment pond within the HWMF perimeter is used to contain all storm water runoff; if there is a spill or release, this is monitored before discharging. Hazardous waste is tracked from the point of generation to final disposal through meticulous "cradle to grave" documentation at each waste handling step. Each waste item received at the HWMF is labeled with a unique bar code, linking the item to the original disposal request. An individually coded waste item typically is a bottle, plastic bag, or other small item that contains chemicals or other waste.

All waste is reviewed at the HWMF before being placed in temporary storage. After sufficient quantities of items have accumulated in the storage bays, the items are packed into larger containers, which are also bar-coded. These packages are moved to an adjacent building to await shipment to a permitted treatment, storage or disposal (TSD) facility or recycling center. Waste is usually processed and shipped off-site within 90 days of receipt.

Applicable regulations for hazardous and chemical waste handled by the HWMF are listed in Chapter 9.

2008 Activities at the HWMF
In 2008, a total of 8,737 package items were handled by the HWMF. The HWMF shipped a total of 55,933 kg (123,311 pounds [lb]) of RCRA-regulated hazardous waste, including recyclable waste. Specific waste categories handled and shipped in 2008 are shown in Table 3-2.

Hazardous and Chemical Waste Minimization
In accordance with the requirements of Module IV, Section B.1 of Permit NM5890110518-1, Sandia annually certifies that there is a "program in place to reduce the volume and toxicity of hazardous waste generated by the facility's operation to the degree determined by the Permittee to be economically practicable" at SNL/NM. Waste minimization

TABLE 3-2. Waste Shipped by the HWMF in 2008

Waste Categories Handled at the HWMF	2008 Waste Shipped	
RCRA Waste	**(kg)**	**(lb)**
Hazardous Waste	52,247	115,185
Hazardous Waste (Generated by ER Project)	4	9
Hazardous Waste (Recycled)	3,682	8,117
Total	55,933	123,311
TSCA		
Asbestos	161,456	355,950
PCB (recycled NR)	9,337	20,585
PCB (dispose NR)	3,375	7,441
PCB (incin RCRA)	17	37
Total	174,185	384,013
BIOHAZARDOUS		
Infectious Waste	573	1,263
OTHER		
NR Waste (minus asbestos, PCB, subtitle D, ER, recycled)	206,446	455,136
Non-hazardous Solid Waste (RCRA Subtitle D)	3,011	6,638
Non-RCRA (Generated by ER Project)	0	0
Used Oil	5,373	11,845
Other (recycled) – various batteries, fluorescent lamps, and non-PCB (ballasts, capacitors, and oils)	61,631	135,873
Total	276,461	609,492
Total Waste and Recyclables Shipped	507,152	1,118,079

NOTES
HWMF = Hazardous Waste Management Facility
RCRA = Resource Conservation and Recovery Act
ER = Environmental Restoration
kg = kilograms
lbs = pounds
TSCA = Toxic Substances Control Act (primarily regulates asbestos and PCBs)
PCB = Polychlorinated Biphenyl

efforts are promoted throughout SNL/NM by the P2 program and investigated and implemented by line organizations with the support and technical assistance of the P2 program.

Hazardous and Chemical Recycling

Sandia recycles all categories of hazardous and chemical waste, where feasible. RCRA recycled waste includes various batteries, silver compounds, mercury compounds, lamps, capacitors, and toxic metals. A total of 3,682 kg (8,117 lb) of RCRA hazardous waste and 5,373 kg (11,845 lb) of used oil was recycled. "Other recyclable waste" includes miscellaneous recycled categories not regulated under RCRA or TSCA. This category includes various batteries, fluorescent lamps, various oils, and non-polychlorinated biphenyl (PCB) ballasts, lead, and capacitors. A total of 61,631 kg (135,873 lb) of material was recycled in this category. Waste recycled at SNL/NM in 2008 is summarized in Table 3-3.

Asbestos Waste Handling

The abatement of asbestos-containing equipment and building materials is ongoing. Removal of asbestos material is only done if the material is an inhalation hazard, or if the building is slated to be torn down or renovated. Typical asbestos-containing building materials are contained in floors, ceilings, and roofing tile, certain types of insulation, and other fire-retardant construction materials.

Similarly, in instances where laboratory equipment has asbestos-containing material in a non-friable form (which poses no inhalation risk), the item(s) in question are allowed to remain in service or are redistributed through the property reapplication program. Typical asbestos waste generated from equipment abatement consists of fume hoods, ovens, and cable insulation. In 2008, a total of 161,456 kg (355,950 lb) of asbestos waste was generated and disposed.

PCB Handling

PCBs are a class of organic chemicals that were widely used in industrial applications due to their practical physical and chemical properties. Use of PCBs included dielectric fluids (used in transformers, capacitors, etc.), hydraulic fluids, and other applications requiring stable, fire retardant materials. The domestic production and distribution of PCBs was banned in 1979, and their use continues to be phased out.

SNL/NM's Radioactive Waste and MW

LLW *is primarily contaminated with isotopes of strontium, plutonium, cobalt, americium, thorium, cesium, tritium, and uranium (plutonium and americium in LLW are below the activity level designated for TRU waste). Sandia's LLW inventory generally consists of laboratory waste, D&D debris, and PPE.*

MW *generally consists of a radioactive component with the addition of RCRA-hazardous component such as a metal or solvent.*

TRU waste *may derive from sealed instrument sources, D&D waste, PPE, and laboratory waste. The radioactive component in TRU is generally americium, plutonium, neptunium, and curium.*

Sandia has identified and replaced most PCBs and PCB-containing equipment. Previously, the largest quantity of regulated PCB-containing equipment in use at SNL/NM was capacitors contained inside fluorescent light ballasts manufactured before July 2, 1979. These have been almost completely eliminated due to an aggressive lighting retrofit program instituted in 1998. This program has removed all known PCB-containing ballasts running T12 lamps, replacing them with energy efficient, electronic (non-PCB) ballasts and T8 lamp technology. Other than fluorescent light ballasts, six PCB regulated items remain in use at SNL/NM. There are also six discrete areas of existing PCB spill contamination on concrete floors (from old transformers that have since been removed from service) which are being actively managed in compliance with an EPA/TSCA use authorization.

In 2008, Sandia performed a self-implemention site cleanup and disposal of PCB remediation waste at one PCB spill contamination area as part of the decommission and demolition of Building 807. All resulting waste was shipped off-site for disposal, and the area was sampled to verify that the cleanup objectives were met. In 2008, a total of 12,729 kg (28,063 lb) of PCB waste was shipped from the HWMF for disposal and recycle (Table 3-2). The majority of PCB waste items came from building demolition.

Explosive Waste

Explosive waste generated at SNL/NM is generally managed at the point of generation until it can be shipped to a treatment facility. Sandia operates the TTF, a unit in TA-III permitted for the treatment of certain explosive waste generated by research and test activities at an adjacent facility. In 2008, 203 kg (447 lb) of waste was treated at the TTF. In 2008, 14,614 kg (32,189 lb) of other explosive waste was transferred to KAFB for treatment. Also in 2008, Sandia shipped fourteen excess Sprint rocket motors, weighing 47,383 kg (104,368 lb), to a permitted out-of-state military installation for treatment by open detonation.

3.4.2 Radioactive Waste and MW

The RMWMF, AHCF, and MSB are used to manage LLW, MW, transuranic (TRU) waste, and mixed TRU waste (MTRU). The waste processing functions at the RMWMF include waste characterization, segregation, treatment, packaging, storage, and shipment to permitted off-site facilities. Wastes are stored at the MSB. The AHCF was not operational and did not manage wastes during 2008.

No high-level radioactive waste (HLW) is generated at SNL/NM. Although Sandia operates several nuclear reactors, no spent fuel has ever been produced since the original fuel rods are still viable. Furthermore, because SNL/NM is not a power producing utility, any spent fuel that would eventually be removed from the research reactors would not be classified as HLW.

All LLW, TRU, MTRU, and MW generators must contact the Radioactive Waste Program to obtain prior approval before generating waste; this allows development of a pathway for waste treatment and disposal before the waste is generated. The LLW and MW managed at the RMWMF is generated through a variety of processes. During 2008, both LLW and MW consisted of legacy wastes (wastes originally generated between 1990 and 1998), newly generated wastes from production processes, wastes from ER activities, and wastes generated during waste management activities at the RMWMF. MW also included wastes that had been treated at the RMWMF. TRU and MTRU wastes consisted of legacy wastes.

Applicable DOE Orders and regulations for LLW and MW management are listed in Chapter 9. Normally, radioactive waste is shipped off-site within a one-year time frame. This is similar to the requirements for hazardous waste and MW. Some LLW may remain on-site longer than one year. Generally, this is to achieve full utilization of transport vehicles by ensuring that vehicles are full prior to leaving the site.

SNL/NM's Radioactive Waste and MW

LLW is primarily contaminated with isotopes of strontium, plutonium, cobalt, americium, thorium,

cesium, tritium, and uranium (plutonium and americium in LLW are below the activity level designated for TRU waste). Sandia's LLW inventory generally consists of laboratory waste, Decontamination and Demolition (D&D) debris, and personnel protection equipment (PPE).

MW generally consists of a radioactive component with the addition of RCRA-hazardous component such as a metal or solvent. TRU waste may derive from sealed instrument sources, D&D waste, PPE, and laboratory waste. The radioactive component in TRU is generally americium, plutonium, neptunium, and curium.

2008 Activities at the RMWMF and MSB

In 2008, all four types of waste (LLW, MW, TRU, and MTRU) were stored at the RMWMF and MSB. On-site treatment at the RMWMF included chemical deactivation (including neutralization), thermal deactivation, stabilization and solidification, macro-encapsulation, and physical treatment (volume reduction).

In 2008, the RMWMF shipped 23,400 kg (51,574 lb) of LLW, and 7,718 kg (17,010 lb) of MW (650 cubic feet [ft^3]) to permitted off-site facilities for treatment and/or disposal. A five-year summary of radioactive waste shipped from SNL/NM is shown in Figure 3-1.

In 2008, 10,702 kg (23,595 lb) of MW was treated at the RMWMF to meet applicable hazardous waste treatment standards. Of the treated waste, 108 kg (238 lb) were rendered non-hazardous. The treated wastes were then stored at the RMWMF or MSB, or they were shipped to permitted off-site facilities.

TRU and MTRU were stored at SNL/NM during 2008. DOE and Sandia plan to send the TRU and MTRU to the Waste Isolation Pilot Plant (WIPP) (either directly or through the Idaho National Laboratory [INL] for final disposal.

3.4.3 MW Regulatory Status

As discussed in Section 2.1.4, Sandia manages MW that is subject to the Federal Facilities Compliance Order (FFCO) (NMED 2004). The requirements include:

- Deadlines for processing and/or disposing of various types of waste, and
- Providing an annual update of activities and the current inventory of stored waste still on-site.

SNL/NM compliance history regarding MW and the FFCO is shown in Chapter 9, Table 9-3.

MW Treatment

Chapter 9, Table 9-4 lists the current MW categories (TG-1 to TG-27, including TRU/MW) with the preferred treatment options and the status for each category. Five of the treatment technologies listed in

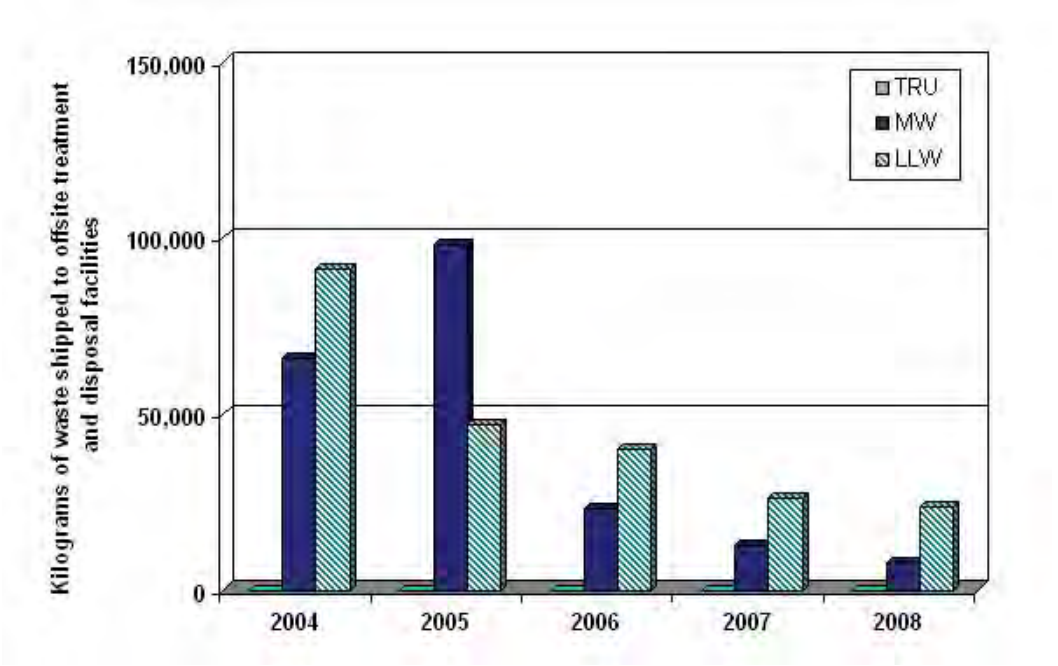


FIGURE 3-1. Five-Year Summary of Total Radioactive Waste Shipped at SNL/NM

TABLE 3-3. Categories of Waste Recycled at SNL/NM in 2008

Material	Pounds
Freon	31
Anti-freeze	7,836
Tires	13,400
Light Bulbs	19,328
Plastics	21,071
Toner/Ink Cartridges	33,011
Ceiling Tiles	40,000
Carpet	45,000
Batteries	49,181
Wood	49,985
Oil/Grease/Fuel	111,425
Computers/Electronics	311,916
Paper/Cardboard	1,031,539
Metals	4,202,445
Concrete/Asphalt	14,506,000

Table 9-4 are performed on-site at the RMWMF as described in the current RCRA Part B permit request (most recently updated in March 2007) and in the draft permit issued by NMED in August 2007.

MW Inventory in 2008

At the end of 2008, the majority of MW stored on-site consisted of inorganic debris and radioactive metallic objects with hazardous waste constituents and wastes that have been treated to meet hazardous waste treatment standards.

3.4.4 Solid Waste

The primary function of the SWTF is to collect, process, and ship for disposal solid waste from SNL/NM in compliance with all applicable regulations. The SWTF primarily accepts solid waste. It does not accept hazardous, radioactive, residential, or food service wastes.

SWTF Operations

Processing solid waste at the SWTF consists of screening 100 percent of the waste for prohibited materials, which are removed if identified. The waste is further screened when it is placed on a conveyor that passes under a radiation detection system. If radiation is detected above background levels, the conveyor is automatically shut down and the source is investigated. Note that screening 100 percent of the solid waste is not a requirement of any regulations, and is a good faith effort to prevent prohibited materials from inadvertently ending up in the landfill. The conveyor then feeds the waste into a baler where it is compressed into desk-sized bales. The bales are weighed, individually tracked, and loaded into a trailer for transport to a local landfill.

The SWTF also processes and ships (but does not collect) solid waste from Kirtland Air Force Base (KAFB) and DOE/NNSA. In 2008, the SWTF received 815,836 kg (1,796,995 lb) of SNL/NM solid waste and 1,089,028 kg (2,398,739 lb) of KAFB and DOE/NNSA solid waste.

Recyclables

The secondary function of the SWTF is to collect, process (screen, bale, and track), market, and ship the following recyclable materials from SNL/NM: cardboard, white paper, mixed paper, aluminum cans, scrap metals, printer consumables, and plastics (Table 3-3). Proceeds from the sale of recyclable materials are used to reinvest in the recycling program. The SWTF also provides some recycling support for KAFB and DOE/NNSA.

In support of small SNL/NM construction and demolition projects, the Construction and Demolition (C&D) Recycle Center accepts small quantities of C&D waste, but it is managed separately from the solid waste. The C&D Recycle Center provides contractors of small C&D projects a location to recycle cardboard, wood, and scrap metal.

3.5 P2 PROGRAM

3.5.1 Program Scope

The P2 Program provides guidance and technical support to reduce waste generation and resource consumption and to help improve the overall efficiency of processes and organizations within SNL/NM. To achieve continuous improvement, the program annually sets targets and activities for recycling, waste reduction, environmentally preferable purchasing (EPP), and reduction of environmental releases. The P2 program is directed by federal laws and DOE Orders, and guided by federal EOs, such as 13423 "*Strengthening Federal Environmental, Energy, and Transportation Management*" (see Chapter 9).

The P2 Program partners with numerous organizations at SNL/NM, including ES&H, Facilities Engineering and Procurement. P2 program staff research waste reduction technologies and strategies applicable to SNL/NM work processes, research avenues to reuse and recycle waste streams currently landfilled, and assist with cost-effective implementation for new waste reduction or recycling initiatives.

3.5.2 Awareness and Outreach

The P2 staff conduct awareness programs and outreach activities that promote and teach P2 strategies and technologies to waste generators. P2 staff also submit nominations for federal (DOE, EPA) and other award programs. P2 has an internal website for employees, and an external website which present P2 information and successes. Articles and press releases are regularly created that showcase P2 activities and awards to Sandia for its P2 accomplishments. Please visit the P2 website for more information.

http://p2.sandia.gov

The P2 Program's premier awareness event each year is the celebration of Earth Day. In 2008, Sandia's event was held on April 17 at the Steve Schiff Auditorium. The theme was "Go Full Circle – Reduce, Reuse, Recycle, Buy Green". An estimated 350 people attended the keynote talk by Dr. Robert Hirsch, on the topic of "Peak Oil." Dr. Hirsch was the lead author of the 2005 DOE report, "Peaking of World Oil Production: Impacts, Mitigation, & Risk Management" and spoke to the audience of the evidence of Peak Oil and mitigation measures that should be taken. During and after the talk, about 750 people checked out the 16 displays in the Auditorium Lobby. Many groups, within Sandia and non-governmental groups, participated by setting up booths reinforcing the theme and providing information on how people can reduce their environmental impact by waste reduction, recycling and making environmentally preferable ("green") purchases. Over 350 people turned in completed one-page surveys, receiving for their effort free gifts of either or both reusable grocery bags (20 percent recycled content) or hats (100 percent organic cotton).

P2 Awards

In 2008, Sandia received several awards for P2 accomplishments, detailed below.

Federal Awards for P2 Accomplishments

Sandia won two DOE P2 Star Awards (highest level P2 award in DOE) in 2008, one for its electronics stewardship results in 2007, and the other being an honorable mention, for its Green Chemistry application example. These efforts were both awarded DOE/NNSA Best-in-Class in January 2008 (see 2007 ASER for further details).

Electronics Stewardship: In June, SNL/NM was presented with a 2008 DOE P2 Star award for its significant accomplishments in electronics stewardship in all three life-cycle stages. In April 2008, Sandia received a Bronze-level recognition from the Federal Electronics Challenge (FEC) for meeting all of the mandatory requirements in the three life-cycle stages, and additional optional measures in the Purchase stage. In December 2008, Sandia was notified that it won the FY08 Electronics Reuse and Recycling Campaign (ERRC) for the South Region - Large Civilian category, for reapplying almost 16,000 computer units and recycling over 316,000 lbs of excess electronics equipment. SNL/NM was one of 12 winners, and one of five DOE winners, out of 135 total participating federal sites. Sandia contributed a little over 25 percent of DOE's total, to help DOE win the agency ERRC award for the third year in a row.

Waste Minimization– DOE P2 Star Award: In June 2008, Sandia was presented an honorable mention 2008 DOE P2 Star award for using a green chemistry approach in a Work for Others (WFO) production process. In this outstanding example of waste minimization, scientists in Sandia's Ceramic and Glass Department eliminated 3,216 kg of waste, saving $90,000 for this one time process.

The original bench scale process was developed to produce powder used for a hydrogen generation application. The customer wanted the process size scaled up 50-times to accommodate larger batches of material. Simply scaling the bench process would have generated 3,304 kg of liquid waste to produce four kg of the desired material, with a disposal cost over $92,500. By altering the stoichiometry and making three significant changes to the process, the total waste was reduced by 97 percent to 88 kg.

For work completed in 2008, Sandia was notified in January 2009 that it received five awards in three different categories from the DOE/NNSA P2 Program for work completed in 2008. The NNSA P2 category/awarded projects are:

Environmental Stewardship

- Recycling/Installing Tents improve and expand recycling at SNL/NM.
- Green Purchasing/EPEAT at SNL/NM – Meeting a Higher Standard.
- Waste Minimization/One Man Re-use project saves over $110,000 and counting.

Best in Class

- Waste Minimization/ P2 measures implemented in D&D Projects.
- Waste Minimization/ Semiconductor Fabrication De-Ionized Water Reduction.

Recycling Bins at SNL/NM

One of the *Best in Class* awards, "P2 measures implemented in Decontamination and Demolition Projects", was submitted by NNSA to be considered for the prestigious White House Closing the Circle Award, to be announced in April 2009. It also won the DOE's Environmental Sustainability Star (EStar) award, announced in March 2009. This nomination highlighted:

- an 86 percent reduction of mixed (radioactive and hazardous) waste, saving greater than $650,000 in waste disposal costs,
- salvage of various equipment and material totaling more than $50,000 in reuse value,
- recycling of more than 1,100 tons of scrap metal and more than 5,000 tons of concrete debris, and
- application of 182,000 yd^3 of crushed recycled concrete as site cover instead of using mined aggregate material, at a savings greater than $54,000.

3.5.3 Environmentally Preferable Purchasing Program (EPP)

Purchasing EPPs and establishing purchasing arrangements with environmentally-aware companies is accomplished through Sandia's contract requirements. Sandia has issued single-source contracts to supply some items and awarded contracts containing EPP requirements for other suppliers. The toner cartridge and motor oil single-source contracts require the vendor to accept used product collected by Sandia, and then remanufacture the spent items into new products for purchase by Sandia. These are examples of how Sandia "closes the loop" by recycling used products and then buying replacement products that have recycled content (RC).

Sandia tracks the purchase of approximately 50 types of products in eight selected categories per the EPA's Comprehensive Procurement Guidelines (CPG) for recycled content products. CPG is a government initiative to create markets for RC products. In 2008, Sandia achieved 97 percent compliance with the EPA CPG on $4.68 million applicable purchases; about 38 percent was for recycled content products and the remainder was for "justified" purchases for which a recycled content alternative meeting the criteria was not available. The P2 program works each year to shift "justified" purchases to RC product purchases. In one instance of going beyond the minimum, about 25 percent of Sandia's annual paper purchases are for 100 percent post-consumer recycled content paper, with the remainder being the 30 percent post consumer recycled content (PCRC) paper. To learn more about CPG, go to the following website:

http://www.epa.gov/epawaste/conserve/tools/cpg/index.htm

3.5.4 Waste Reduction

Sandia continues to work on reducing the quantities of waste it generates. Implementation results accomplished in 2008 are highlighted below:

- A Process Improvement Team was formed to promote implementation of the recommendations reduced the weep of the Quick-Dump-Rinse (QDR) De-Ionized (DI) water baths by 32 QDR, the process is now saving almost 1.4 million gal per month, which went beyond the recommendations in the P2 Opportunity Assessment (PPOA). The savings prolong the life of the ion exchange resin beds, and the cost savings are $170,000 per year, accounting for the daily savings of DI water production costs.
- One process improvement in the semiconductor fabrication operations will reduce the Photo-Resist solvent (PRS) by 40 percent, with no negative impact to the yield.

The day after Earth Day 2008, it was announced that the printed publication of *Lockheed Martin (LM) Today* (the newspaper) would be replaced at SNL/NM with an on-line version. This is a significant 11,000 copies per month waste reduction (more than 130,000 copies annually) that are no longer received by the mail room. This represents a savings of:

- About 12 tons of paper per year no longer printed,

- About 400 ft^3 of paper waste not being added to the landfill, per estimates over half of the newspaper was being thrown in the trash, and
- Reduced labor in the mail room as staff no longer sorts and delivers the newspaper to SNL/NM buildings.

In 2008, Sandia reduced its solid waste to the Rio Rancho landfill by about 25 percent compared to the previous year. Some of this is attributed to organizational moves from buildings on KAFB to buildings in the off-site Sandia Science and Technology Park (SS&TP), however, the overall reduction is still estimated to exceed 15 percent.

3.5.5 Electronics Stewardship

Electronics Stewardship covers the life-cycle impacts of electronic office equipment ownership; this is a new area included in environmental protection as identified by the DOE in the revised DOE Order 450.1A (DOE 2008). Life-cycle includes product purchase, operations and disposal. Sandia has made significant progress in this area, but previously it was described separately in the EPP and recycling sections.

In 2008, Sandia continued its partnership in the Federal Electronics Challenge (FEC) program. The FEC promotes a comprehensive approach to reducing the environmental impact of electronics assets ownership. One part of that is by use of the Electronic Product Environmental Assessment Tool (EPEAT) for office computer system purchases. EPEAT is a set of criteria used to determine the environmental attributes of a particular electronic or office product; currently, EPEAT is only targeting computer desktops, towers, laptop computers and monitors.

In 2008, 99 percent of Sandia's purchases of computers, laptops and liquid crystal display (LCD) monitors were EPEAT Silver or higher. Of that total, about two-thirds of the computer purchases were EPEAT Gold; the higher rating means the product had: intentionally eliminated cadmium and hexavalent chromium, plastic housing free of polyvinyl chloride (PVC) – commonly referred to as vinyl, batteries free of lead, mercury and cadmium, and the product itself is greater than 90 percent reusable or recyclable (there is no price premium for the Gold EPEAT qualified unit).

Sandia addresses the operations aspect of electronics office equipment by ordering and enabling Energy Star qualified equipment. This is applicable to monitors, printers and other imaging equipment such as fax machines and copiers, and means that the equipment reduces to minimum power (less than10 percent of normal) when not needed after a set delay period.

Sandia's Property Reapplication Services receive and reapply equipment and material that still has value. One continuing stream of equipment received that usually cannot be reapplied after a certain technology threshold is reached are computers, monitors and other office electronics equipment. With a total of ten shipments in 2008, SNL/NM was able to recycle over 5,800 desktop computers, 885 laptop computers, 1,800 CRT monitors, 175 LCD monitors and miscellaneous other electronic scrap totaling almost 170 tons and achieving 100 percent recycling of a waste stream that Sandia would be required to categorize as hazardous if disposed of in a landfill. Sandia has an arrangement with an approved electronics recycling vendor to make sure all excess electronics assets are recycled compliant with federal regulations. Almost 16,000 computer units were reapplied to new owners within Sandia.

3.5.6 Recycling

Sandia accounts for its recycling in two separate categories:

- routine (which is waste from recurring and/or typical office operations), and
- non-routine (which is from intermittent clean-up and construction activities).

In 2008, 47 percent of Sandia's routine waste and nearly two-thirds of non-routine waste was recycled. This diverted more than 10,220 tons (20,440,000 lbs) of waste from landfills. Table 3-3 shows the breakdown of recycling by waste stream.

This year, recycling of mixed paper became a significant effort, compared to previous years. A 2004 study at SNL/NM revealed that mixed paper created in the office waste stream offered a significant opportunity for recycling. Since 2000, mixed paper was only recovered from operations in the Mailroom and the Technical Library. Earth Day 2008 was used to announce the launch of the pilot program for mixed paper recycling. Initially, only eight 6 yd^3 dumpsters were deployed around the site and before the end of the year; the pilot program has since grown to include 21 outdoor dumpsters and approximately 250 hallway bins inside 30 buildings. The effort is buoyed by 32 volunteers ("champions") in 26 buildings. In the past year, the quantity of mixed paper recycling diverted from the trash each month has more than doubled to an average of 6,900 lbs. Overall, a 40 percent increase in mixed paper recycling has been realized.

As described under Section 3.4 of this chapter, Sandia routinely recycles a variety of materials that arrive at its waste management facilities. In addition to the typical office waste recyclables (paper, cardboard, aluminum and plastic beverage containers), Sandia also recycles lamps & ballasts, used oil, and lead-acid batteries. Sandia's office operations waste recycling rate in 2008 was 27 percent, but when all other routine operation recycled materials are included, the number increases to nearly 50 percent.

The P2 recycling tent (installed in summer 2007 at the Reapplication Services yard) went into its first full year of operation in 2008. The 4,000-sq ft. sprung tent structure, paid for with recycling revenues, enabled the storage of excess electronics, carpet tile, ceiling tile, surplus toner cartridges and other printer maintenance supplies (all of which require protection from the weather for optimum reuse or recycle value). Sandia has not been able to recycle ceiling tile on a single-instance basis since 2004, when a building's demolition produced a full truck-load of tiles making it cost-effective to recycle. In 2008, Sandia sent one shipment of ceiling tiles (weighing 40,000 lbs) for recycling, using the Armstrong World Wide Industries recycling program. This was followed with the first truck-load of carpet (weighing 45,015 lbs) which was shipped through the Interface Carpet Manufacturers ReEntry recycling program. These two shipments are examples of non-routine waste recycling at SNL/NM that are available to Sandia, and P2 staff asserted that no carpet tile or mineral fiber ceiling tile should ever be sent to the landfill again.

The P2 program conducted the first crushing event at the Concrete and Asphalt Recycling Area (CARA) in 2008. The CARA was established as an accumulation site for concrete and asphalt rubble generated by Sandia construction-like activities. The rubble is periodically crushed to meet specific aggregate material requirements, and becomes a valuable commodity for reuse at SNL/NM for applications such as base course beneath asphalt pavement, paving material for remote dirt roads, and as general surface cover. Projects using crushed aggregate material reimburse the P2 program based on the quantities used, thus providing a financially self-sustaining operation. Approximately 7,253 tons (14,506,000 lbs) of concrete and asphalt were crushed in 2008, representing the largest recycle stream at SNL/NM. P2 has identified customers for using this product in 2009.

In 2008, the P2 program made further progress in its major focus areas (Waste Reduction, Electronics Stewardship, EPP and Reuse/Recycling and Awareness programs) with the intent to institutionalize approaches and actions supporting environmental sustainability into the daily work activities of Sandia's mission-related and support programs. The P2 program has set new targets for 2009 for continuous improvements in environmental sustainability. The 2009 environmental sustainability targets for the P2 program include increasing the recycle rate for both routine and non-routine waste streams; increasing purchases of biobased products in the area of penetrating lubricants and vacuum pump oil; reducing quantities of toxic chemical (mercury) inventories in laboratories; and increasing the procurement of electronic products meeting the EPEAT Gold performance standard.

3. 6 BIOLOGICAL CONTROL ACTIVITIES

The Biological Control Activity provides customer support related to animal control issues and compiles information on pesticide use at SNL/NM. Animal control support includes providing general information and resolving issues related to removing nuisance animals. Requests for assistance in resolving nuisance animal problems are relayed and documented through Sandia's Facilities Telecon Organization. This effort may involve interacting, as necessary, with the U.S. Air Force (USAF) and State of New Mexico agencies to resolve animal control issues. The Biological Control Activity also involves providing support in addressing animal-borne disease concerns (e.g., Hantavirus) through activities including disinfecting, sanitizing, and cleaning up areas infested with rodents or pigeons.

Pesticide use at SNL/NM includes the use of herbicides for weed control, rodenticides for controlling mice, and insecticides for the control of insects in food service and work areas. Sandia uses EPA-registered pesticides that are applied by certified pest control agencies. Material Safety Data Sheets (MSDSs) and product labels for pesticides used at SNL/NM are maintained under the program. Pesticide use (product names and amounts applied) are documented in quarterly reports. Documents related to the program are listed in Chapter 9.

3.7 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE PROGRAM

Sandia provides DOE/NNSA/SSO with technical assistance supporting compliance with NEPA and the National Historic Preservation Act (NHPA). The SNL/NM NEPA Team reviews projects for conformance to existing DOE NEPA documents and determinations. The use of the ISMS NEPA Module software facilitates SNL/NM NEPA reviews, citing existing NEPA documentation as appropriate. The ISMS NEPA Module also streamlines DOE/NNSA/SSO's review and approval of NEPA compliance, when required, and supports QA by providing a consistent framework that makes NEPA compliance documentation and information readily available. For some projects, a NEPA review or an Air Force Form 813 is prepared for DOE review and determination, if the proposed action:

- Does not fall within the analysis of an existing SNL/NM NEPA document, or
- Would occur on USAF property (permitted, or requested to be permitted, for SNL/NM use).

NEPA program documents and regulations are listed in Chapter 9. See Table 3-4 for summary of compliance reviews.

SNL/NM Site-Wide Environmental Impact Statement (SWEIS)

The SWEIS update process continued to undergo revision during Calendar Year (CY) 2008 to better track and evaluate environmental operational limits at both the facility and site level. To accomplish this, Environmental Planning personnel met with representatives from SNL/NM facilities to discuss environmental operational limits (site and facility limits on parameters such as water and electricity use, waste generation, and air emissions) and their significance within the SWEIS and other NEPA coverage. Causes for exceeding operational parameters were researched and tracked. Exceedances were also put into the context of future activities, for example, whether an exceedance was a one-time event or represented a permanent change in facility configuration or operations.

2008 NEPA Documentation

The NEPA Team participated in the completion of the following environmental documents:

(1) the *Final Environmental Assessment for the Expansion of Permitted Land and Operations at the 9940 Complex and Thunder Range at Sandia National Laboratories/New Mexico* (DOE/EA-1603);
(2) the *Complex Transformation Supplemental Programmatic Environmental Impact Statement (Complex Transformation SPEIS)* (DOE/EIS-0236-S4), for Operations Involving Plutonium, Uranium, and the Assembly and Disassembly of Nuclear Weapons, and for Tritium Research and Development, Flight Test Operations, and Major Environmental Test Facilities (DOE 2008b);
(3) an *Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for the Hawaii Range Complex (HRC), Hawaii* (DoD 2008);
(4) a draft SAND report for SNL/NM Existing Environmental Analyses Bounding Environmental Test Facilities; and
(5) two white papers on facility upgrades, one for Red Storm scientific computing, and the other for Center for Integrated Nanotechnologies (CINT) biological nanomaterials laboratories.

The NEPA Team reviewed a total of 1,587 proposed projects in the ISMS NEPA module and other corporate applications. Seventy NEPA checklists were transmitted to the DOE/NNSA/SSO for review and determination in 2008.

Summary data for SNL/NM NEPA compliance reviews performed in 2008 are detailed in Table 3-4.

3.8 ENVIRONMENTAL OUTREACH PROGRAM

SNL/NM's Environmental Outreach Program reaches out to the community via various events, and provides environmental information to members of Sandia's workforce. The outreach program supports Sandia's EMS and LTES Programs. Sandia recognizes that in addition to complying with requirements, it is important to communicate with Sandia's workforce and the local community to help reduce environmental impacts at work and at home. Sandia has an integrated approach to communicate environmental awareness to its workforce via quarterly EMS Newsletters, semi-annual LTES newsletters, awareness campaigns, and various outreach events. Sandia collaborates with numerous internal and external organizations such as Sandia's Energy Management Team, Sandia's Long-range Development Plan Team, the City of Albuquerque (COA) , and the Environmental Education Association of New Mexico.

Currently, Sandia participates in or holds several internal and external outreach and awareness events. Events conducted in FY08 include the First Annual

TABLE 3-4. Summary Data for SNL/NM NEPA Compliance Reviews Submitted to DOE/NNSA/SSO in 2008

NEPA Reviews	Review Breakouts		Quantity
Corporate NEPA Software System	Reviewed by SNL/NM NEPA Team		358
	Reviews Submitted to DOE/NNSA/SSO		70
Other Corporate NEPA Reviews	Completed by SNL/NM NEPA Team		1,133
DOE / U.S. Air Force NEPA Documents	New Land-Use Permit Reviews	0	
	Land-Use Permit Renewal Reviews	16	
	Land-Use Permit Termination Reviews	1	
	Project-Specific Reviews	9	
	Environmental Assessments Under AF Activities	0	
	Subtotal for USAF Reviews Submitted		26
Grand Total of all NEPA Reviews			**1,587**
Percentage of Total Reviews Requiring Submittal to DOE ***Total DOE Reviews*** (70 + 26 = 96) ***divided by Total NEPA Reviews*** (1,587) =			6 %

NOTES:
NEPA = National Environmental Policy Act
SNL/NM = Sandia National Labs / New Mexico
DOE = U.S. Department of Energy
USAF = United States Air Force
% = percent

Earth, Wind and Sun Sustainability event, New Mexico Environmental Health Conference; Teachers' Open House, Los Lunas Science Show, Youth Conference on the Environment; School to World, Sandia Earth Day; Take Our Daughters and Sons to Work Day; and Semi-annual EMS Excellence Awards Ceremony. Sandia also coordinates the semi-annual DOE Public Meeting. At these events, the outreach team distributes fact sheets and newsletters; when working with children, the team often demonstrates environmental education models on topics including local air quality, landfills, and watershed education. The Outreach team also encourages the Members of the Workforce and the community to provide feedback and ask questions about Sandia's environmental programs.

In July 2008, Sandia hosted the first annual Earth, Wind and Sun sustainability event. The event was focused around the added requirements of the new EO (13423) and DOE Orders (450.1A and 430.2B), which formally expanded the scope of an EMS to include Energy and Water Conservation, Fleet Operations and Sustainable Building activities. The two-day event featured keynote speaker Edward Mazria, an internationally recognized architect, author, and educator who presented "Buildings and Climate Change: Energy Conservation, Solar and Daylighting Design." In addition, 30 exhibitors were hosted (including Sandia's Programs and external commercial and non-profit organizations), highlighting information on energy, water, and alternative transportation options. Sandia also offered tours to the Leadership in Energy and Environmental Design (LEED®) Certified buildings and Sandia's solar research and test facilities. A series of workshops for the community, Sandia's Members of the Workforce and management was conducted. Topics included "Greening Your Life," "Ecology of National Security," Ecological Footprinting," "Tax Incentives," "Installing Photovoltaics," and a panel discussion on alternative energies. Over 1,200 people attended the Earth, Wind and Sun event.

The Annual Youth Conference on the Environment is a free, one-day conference offered to high school students as a means to educate them on various environmental issues. In 2008, the conference focused on the Rio Grande River and its surrounding ecosystem. Over 150 students attended presentations about the river's water quality and habitat species. The event was co-sponsored by Sandia, the Environmental Education Association of New Mexico (EEANM), and the COA.

The semi-annual EMS Excellence Awards Program recognizes Members of the Workforce who demonstrate environmental excellence in five specific categories (energy reduction/water conservation, risk mitigation/ environmental protection, environmentally preferable purchasing, waste minimization, and recycling). Since its inception in 2006, the EMS Team has received over 120 nominations from individuals and teams who are contributing to Sandia's vision of EMS. For additional information, please visit the following websites:

http://ltes.sandia.gov
http://environment.sandia.gov/new/ndex.shtml

4.0 Terrestrial and Ecological Surveillance

This chapter provides a summary of the following:

- Terrestrial Surveillance Program
- Ecological Surveillance

4.1 TERRESTRIAL SURVEILLANCE PROGRAM

Terrestrial surveillance is conducted at Sandia National Laboratories, New Mexico (SNL/NM) to detect the possible deposition or migration of contaminants to off-site locations and to determine the impact, if any, of SNL/NM's operations on human health or the environment.

The Terrestrial Surveillance Program samples surface soils, arroyo and river sediments, and vegetation from various on-site, perimeter, and off-site locations. The samples are used to detect the presence of anomalous radiological and non-radiological constituents.

Various locations have been used for sample collection for one to 20 years. Some of the older sampling locations are no longer relevant to current operations. In the future, routine sampling for non-radiological parameters at fixed locations will be reduced, and greater emphasis will be placed on sampling specific areas with potential environmental impact. However, the total number of samples collected annually should remain approximately the same as in the past. Several significant programmatic changes have occurred over the years, and are documented in this chapter.

4.1.1 Program Objectives

The Terrestrial Surveillance Program is designed to meet the objectives of the U.S. Department of Energy (DOE) Order 450.1A, Environmental Protection Program (DOE 2008):

- Collect and analyze samples in order to characterize environmental conditions and identify trends,
- Establish baseline (or background) levels of radiological and non-radiological constituents,
- Assess the effectiveness of Pollution Prevention (P2) and abatement programs,
- Identify new or existing environmental quality problems and their potential impacts on human health or the environment, and
- Verify compliance with applicable laws and regulations, as well as commitments made in official documents (such as Environmental Impact Statements [EISs], in accordance with the National Environmental Policy Act [NEPA]).

Standards for Comparison

No regulatory limits are available to directly compare concentrations of some radiological or non-radiological constituents in surface soils, vegetation, or sediments. SNL/NM conducts statistical analyses to compare the results from on-site and perimeter samples to off-site results, and to establish trends in order to identify possible pollutants and their potential impact on human health or the environment. However, If anomalies are observed, there are various documents used for guidance with risk assessment, such as DOE Order 5400.5 Radiation Protection of the Public and the Environment (DOE 1993).

In addition, sample results for metals in surface soils are compared to U.S. surface soil average concentrations (Kabata-Pendias 2000), local/regional surface soil average concentrations, (Dragun and Chekiri 2005), or site-specific surface soil concentrations (Dinwiddie 1997). A summary report of metals-in-soils at SNL/NM collected annually between 1993 and 2005 has been prepared and serves as another point of reference (SNL 2006).

In summary, the mean value of non-radiological constituents in soils is less than the residential level of the State of New Mexico soil screening guidelines, with the exception of arsenic. However, the mean value for arsenic is less than the industrial level set by State of New Mexico soil screening guidelines. For an added measure of sample verification, the DOE Oversight Bureau of the New Mexico Environment Department (NMED) split samples with SNL/NM at several locations.

Statistical Analysis

Samples are generally collected from fixed locations to effectively enable statistical comparisons with results from previous years. Statistical analyses are performed to determine if a specific on-site or perimeter location differs from off-site values and to identify trends at a specific sampling location. Since multiple data points are necessary to provide an accurate view of a system, the Terrestrial Surveillance Program does not rely on the results from any single year's sampling event to characterize on-site environmental conditions. Results from a single sampling point may vary from year to year due to slight changes in sampling locations, differences in climatic conditions, and laboratory variations or errors. Therefore, as the amount of data increases, the accuracy of the characterization increases.

The results of the statistical analyses allow SNL/NM to prioritize sample locations for possible follow-up action. The prioritization process is a decision-making tool used to assist in the determination of the appropriate level of concern for each sample result. The Statistical Analysis Prioritization Methodology (Shyr, Herrera, and Haaker 1998) is based on two "yes or no" questions resulting in a matrix of four priority levels. The matrix is shown in Table 4-1. In addition, a qualitative visual inspection of a graphical presentation of the data is conducted to compare sampling results

TABLE 4-1. Decision Matrix for Determining Priority Action Levels

Priority	Are results higher than off-site?*	Is there an increasing trend?	Priority for further investigation
1	Yes	Yes	Immediate attention needed. Specific investigation planned and/or notifications made to responsible parties.
2	**Yes**	No	Some concern based on the level of contaminant present. Further investigation and/or notifications as necessary.
3	No	**Yes**	A minor concern since contaminants present are not higher than off-site averages. Further investigation and/or notifications as necessary.
4	No	No	No concern. No investigation required.

NOTES: Based on *Statistical Analysis Prioritization Methodology* (Shyr, Herrera, and Haaker 1998).
*Some sites may appear higher than off-site. However, there may not be a statistically significant difference.

to regional, local, and site-specific concentrations. This step is performed to ensure that anomalous data that would otherwise pass statistical scrutiny is flagged for further investigation.

In 2000, SNL/NM changed to analytical laboratories with lower detection capabilities for many of the metals. The analysis in 2008 utilized data from the same analytical laboratory since 2000.

In some instances, this qualitative inspection of the data is augmented by the graphical evaluation methodology described and documented in the 1993-2005 *Metals-in-Soil Summary Report* (SNL 2006). This enables the visual identification of anomalies in the data that stand out from the data population for the entire site, or just that location. This is particularly useful where insufficient data exists for trending, but comparison of new data to "expected values" is desired.

4.1.2 Sample Media

Samples of surface soils, arroyo and river sediments and vegetation are collected as part of the Terrestrial Surveillance Program and analyzed for radiological and non-radiological constituents.

Soil
Soil samples are collected to ascertain the presence or buildup of pollutants that may have been transported by air or water and deposited on the ground surface. Approximately 1,500 grams (g) of sample is collected from the top two inches of soil in accordance with SNL/NM Field Operating Procedures (FOPs). In 2008, soil samples were collected from locations indicated in Tables 4-2, 4-3 and 4-4. In addition, a special sampling campaign and summary report of non-radiological parameters (Target Analyte List [TAL]) was prepared for several areas in Thunder Range (*Thunder Range July-August 2008 Field Report on Baseline Sampling*) (SNL 2009) (see Appendix E on attached CD) to serve as a baseline for future reference regarding non-radiological results in nearby soils.

Sediment
Sediment samples are collected from arroyo beds and from the banks of rivers and creeks to ascertain the presence, or buildup, of pollutants deposited from surface waters. Approximately 1,500 g of sample is collected from the top two inches of soil in accordance with SNL/NM FOPs. Sediment samples were collected from locations listed in Tables 4-2, 4-3 and 4-4.

Vegetation
Vegetation is sampled to monitor for potential uptake of radioactive pollutants, which could provide an exposure pathway to foraging animals and to humans through the food chain. In actuality, human exposure to contaminants through the food chain is highly unlikely on Kirtland Air Force Base (KAFB) since there is no hunting, livestock, or commercial farming within the boundaries of the base. Approximately 500 g of sample is collected, preferably from perennial grass, by cutting back several inches of growth from the plant. If grass is not available, samples from small leafy plants may be collected. In 2008, no vegetation was collected due to the on-going drought.

Gamma Radiation Levels
Gamma radiation levels are measured using thermoluminescent dosimeters (TLDs) to determine the impact, if any, of SNL/NM's operations on ambient radiation levels. The TLDs are changed out on a quarterly basis and processed at an on-site

TABLE 4-2. On-site Terrestrial Radiological Surveillance Locations and Sample Types

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
1	Pennsylvania Ave.	X			X
2NW	Mixed Waste Landfill (MWL) (northwest)	X			X
2NE *	MWL (northeast)	X			
2SE	MWL (southeast)	X			
2SW	MWL (southwest)	X			
3	Coyote Canyon Control	X			X
6	Tech Area (TA) III (east of water tower)	X			X
7 *	Unnamed Arroyo (north of TA-V)	X			X
27	Albuquerque Fire Station 11, Southern SE				X
31	TA-II Guard Gate				X
33	Coyote Springs	X		X	
34	Lurance Canyon Burn Site	X			
35	Chemical Waste Landfill (CWL)	X			
41	TA-V (northeast fence)	X			X
42	TA-V (east fence)	X			X
43	TA-V (southeast fence)	X		X	X
45	Radioactive and Mixed Waste Management Facility (RMWMF), TA-III (northwest corner)	X			X
45E	RMWMF, TA-III (east fence)				X
46	TA-II (south corner)	X			X
47	Tijeras Arroyo (east of TA-IV)				X
48	Tijeras Arroyo (east of TA-II)				X
49	Near the Explosive Components Facility (ECF)	X			
51	TA-V (north of culvert)	X			
52	TA-III, northeast of Bldgs. 6716 and 6717	X			
53 *	TA-III south of long sled track	X			
54	TA-III, Bldg. 6630	X			
55	Large Melt Facility (LMF), Bldg. 9939	X		X	
56	TA-V, Bldg. 6588 (west corner)	X			
57	TA-IV, Bldg. 970 (northeast corner)	X			
66	KAFB Facility	X			X
72	Arroyo del Coyote (midstream)		X		
74N	TA-IV, Tijeras Arroyo (midstream)		X		
75	Arroyo del Coyote (down-gradient)		X		
76	Thunder Range (north)	X			
77	Thunder Range (south)	X			
78	School House Mesa	X			
79	Arroyo del Coyote (up-gradient)	X	X		
83	Tijeras Arroyo GW Well		X		
84	Storm Water Monitoring Point (SWMP)-10		X		
85	Arroyo del Coyote Cable Site		X		
86	Corner of Wyoming and S Street	X			X

NOTES:

* = Replicate sampling locations: In addition to single samples taken for each medium, two replicate samples are collected for internal checks on comparability of sampling and analysis.

TLD = thermoluminescent dosimeter

TABLE 4-3. Perimeter Terrestrial Radiological Surveillance Locations and Sample Types

Location Number	Sampling Location	Soil	Sediment	Vegetation**	TLD
4	Isleta Reservation Gate	X			X
5	McCormick Gate	X			X
12	Northeast Perimeter	X			
16	Four Hills	X			X
18	North Perimeter Road				X
19	USGS Seismic Center Gate	X			X
39	Northwest DOE Complex				X
40	Tech Area I, northeast (by Bldg. 852)				X
58	North KAFB Housing	X			
59	Zia Park (southeast)	X			
60	Tijeras Arroyo (down-gradient)	X	X		
61	Albuquerque International Sunport (west)	X			
63	No Sweat Boulevard	X			
64 *	North Manzano Base	X			
73 *	Tijeras Arroyo (up-gradient)		X		
80	Madera Canyon	X			
81	KAFB West Fence	X			X
82	Commissary	X			
87	Mesa del Sol (North)	X			
88	Mesa del Sol (Middle)	X			
89	Mesa del Sol (South)	X			

NOTES: TLD = thermoluminescent dosimeter ** = No vegetation samples were collected due to the ongoing drought.
* = Replicate sampling locations: In addition to single samples taken for each medium, two replicate samples are collected for internal checks on comparability of sampling analysis.

TABLE 4-4. Off-site Terrestrial Radiological Surveillance Locations and Sample Types

Location Number	Sampling Location	Soil	Sediment	Vegetation**	TLD
8	Rio Grande, Corrales Bridge (up-gradient)	X	X		
9	Sedillo Hill, I-40 (east of Albuquerque)	X			
10	Oak Flats	X			X
11 *	Rio Grande, Isleta Pueblo (down-gradient)	X	X		X
21	Bernalillo Fire Station 10, Tijeras				X
22	Los Lunas Fire Station				X
23	Rio Rancho Fire Station, 19th Ave.				X
24	Corrales Fire Station				X
25	Placitas Fire Station	X			X
26	Albuquerque Fire Station 9, Menaul NE				X
27	Albuquerque Fire Station 11, Southern SE				X
28	Albuquerque Fire Station 2, High SE				X
29	Albuquerque Fire Station 7, 47th NW				X
30	Albuquerque Fire Station 6, Griegos NW				X
62	East resident	X			
68	Las Huertas Creek		X		

NOTES: TLD = thermoluminescent dosimeter ** = No vegetation samples were collected due to the ongoing drought.
* = Replicate sampling locations: In addition to single samples taken for each medium, two replicate samples are collected for internal checks on comparability of sampling analysis.

laboratory. TLDs were collected from locations listed in Tables 4-2, 4-3 and 4-4.

4.1.3 Sampling Locations

To the extent practicable, "sentinel" sampling locations are consistent from year to year in order to establish trends. Occasionally, sampling locations are added or dropped for different reasons, including the start-up of a new facility or operation, closure of an existing facility or operation, additional characterization of areas with elevated concentrations or increasing trends, or other technical or budgetary reasons. These locations are shown in Figure 4-1. Locations sampled are shown in Tables 4-2, 4-3 and 4-4.

In some instances, special "sampling campaigns" (radiological or non-radiological) near operations of interest (such as described in Section 4.1.5) may be conducted in addition to, or in partial substitution for, fixed "sentinel" locations.

On-site

On-site locations are selected within or near areas of past or current SNL/NM operations (see Figure 4-1 and Table 4-2). Sample locations are chosen near sites with known contamination from past operations, or near facilities that have the potential to discharge radiological or non-radiological pollutants to the environment. Other considerations in the selection of sampling locations include local topography and meteorology.

Perimeter

Perimeter locations (Figure 4-1 and Table 4-3) are selected to determine if contaminants are migrating from SNL/NM sites toward the off-site community. With a few exceptions, perimeter locations are typically situated off SNL/NM property, but within the boundaries of KAFB.

Off-site

Off-site locations are selected to establish concentrations of radiological and non-radiological constituents for comparison with on-site and perimeter results (see Figure 4-2 and Table 4-4). Sample locations have been selected within a 25-mile radius of SNL/NM.

4.1.4 Radiological Parameters and Results

Radiological analyses are performed on all soil, sediment, and vegetation samples and are summarized in this section. The 2008 radiological parameters and analytical results are found in Appendix D of this report (see attached CD). The detailed statistical analyses are documented in the 2008 *Data Analysis in Support of the Annual Site Environmental Report* (SNL 2009a).

Radiological Results

The results of the statistical analysis showed no on-site or perimeter soil or sediment locations that were Priority-1 (both higher than off-site and with an increasing trend). One location was identified as Priority-2 (higher than off-site) for cesium-137. The Priority-2 location and parameters are listed in Table 4-5. There were no Priority-3 locations identified.

Cesium-137

One perimeter location (12) continues to be identified as Priority-2 for cesium-137 in surface soils. Location 12 is located on the U.S. Forest Service (USFS) land withdrawn area. This location is at a slightly higher elevation, which receives greater precipitation and results in slightly higher cesium-137 levels from fallout. Cesium-137 is prevalent in surface soils worldwide as a result of historical nuclear weapons testing. Over the past nine years, the values for cesium-137 at these perimeter locations ranged from 0.49 to 1.82 picocuries per gram (pCi/g). However, these levels are not cause for concern.

All sediment sample locations were identified as Priority-4 (consistent with off-site results and no increasing trends) for cesium-137.

Tritium

Tritium is not a significant indicator radionuclide for operations at SNL/NM, and the low soil moisture in the area will always make low-activity assay difficult. There was no unusual tritium concentrations noted for any of the soil or sediment samples collected.

Total Uranium

No sediment locations were identified as Priority-1, Priority-2 or Priority-3 for Total Uranium.

TLDs

TLD exposure by quarter and the exposure rate for each location class for 2008 is shown in Appendix D (see attached CD). The exposure rate summary statistics for each location class is also in Appendix D. In 2008, all TLDs were collected every quarter. If a TLD is not collected for a quarter, it is deleted from the statistical analysis.

Data for 2000 through 2008 were analyzed to determine if any statistical differences were observed for either location class (on-site, perimeter, or community) or year. If a TLD was missing a quarter's sample in

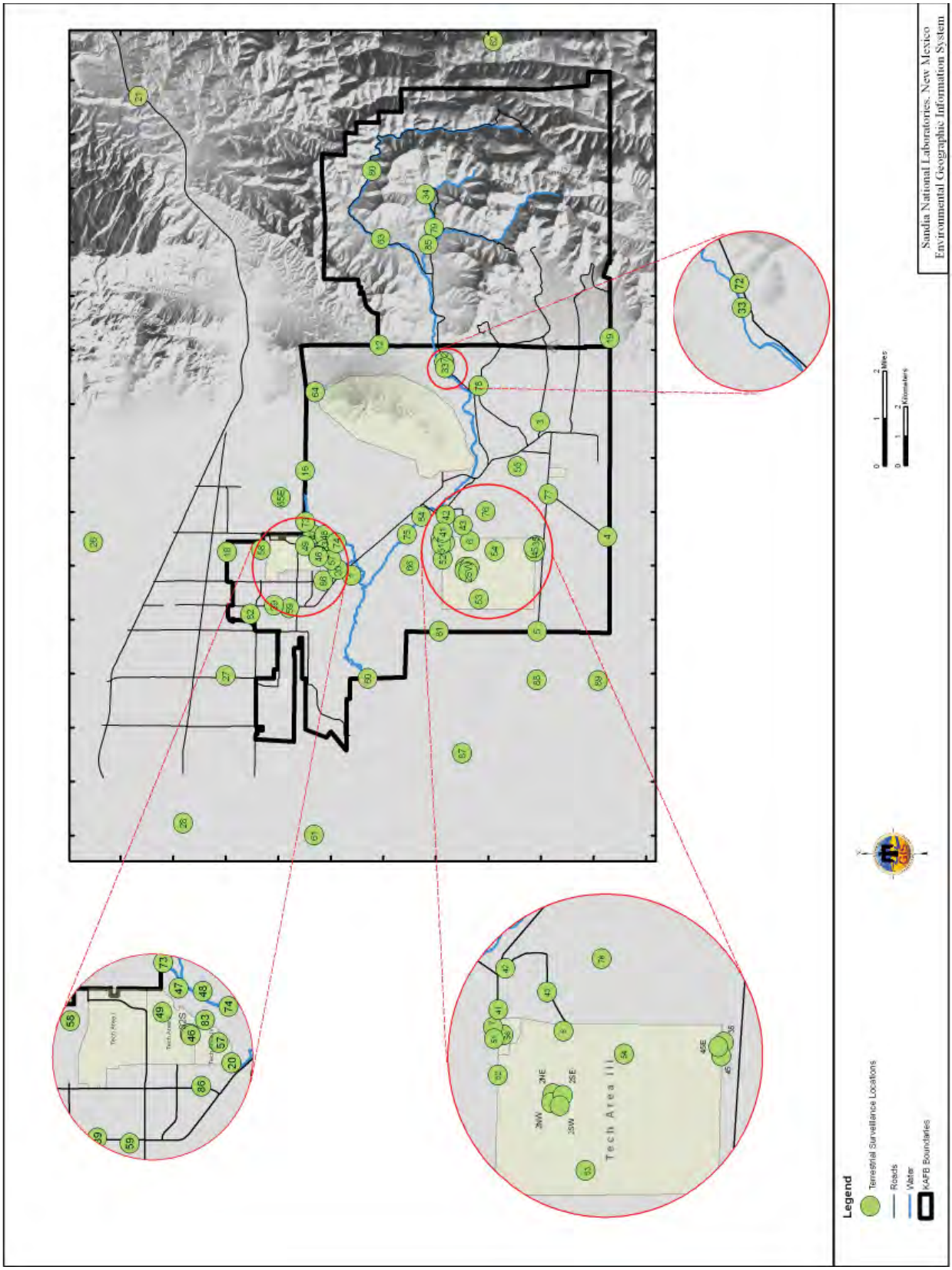


FIGURE 4-1. Terrestrial Surveillance Program On-site and Perimeter Sampling Locations.
On-site locations are within areas of SNL/NM operations. Perimeter locations are located both on and off KAFB property.

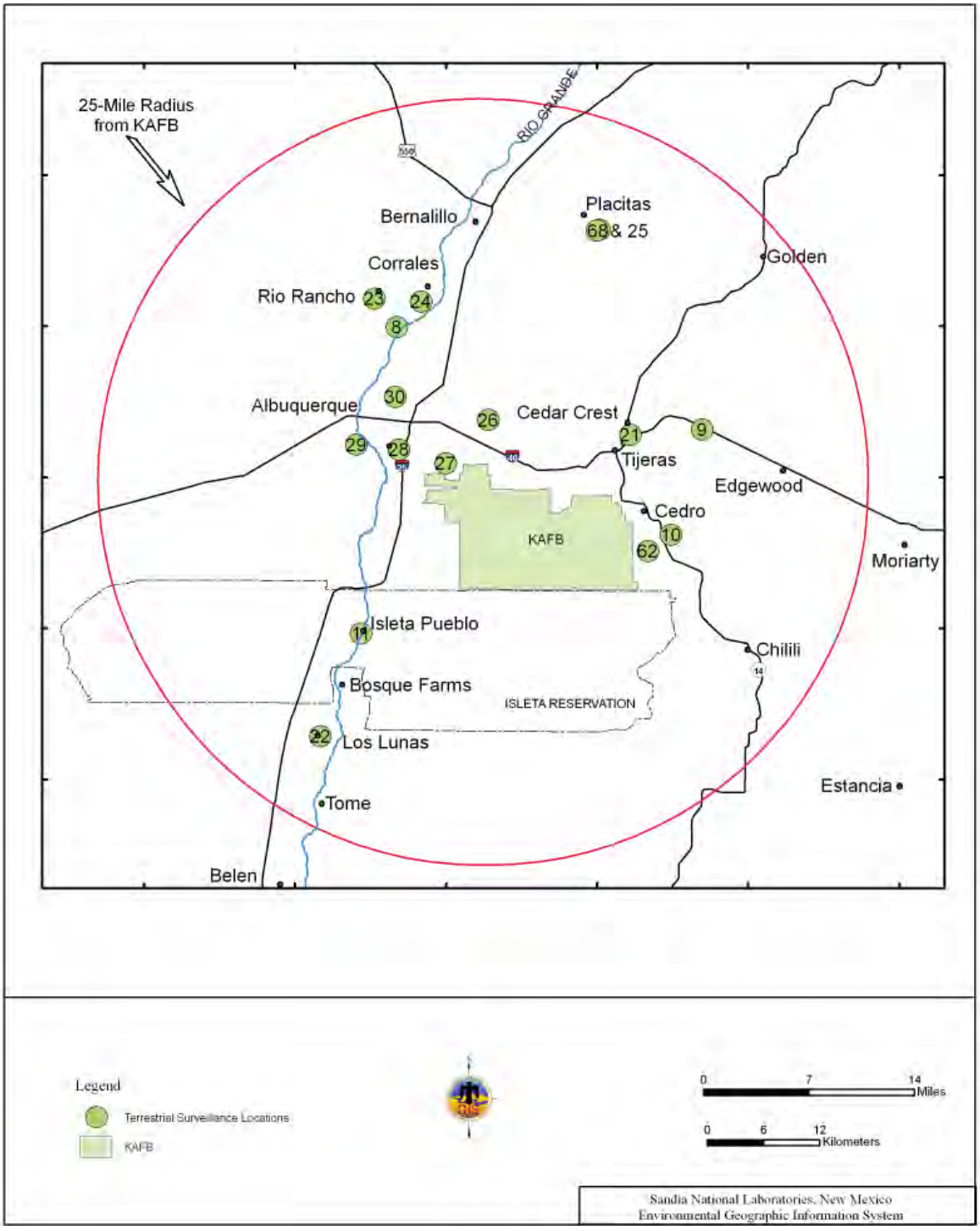


FIGURE 4-2. Terrestrial Surveillance Program Off-site Sampling Locations.

TABLE 4-5. Radiological Results Summary Statistics for Sample Locations (2000-2008) Noted as Priority-2 During 2008

Sample Media	Analyte	Units	Location	Number of Samples	Average	Median	Std. Dev.	Min.	Max.
Soil	Cesium-137	pCi/g	12	9	1.17	1.2	0.46	0.49	1.82

NOTES: Std. Dev. = Standard Deviation Min. = Minimum max. = Maximum
pCi/g = picocurie per gram mg/kg = milligram per kilogram Data presented is for nine years.

any year of interest, it was deleted from the analysis. Operational locations are also excluded from the statistical analysis. There was no statistical difference between on-site, perimeter, and off-site locations. Table 4-6 shows the overall exposure rate summary statistics for 2000 through 2008. Figure 4-3 shows the TLD exposure rates by year and location class

4.1.5 Non-Radiological Parameters and Results

In May, routine samples were collected in the spring at "sentinel" locations for trending analysis. Later in the summer of 2008, several areas on Thunder Range, where future explosive testing is planned, were sampled for baseline characterization. This sampling was performed to determine if current or proposed activities at a given site or specific area will impact human health or the environment. This sampling was also required to document pre-existing contaminants that remain in the area from past operations.

The sampling strategy for these areas included collecting samples from a dense multi-point grid superimposed over the respective area in which future activities are anticipated. In addition, samples were collected from three judgmental locations at discolored, suspect or low areas. Samples were collected at a depth of zero to two inches.

Baseline environmental monitoring data, collected from soil samples within the study areas, indicate that currently there is no unusual contamination of soils with TAL metals, High Explosive (HE) compounds, or perchlorate. With the exception of arsenic, none of the analyte concentrations detected in the site soils exceed soil screening levels for industrial/occupational land use. In all but 36 out of 166 samples, the arsenic concentrations (4.9 to 8.8 milligram per kilogram [mg/kg]) did not exceed the NMED residential soil screening levels. Based on process knowledge of site activities, these arsenic concentrations are most likely naturally occurring.

The data collected during this study are suitable to use as baseline data for comparison to future data collected during long-term monitoring at the site to verify that future testing activities are not significantly impacting the environment. The full report can be found in *Thunder Range July-August 2008 Field Report on Baseline Sampling* (SNL 2009) (see Appendix E on attached CD). Summary statistics from this investigation are found in Table 4-7.

This information can be used to establish "baseline" conditions for metals in soil in the areas studied. It will also serve as a useful point of reference for future characterization of the site if and when the site is no longer used and it is to be returned to unrestricted use for others.

The results are consistent with Table 4-8, and in no instance do they exceed NMED industrial/occupational soil screening guidelines.

Site-wide Non-Radiological Results

No sampling location was noted to be Priority-1 (both higher than off-site and with an increasing trend). Fifteen locations were identified as Priority-2 and Priority-3 (higher than off-site or increasing trend). The Priority-2 and Priority-3 locations and parameters are listed in Tables 4-9 and 4-10. It should be noted that beginning in 2008, all trending analyses will include data from 2000 forward, rather than the previous five year window. This change will make the trending analyses more meaningful by including all comparable data since 2000. However, when comparing the number (six) of Priority-2 and Priority-3 locations in the 2007 *Annual Site Environmental Report* (ASER) (SNL 2008c) the number noted in 2008 (15) will appear to be a significant increase. However, this was to be expected, since the "comparison pool" increased from five years of data to nine years. All results are orders of magnitude below NMED Soil Screening Levels (SSLs), levels that would trigger further investigation. All metals were listed as Priority-4 for all sediment samples.

TABLE 4-6. Summary Statistics for TLD Exposure Rates, 2000-2008

Location Class	No. of Obs	Units	Mean	Median	Std Dev	Minimum	Maximum
Community	103	mR/hr	94.9	91.6	14.1	73.2	147.6
Perimeter	69	mR/hr	96.4	95	11.3	78.5	132.2
On-Site	121	mR/hr	95.6	93.6	9.3	80.9	119.7

NOTE: mR/hr = milliroentgen per hour (10^{-3} roentgen per hour)
Std Dev = Standard deviation

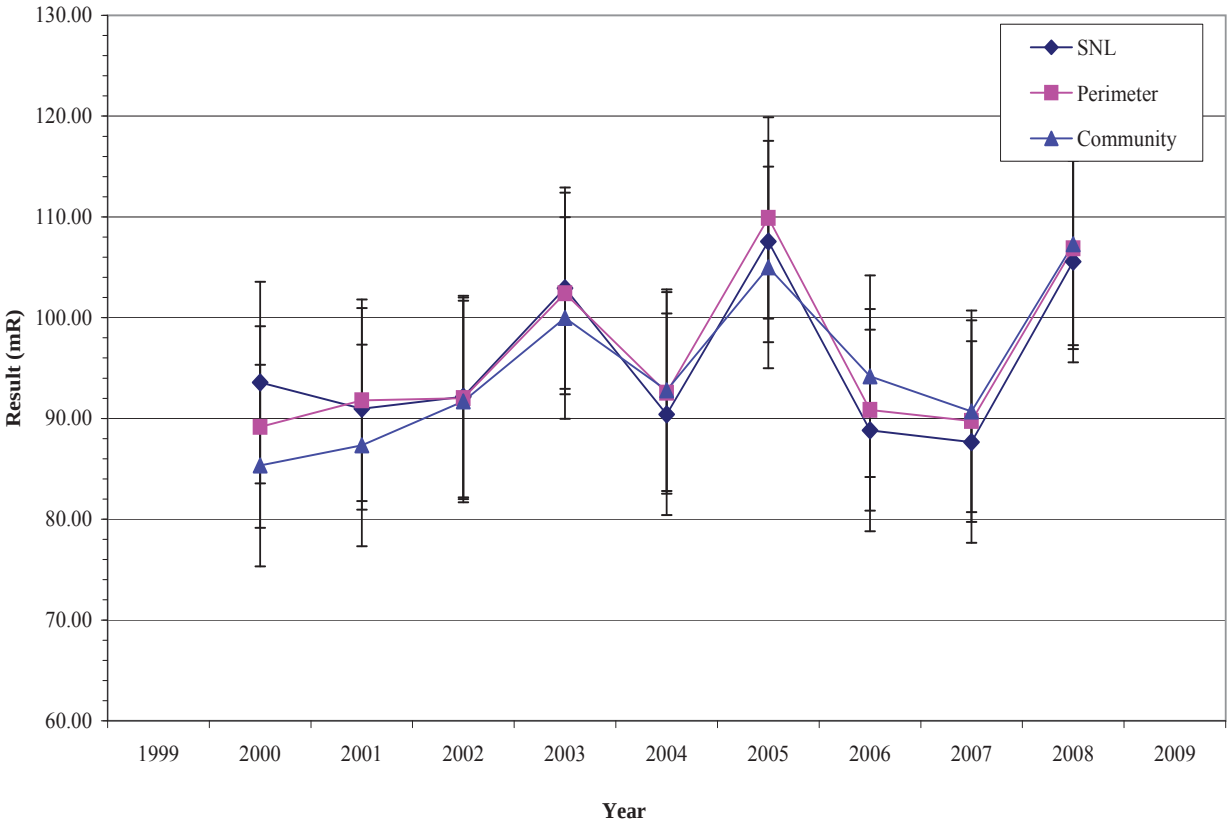


FIGURE 4-3. TLD Exposure Rates by Year and Location Class

TABLE 4-7. Thunder Range 2008 Baseline Sampling Summary Statistics .

Analyte	Number of Samples	Number of Non-Detects	Mean (mg/kg)	Standard Deviation (mg/kg)	Minimum (mg/kg)	Median (mg/kg)	Maximum (mg/kg)	NMED Residential SSL * (mg/kg)	NMED Industrial SSL * (mg/kg)
Aluminum	221	0	7,242	1,668	3,310	7,130	14,100	77,800	100,000
Amino-2,6-dinitrotoluene	0	221	ND	ND	ND	ND	ND	122,000,000 ug/kg	1,370,000,000 ug/kg
Antimony	146	75	0.75	0.34	0.31	0.69	2.40	31.3	454
Arsenic	166	55	3.11	1.25	0.52	2.97	8.78	3.9	17.7
Barium	221	0	93.0	29.8	47.3	88.6	296.0	15,600	100,000
Beryllium	88	133	0.446	0.116	0.100	0.443	0.703	156	2,250
Cadmium	203	18	0.32	0.18	0.10	0.28	1.31	39	564
Calcium	221	0	17,066	22,532	1,540	11,100	159,000	not applicable	not applicable
Chromium	221	0	8.8	2.0	4.7	8.7	20.0	100,000	100,000
Cobalt	221	0	3.91	1.08	1.73	3.84	10.80	1,520	20,500
Copper	221	0	34.7	217.3	4.7	8.9	2,350	3,130	45,400
HMX	9	212	23,228	33,536	331	9,830	103,000	3,060,000 ug/kg	34,200,000 ug/kg
Iron	221	0	10,710	2,595	5,340	10,400	32,400	23,500	100,000
Lead	221	0	11.3	5.2	1.7	10.5	43.2	400	800
Magnesium	221	0	2,857	687	1,320	2,780	5,810	not applicable	not applicable
Manganese	221	0	228	77	85	216	495	3,590	48,400
Mercury	209	12	0.010	0.009	0.002	0.008	0.107	100,000	100,000
Nickel	221	0	7.36	2.145	3.32	7.09	26.7	1,560	22,700
Perchlorate	0	221	ND	ND	ND	ND	ND	55	790
Potassium	221	0	2,298	728	851	2,250	4,930	not applicable	not applicable
RDX	7	214	2,588	2,769	171	2,240	8,460	44,200,000 ug/kg	174,000,000 ug/kg
Selenium	195	26	2.9	1.7	0.6	2.6	14.2	391	5,680
Silver	65	156	0.25	0.11	0.10	0.24	0.58	391	5,680
Sodium	209	12	66	90	27	44	660	not applicable	not applicable
Tetryl	2	219	393	257	211	393	575	240,000 ug/kg	2,700,000 ug/kg
Thallium	14	207	1.69	1.70	0.53	1.07	5.58	5.16	74.9
Trinitrotoluene,2,4,6	1	220	717	not applicable	717	717	717	3,600 ug/kg	342,000 ug/kg
Vanadium	221	0	20.3	5.0	11.0	19.9	63.4	78.2	1,140
Zinc	221	0	32	13	14	30	171	23,500	100,000

NOTES:

a NMED June 2006, Technical Background Document for Development of Soil Screening Levels, Revision 4.0, New Mexico Environment Department, Hazardous Waste, Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico (NMED, 2006).

ND = Not Detected

mg/kg = milligram per kilogram

SSL = Soil Screening Level

TABLE 4-8. *V*arious Reference Values for Metals in Soil (all units in mg/kg)

	NM Soil Concentrations [1]		NMED Soil Screening Levels [2]		US Soil Concentrations [3]	
Analyte	Lower Limit	Upper Limit	Residential	Industrial	Lower Limit	Upper Limit
Aluminum	5,000	100,000	74,000	100,000	4,500	100,000
Antimony	0.2	1.3	31	454	0.25	0.6
Arsenic	2.5	19	4	17	1	93
Barium	230	1,800	15,600	100,000	20	1,500
Beryllium	1	2.3	156	2,250	0.04	2.54
Cadmium	ND	11	39	564	0.41	0.57
Calcium	600	320,000	N/A	N/A	N/A	N/A
Chromium	7.6	42	100,000	100,000	7	1,500
Cobalt	2.1	11	1,520	20,500	3	50
Copper	2.1	30	3,130	45,400	3	300
Iron	1,000	100,000	23,500	100,000	5,000	50,000
Lead	7.8	21	400	800	10	70
Magnesium	300	100,000	N/A	N/A	N/A	N/A
Manganese	30	5000	3,590	48,400	20	3,000
Mercury	0.01	0.06	100,000	100,000	0.02	1.5
Nickel	2.8	19	1,560	22,700	5	150
Potassium	1,900	63,000	N/A	N/A	N/A	N/A
Selenium	0.2	0.8	391	5,680	0.1	4
Silica (Silicon)	150,000	440,000	N/A	N/A	24,000	368,000
Silver	0.5	5	3921	5,680	0.2	3.2
Sodium	500	100,000	N/A	N/A	N/A	N/A
Thallium	N/A	N/A	5.6	74.9	0.02	2.8
Titanium	910	4,000	N/A	N/A	20	1,000
Vanadium	15	94	78.2	1,140	0.7	98
Zinc	18	84	23,500	100,000	13	300

NOTES:
NMED = New Mexico Environmental Department
N/A = not applicable
ND = not detected
mg/kg = milligram per kilogram

(1) Dragun and Chekiri, *Elements in North American Soils,* 2005, Hazardous Materials Control Resources Institute, (Used *San Juan Basin, A Horizon* to determine values).

(2) *Technical Background Document for Development of Soil Screening Levels*, Revision 4.0, New Mexico Environment Department, Hazardous Waste. Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico (SNL 2006).

(3) U.S. Soil Surface Concentrations, Kabata-Pendias, A., CRC, *Trace Elements in Soils and Plants*, 3rd Edition, 2000.

TABLE 4-9. Summary Statistics for All Locations (2000-2008) Identified as Priority-2 for Metals in Soil During Calendar Year 2008 (all units in mg/kg)

Analyte	Location Type	Location	Average	Std Dev	Min	Max	NMED Soil Screening Level (Residential)	NMED Soil Screening Level (Industrial)
Aluminum	On-site	34	14,585	3728	5,370	17,700	74,000	100,000
	Perimeter	12	13,426	2,2994	7,780	17,300		
		63	13,380	2,322	8,960	16,600		
		64	13,450	1,768	10,500	15,000		
Arsenic	On-site	33	13.2	9.9	4.5	32.7	4	17
Beryllium	On-site	33	1.25	0.29	0.79	1.59	156	2,250
		34	0.73	0.14	0.55	0.94		
Chromium	On-site	33	12.02	2.15	8.33	13.70	100,000	100,000
	Perimeter	19	15.73	3.33	11.50	20.00		
		80	15.56	2.56	10.40	17.90		
Cobalt	On-site	1	5,82	0.87	4.43	7.07	1,520	20,500
		33	6.07	0.76	5.12	7.14		
		34	6.02	0.62	5.19	6.98		
	Perimeter	12	6.26	0.38	5.78	6.74		
		16	6.13	1.71	3.12	8.11		
		19	5.86	0.73	5.04	6.87		
		60	5.52	0.57	4.74	6.35		
		63	5.83	0.65	4.88	6.63		
		64	8.60	0.72	7.30	9.35		
Copper	Perimeter	12	14.0	2.64	11.8	18.0	3,130	45,400
		19	13.2	2.13	10.2	16.0		
		64	15.4	1.14	14.0	16.6		
Iron	Perimeter	64	21,818	2,685	18,100	25,500	23,500	100,000
Lead	Perimeter	59	19.2	5.1	10.1	23.7	400	800
Magnesium	On-site	3	5,127	1,323	3,430	6,460	n/a	n/a
	Perimeter	64	7,558	373	7,030	7,880		
		80	4,966	3,54	4,450	5,310		
		64	602.8	33.8	558	638		
Manganese	On-site	33	12.7	3.0	8.8	18.1	3,590	48,400
		34	13.2	1.6	10.5	14.9		
Nickel	On-site	33	12.7	3.02	8.85	18.1	1,560	22,700
		34	13.2	1.59	10.5	14.9		
	Perimeter	19	12.7	1.6	11.0	15.4		
		63	11.8	1.1	10.0	13.0		
		80	12.8	1.0	11.3	14.2		
Potassium	On-site	1	4,142	1,570	1,020	5,160	n/a	n/a
	Perimeter	60	3,734	353	3,380	4,330		
		64	3,788	433	3,080	4,410		
Vanadium	Perimeter	64	35.2	4.9	26.9	41.1	78.2	1,140
Zinc	Perimeter	64	82.5	7.3	75.7	95.8	23,500	100,000

NOTES:
Std Dev = Standard deviation
mg/kg = milligram per kilogram
n/a = not applicable

TABLE 4-10. Summary Statistics for Soil Locations (2000-2008) Identified as Priority-3 for Metals in Soil During Calendar Year 2008 (all units in mg/kg)

Analyte	Location Type	Location	Average	Std Dev	Min	Max	NMED Soil Screening Level (Residential)	NMED Soil Screening Level (Industrial)
Aluminum	On-site	55	9,510	2,433	6,140	12,700	74,000	100,000
		77	12,175	2,896	7,530	16,000		
	Perimeter	64	13,450	1,768	10,500	15,000		
	On-site	34	3872	510	3110	4370	n/a	n/a
	Perimeter	58	4518	876	3740	6200		
Nickel	On-site	45	6.6	1.8	4.6	10	1,560	22,700
Potassium	On-site	2SW	2775	699	2070	3520	n/a	n/a
		45	2362	808	1390	3630		
		55	2590	604	1650	3340		
		78	2012	367	1380	2370		
Vanadium	On-site	45	16.7	4.4	9.6	21.9	78.2	1,140

NOTES: Std Dev = Standard deviation mg/kg = milligram per kilogram n/a = not applicable

Refer to Figure 4-1 for an illustration of the locations listed in the following descriptions.

Aluminum
One on-site location (34) and three perimeter locations (12, 63 and 64) were identified as Priority-2 (higher than off-site) for aluminum in surface soils. Two on-site locations (53 and 77) and one perimeter location (64) were identified as Priority-3 (increasing trend) for aluminum in surface soils. These results are within the range of background identified for aluminum in New Mexico surface soils. All remaining soil and sediment samples were identified as Priority-4 for aluminum.

Arsenic
One on-site location (33) was identified as Priority-2 (higher than off-site) for arsenic in surface soils. The concentration is well within the range of background identified for New Mexico surface soils and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for arsenic.

Beryllium
Two on-site locations (33 and 34) were identified as Priority-2 (higher than off-site) for beryllium in surface soils. The concentration of beryllium at this location was well within the range of background identified for New Mexico surface soils, and is expected to be naturally occurring. All remaining soil, sediment and vegetation samples were identified as Priority-4 for beryllium.

Chromium
One on-site location (33) and two perimeter locations (19 and 80) were identified as Priority-2 (higher than off-site) for chromium in surface soils. The concentrations at all three locations are within the range of background for chromium in New Mexico surface soils, and is expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for chromium.

Cobalt
Three on-site locations (1, 33 and 34) and six perimeter locations (12, 16, 19, 60 63 and 64) were identified as Priority-2 (higher than off-site) for cobalt in surface soils. The concentrations at all locations are within the range of background for cobalt in New Mexico surface soils, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for cobalt.

Copper
Three perimeter locations (12, 19 and 64) were identified as Priority-2 (higher than off-site) for copper in surface soils. The results were well within the range of background identified for New Mexico surface soils, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for copper.

Iron
One perimeter location (64) was identified as Priority-2 (higher than off-site) for iron in surface soils. The concentration is well within the range of

background for iron in Western U.S. surface soils, and is expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for iron.

Lead
One perimeter location (59) was identified as Priority-2 (higher than off-site) for lead in surface soils. The concentrations at this location is well within the range of background for lead in New Mexico surface soils, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for lead.

Magnesium
One on-site location (3) and two perimeter locations (64 and 80) were identified as Priority-2 (higher than off-site) for magnesium in surface soils. One on-site location (34) and one perimeter location (58) were identified as Priority-3 (increasing trend) for magnesium in surface soils. These results are within the range of background identified for magnesium in New Mexico surface soils. All remaining soil and sediment samples were identified as Priority-4 for magnesium.

Nickel
Two on-site locations (33 and 34) and three perimeter locations (19, 63 and 80) were identified as Priority-2 (higher than off-site) for nickel in surface soils. One on-site location (45) was identified as Priority-3 (increasing trend) for nickel in surface soils. The concentrations at these locations are well within the range of background for nickel in New Mexico surface soils, and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for nickel.

Potassium
One on-site location (1) and two perimeter locations (60 and 64) were identified as Priority-2 (higher than off-site) for potassium in surface soils. Four on-site soil locations (2SW, 45, 55 and 78) were identified as Priority-3 (increasing trend). These soil concentrations are within soil concentrations identified in the Western U.S. soils concentrations. All remaining soil and sediment samples were identified as Priority-4 for potassium.

Vanadium
One perimeter location (64) was identified as Priority-2 (higher than off-site) for vanadium in surface soils. One on-site soil location (45) was identified as Priority-3 (increasing trend). These soil concentrations are within soil concentrations identified in the Western U.S. soils concentrations and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for vanadium.

Zinc
One perimeter location (64) was identified as Priority-2 (higher than off-site) for zinc in surface soils. This soil concentration is within soil concentrations identified in the Western U.S. soils concentrations and are expected to be naturally occurring. All remaining soil and sediment samples were identified as Priority-4 for zinc.

4.2 ECOLOGICAL SURVEILLANCE

Biota monitoring began in 1996 as an additional element of environmental monitoring within the Terrestrial Surveillance Program. The objectives of the Ecological Surveillance Program are to:

- Collect ecological resource inventory data to support site activities while preserving ecological resources and to maintain regulatory compliance,
- Collect information on plant and animal species present to further the understanding of ecological resources on-site,
- Collect biota contaminant data on an as needed basis in support of site projects and regulatory compliance,
- Assist SNL/NM organizations in complying with regulations and laws,
- Educate the SNL/NM community regarding ecological resource conservation, and
- Support line organizations with biological surveys in support of site activities.

The biota data collected are consistent with the requirements under DOE Order 450.1A (DOE 2008). Data are collected on mammal, reptile, amphibian, bird, and plant species that currently inhabit SNL/NM. Data collected include information on presence, abundance, species diversity, and land use patterns. Since no significantly elevated levels of radionuclides or metals were observed in soil or vegetation samples, no contaminant analysis of radionuclides and metals on wildlife were performed in 2008. Table 1-1 in Chapter 1 represents common species identified at KAFB.

These data are primarily utilized to support NEPA documentation and land use decisions on a corporate level. Data also support wildlife communication campaigns to ensure safe work environments and sustainable decision-making strategies.

"YuccaCircles" 2008 Photo Contest, photo by Mark Miller.

5.0 Air Quality Compliance & Meteorological Monitoring

This chapter provides a summary of the following:

- Meteorological Monitoring Program
- Ambient Air Surveillance Program
- Radiological Air Emissions Assessment of Potential Dose to the Public
- Air Quality Requirements and Compliance Strategies

Personnel at Sandia National Laboratories, New Mexico (SNL/NM) conduct air quality monitoring and surveillance under the following three programs:

- Clean Air Network (CAN) Program conducts meteorological monitoring (see Section 5.1) and ambient air surveillance (see Section 5.2).
- National Emission Standards for Hazardous Air Pollutants (NESHAP) Program coordinates with facility owners to meet radiological air emission regulations (see Sections 5.3 and 5.4).
- Air Quality Compliance (AQC) Program ensures that all non-radiological air emission sources at SNL/NM (such as generators, boilers, chemical users, and vehicles) meet applicable air quality standards and permitting requirements (see Section 5.5).

5.1 METEOROLOGICAL MONITORING PROGRAM

The meteorological monitoring program is part of the CAN program. The main objective of the Meteorological Monitoring Program is to provide site-specific representative data for SNL/NM. Data is used for air dispersion and transport modeling, to support emergency response activities, and to support regulatory permitting and reporting processes. Additional uses of meteorological data include supporting various environmental activities and programs, and providing data to SNL/NM research and development (R&D) projects.

The U.S. Department of Energy (DOE) directives and regulations applicable to the Meteorological Monitoring Program are listed in Chapter 9.

Tower and Network Instrumentation
Sandia Corporation (Sandia) conducts meteorological monitoring through a network of eight meteorological towers located throughout Kirtland Air Force Base (KAFB). All towers are on or near SNL/NM property, and the network includes:

- Six 10-meter towers,
- One 30-meter tower, and
- One 60-meter tower.

Routine instrument calibrations and weekly tower site visits are performed as part of the Quality Assurance (QA) Program for the monitoring network. The CAN network of meteorological towers and ambient air monitoring locations are shown in Figure 5-1.

Meteorological Monitoring Towers
All meteorological towers are instrumented to measure temperature and wind velocity* at 3- and 10-meter levels. Temperature and wind velocity are also measured at the top of the two tallest towers (30- and 60-meters).

In addition, relative humidity is measured at the 3-meter level. Rainfall is measured at the 1-meter level at towers A36, A21, and SC1. Barometric pressure is measured at the 2 meter level at towers A36 and A21.

* including the standard deviation of horizontal wind direction (sigma theta).

5.1.1 Meteorological Monitoring Results

The A36 60-meter tower is used to describe general meteorology at SNL/NM due to its central geographic position and the availability of data at all instrument levels. The 2008 annual climatic summary for tower A36 is shown in Table 5-1.

In general, the annual statistics for each of the towers are similar. However, daily meteorology varies considerably across the meteorological network. This real-time variability of meteorological conditions has implications on the transport and dispersion of pollutants, which are important in atmospheric emergency release scenarios and air dispersion modeling. Figure 5-2 shows some of the variations and extremes found in meteorological measurements across SNL/NM.

The following website provides current weather information from the SNL/NM - CAN Meteorological network:

http://132.175.200.42/

5.1.2 Wind Analysis

Annual wind roses for three locations across SNL/NM are illustrated in Figure 5-3. A wind rose is a graphical representation of wind speed and direction frequency distribution. Wind direction is the true bearing when facing the wind (the direction from which the wind is blowing). As shown in Figure 5-3, wind directions and speeds can vary significantly across SNL/NM. Although not shown, the annual wind frequency distribution for Technical Area (TA)-I shows yet another pattern, with the greatest direction frequency from the east and east-northeast, as winds blow from Tijeras Canyon. The predominant wind direction at most locations is produced by topographic influences that also create nocturnal drainage flows.

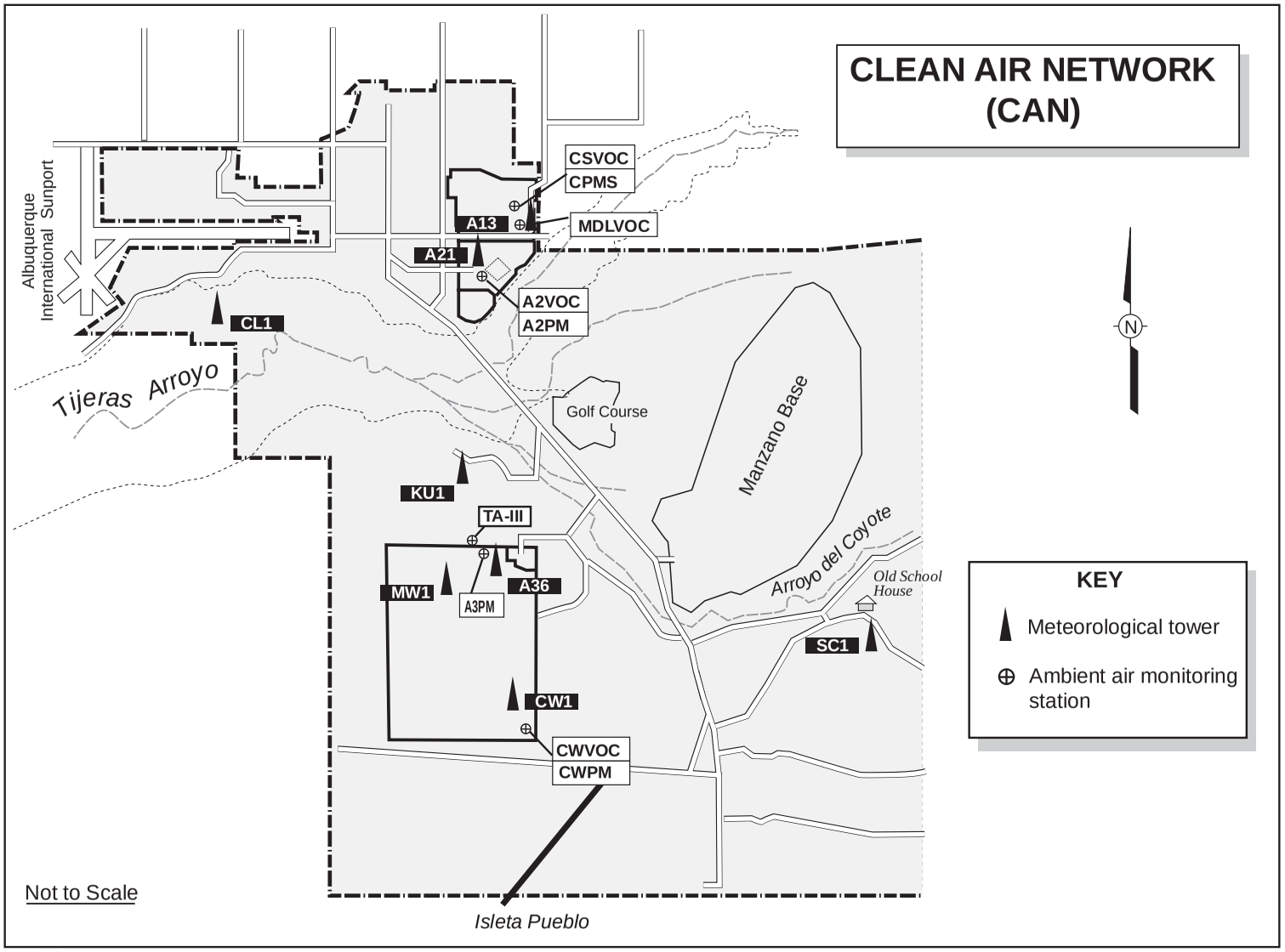


FIGURE 5-1. The Clean Air Network (CAN) of Meteorological Towers and Ambient Air Monitoring Stations

TABLE 5-1. Annual Climatic Summary from Tower A36 – CY 2008

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (°C)													
Average Daily High	5.89	11.07	16.31	20.27	24.53	31.71	30.13	30.65	27.01	20.65	14.23	8.39	20.07
Average Daily Low	-5.63	-1.41	1.18	5.01	9.78	15.71	17.21	17.10	14.03	7.32	1.74	-2.05	6.67
Monthly Mean	0.53	5.01	9.03	12.97	17.50	24.20	23.40	23.68	20.40	14.44	8.49	3.44	13.59
Extremes (°C)													
High	14.02	19.21	23.07	27.46	32.59	35.06	34.19	35.78	30.93	27.00	22.23	18.23	35.78
Low	-12.75	-9.11	-7.25	-1.61	-0.91	7.70	14.15	13.77	10.09	-2.94	-4.54	-10.90	-12.75
Relative Humidity (%)	49.05	49.05	28.69	19.93	27.05	20.44	49.63	44.35	38.08	41.76	41.12	55.96	38.76
Precipitation (cm)													
Monthly	1.19	1.22	0.00	0.91	1.32	0.03	4.24	3.73	0.03	3.43	0.63	1.37	18.11
24 Hour Max	0.48	0.36	0.00	0.91	0.81	0.03	0.99	2.84	0.03	1.30	0.61	0.46	2.84
Wind (m/s)													
Monthly	3.40	3.75	4.35	4.49	4.55	4.40	3.62	3.67	3.49	3.48	3.47	3.24	3.82
24 Hour Max	7.51	9.60	8.27	6.92	9.46	7.37	6.20	6.09	6.06	8.28	7.23	6.24	9.60
Maximum Gust	22.26	23.46	25.46	24.90	25.14	25.58	23.50	22.22	19.78	23.50	22.62	21.30	25.58
Barometric													
Pressure (mb)	834.69	832.60	832.39	831.91	830.68	833.56	835.33	834.70	836.64	837.47	836.47	833.54	834.17

NOTES: Barometric Pressure sensor slow degradation produced approximately 0.5 mb increase in Oct. - Dec. values.
Conversions to English Units: Temperature = °F = (1.8) (°C) + 32 °C = degree centigrade
Wind Speed = mph = (2.2369) (m/s) cm = centimeter Rainfall. = in. = (2.54)(cm)
m/sec = meters per second mb = millibar

The diurnal pattern of wind flow common through many areas at KAFB is not apparent in the annual frequency distribution. Figure 5-4 shows the day and night wind frequency distributions for tower A36, respectively. In general, the closer to the mountains or canyons to the eastern borders of the KAFB, the greater the frequency of winds coming from the easterly directions at night. Daytime wind patterns are not quite as pronounced, but winds generally flow towards the mountains and channel into canyons or up the Rio Grande Valley.

5.2 AMBIENT AIR SURVEILLANCE PROGRAM

Ambient air surveillance is conducted under the CAN Program through a network of six air monitoring stations located on or near SNL/NM property (see Figure 5-1). The primary objective of the Ambient Air Surveillance Program is to show compliance with the National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] 50) and New Mexico Ambient Air Quality Standards (NMAAQS) (20.2.3 New Mexico Administrative Code [NMAC]). Ambient air surveillance is also important to establish background concentration levels for pollutants of concern and to evaluate the effects, if any, from SNL/NM operations on the public and the environment due to operations at SNL/NM. Applicable requirements are listed in Chapter 9.

5.2.1 Monitoring Stations

Criteria Pollutant Monitoring Station (CPMS) – There is one CPMS in the CAN network. The CPMS is located in the northeast corner of TA-I. Criteria pollutants are the set of six common pollutants for which the U. S. Environmental Protection Agency (EPA) must set national ambient standards according to the Clean Air Act (CAA). For more information on air pollutants, use the link provided below:

http://www.epa.gov/ebtpages/air.html

The CPMS is used to perform continuous monitoring for sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), and ozone (O_3). Data are

Wind Speed

- Average Annual Wind Speed
- Greatest Difference in Wind Speed over 24 hours
- Greatest Daily Difference in Maximum Wind Gust
- Average Difference in Daily Wind Speed

Minimum (m/sec)	Maximum (m/sec)	Spread (m/sec)
3.79 (CL1)	4.02 (CW1)	0.23
6.23 (KU1)	11.4 (A13)	5.17 In November
15.42 (SC1)	32.53 (KU1)	17.11 In July
0.95		

Temperature

- Average Annual Temperature
- Network Annual Temperature Extremes
- Greatest Difference in Daily Minimum Temperature
- Greatest Difference in Average Daily Temperature
- Greatest Difference in Daily Maximum Temperature

Minimum (°C)	Maximum (°C)	Spread (°C)
13.31 (SC1)	14.06 (A13)	0.75
-13.76 (SC1)	35.83 (A21)	49.59
-5.12 (MW1)	2.59 (SC1)	7.71 In December
1.58 (CL1)	6.00 (SC1)	4.42 In December
2.01 (SC1)	6.06 (KU1)	4.05 In December

Precipitation

- Annual Precipitation (Extremes)
- Daily Rainfall Variation
- Greatest Monthly Precipitation Difference
- Greatest in Monthly Rainfall occurred in August

Minimum (cm)	Maximum (cm)	Spread (cm)
15.27 (A21)	21.21 (SC1)	5.94
0.18 (A36)	1.42 (A21)	1.24 In July
2.72 (A21)	5.03 (SC1)	2.31 In August
	5.46 (A21 in July)	

NOTE: Winter precipitation that falls as snow is underestimated (mostly at the SC1 tower). The precipitation at A21 in October is underestimated.

FIGURE 5-2. Variations and Extremes in Meteorological Measurements Across the Meteorological Tower Network During CY 2008.

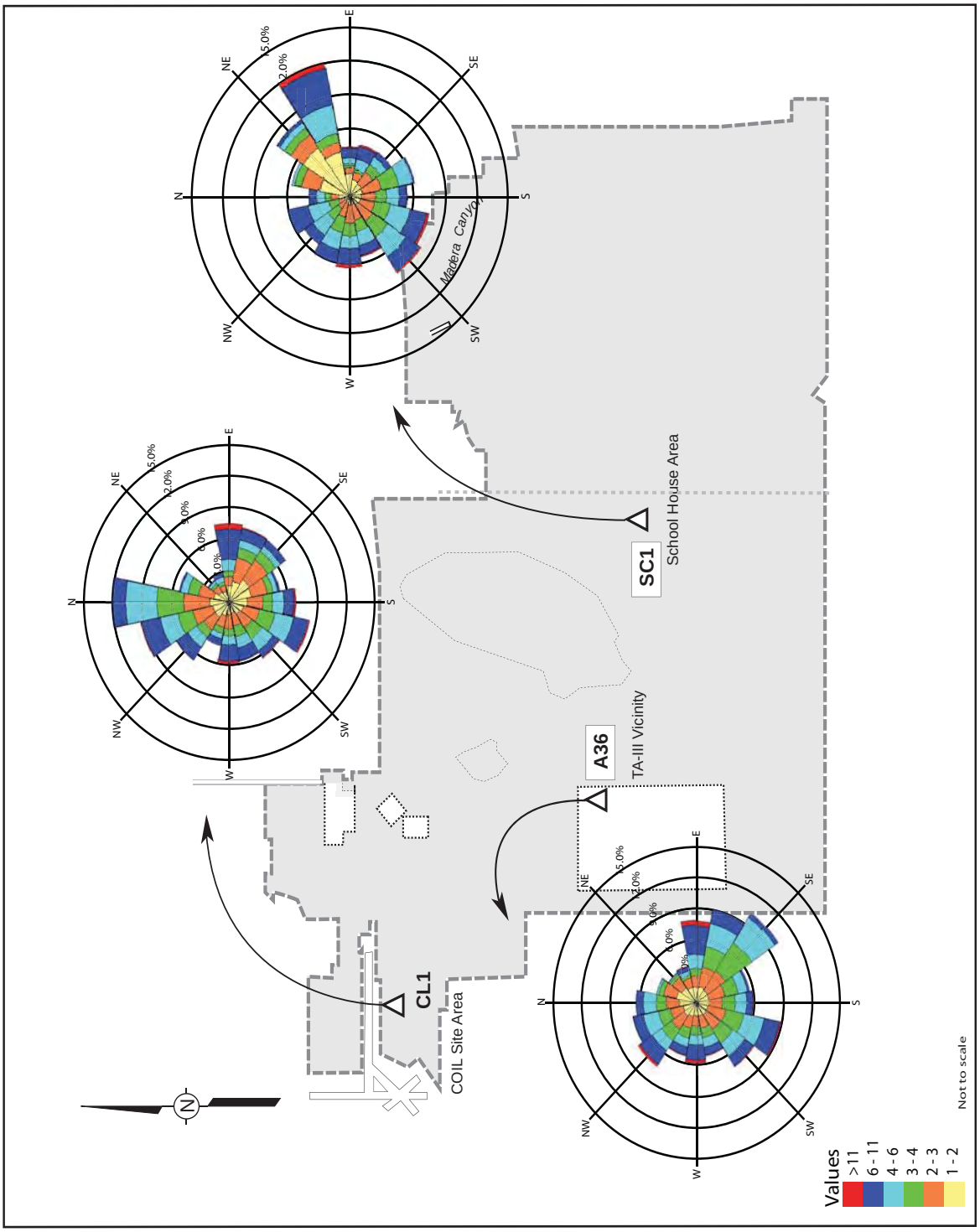


FIGURE 5-3. 2008 Annual Wind Roses for Towers Cl1, A36, and SC1

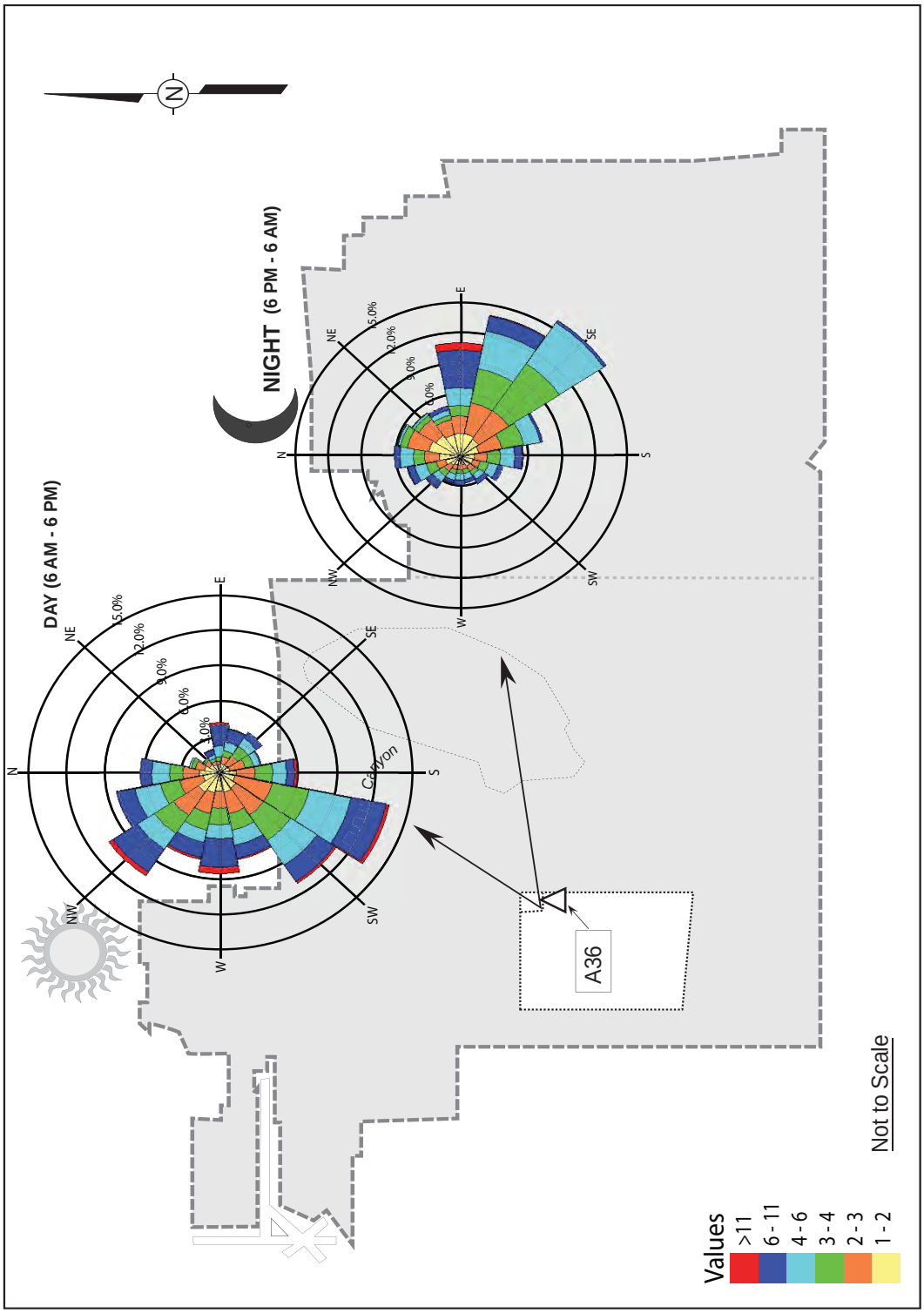


FIGURE 5-4. 2008 Annual Wind Roses for Daytime and Nighttime Wind Frequency at the A36 Tower

then compiled into hourly averages. A particulate matter (PM) monitor is a part of the CPMS. Lead (Pb), a criteria pollutant, is one of 23 metals analyzed from PM samples at this station.

PM_{10} Stations – PM with a diameter equal to or less than 10 microns are measured at four monitoring locations (CPMS, A2PM, A3PM, and CWPM). Samples are collected over a 24-hour period, starting and ending at midnight, every sixth day. This schedule is consistent with the National Air Sampling Program. Samples are analyzed for 23 metals and are radiologically screened using gross alpha, gross beta, and gamma spectroscopy.

$PM_{2.5}$ Stations – PM with a diameter equal to or less than 2.5 microns is measured at two locations (CPMS and TA-III) at SNL/NM. $PM_{2.5}$ is measured continuously and recorded in hourly concentrations 24-hours-a-day, 365-days-per-year. Filters are not manually weighed with this system. The mass is calculated with microprocessor measurements. $PM_{2.5}$ and PM_{10} measurements at SNL/NM are done with different instruments and should not be quantitatively compared with each other due to differing instrument limitations and processing techniques. $PM_{2.5}$ filters are not sent to a laboratory for chemical analysis.

Volatile Organic Compound (VOC) Stations – There are four VOC monitoring stations (CSVOC, MDLVOC, CWVOC, and A2VOC). VOC samples are collected once a month over a 24-hour period.

5.2.2 Ambient Air Monitoring Results

Criteria Pollutants

The latest EPA standards for criteria pollutants can be found at the following website:

http://www.epa.gov/air/criteria.html

In 2008, the automated data recovery for criteria pollutants was approximately 99 percent. Table 5-2 lists the results from the CPMS, PM_{10} and monitors and compares them to NAAQS and NMAAQS for criteria pollutants.

Although violations of annual federal standards for criteria pollutants are not allowed, exceedances for short-term standards are allowable once a year. State standards also allow short-term exceedances due to meteorological conditions for example, in the case of an atmospheric inversion where air mixing may be extremely restricted. There were no exceedances of the criteria pollutant standards in 2008.

PM_{10}

Data recovery for PM_{10} was 98 percent complete based on a sampling schedule occurring every sixth day. The highest daily particulate loading occurred at the CPMS site. A PM_{10} concentration of 37 micrograms per cubic meter ($\mu g/m^3$) occurred at A2PM in April 2008. The monthly and annual averages for PM_{10} are listed in Table 5-3 (Table 5-4 shows monthly and annual averages for $PM_{2.5}$). The annual PM concentrations for 2008 are slightly lower, though comparable to the results for 2007.

All filters collected from the PM_{10} stations that have complete field data are analyzed for 23 metals plus the radiological analyses. Filters are collected every sixth day and are consolidated into monthly composites for analyses. In 2008, monthly composites varied from three to six filters per month, depending on the sampling schedule and sampler power problems. In an attempt to provide better analytical information, results are included in averages only when they are actually higher than the radiological decision levels or instrument detection limits. Table 5-5 lists the averaged results of the PM_{10} analysis. It should be noted that most of the radionuclides are naturally occurring, or are short-lived decay daughter products found while the sample was in the counter, and are not emitted from SNL/NM sources. Many of the radionuclide averages in Table 5-5 are based on the results of one or two samples in the year identifying small concentrations of the constituent.

An Analysis of Variance (ANOVA) was performed to determine if statistical differences existed between stations. The results of the ANOVA indicated that the concentrations of thorium-234 and uranium-238 at the CWPM station were statistically different and slightly higher than the other sites. The area surrounding the CWPM station is mostly desert landscape, and these two radionuclide compounds are naturally occurring which could account for their slightly elevated levels. The results of the ANOVA also indicated that the concentration of selenium at the CPMS station was statistically different and slightly higher than the other sights. This metal is commonly used in industrial applications and could be expected to be higher due to the type of operations that take place in the area of the CPMS.

$PM_{2.5}$

$PM_{2.5}$ is also known as "fine particulate." Fine particulates are thought to be a greater health hazard than PM_{10} because the smaller-sized particles can lodge deep in the lungs. Most $PM_{2.5}$ is created either directly from the combustion of all types of fossil fuels, including wood burning, or by secondary reactions

TABLE 5-2. Criteria Pollutant Results as Compared to Regulatory Standards – 2008

Criteria Pollutant	Averaging Time	Unit	NMAAQS Standard	NAAQS Standard	Maximum or Measured Concentrations
Carbon Monoxide	1 hour	ppm	13.1	35	8.8
	8 hours	ppm	8.7	9	3.3
Nitrogen Dioxide	24 hours	ppm	0.10	-	0.03
	Annual	ppm	0.05	0.053	0.01
Sulfur Dioxide§	3 hours	ppm	-	0.50	0.02
	24 hours	ppm	0.10	0.14	0.003
	Annual	ppm	0.02	0.03	0.001
Ozone	1 hour	ppm	d	d	0.08
	8 hour	ppm	-	0.075	0.04[a]
PM_{10}	24 hours	$\mu g/m^3$	-	150[b]	37
	Annual	$\mu g/m^3$	-	50	10.8
$PM_{2.5}$	24 hours	$\mu g/m^3$	-	35	20.6[c]
	Annual	$\mu g/m^3$	-	15.0	7.5
Lead	Any quarter	$\mu g/m^3$	1.5	1.5	0.001

NOTES: ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter
NMAAQS = New Mexico Ambient Air Quality Standards
NAAQS = National Ambient Air Quality Standards
PM_{10} = particulate matter (diameter equal to or less than 10 microns)
$PM_{2.5}$ = respirable particulate matter (diameter equal to or less than 2.5 microns)
§ Standards are defined in $\mu g/m^3$ and have been converted to ppm.
[a] Reported as the fourth highest average of the year – per regulatory standards.
[b] Not to be exceeded more than once per year - per updated regulatory standards
[c] Reported as the three year 98th percentile value - per regulatory standards

TABLE 5-3. Monthly and Annual Averages for PM_{10} (Air) – 2008

Sample Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
A2PM	5.50	3.00	9.67	21.00	16.40	19.20	15.00	11.00	11.20	11.00	12.00	4.20	11.60
CPMS	5.83	3.50	7.67	13.80	12.60	16.80	21.25	9.00	10.40	6.00	8.20	3.60	9.89
CWPM	6.33	6.50	9.67	16.40	15.75	18.80	15.50	11.50	11.40	10.25	11.00	4.00	11.43
A3PM	4.40	4.50	7.00	12.60	15.00	17.60	20.33	10.00	10.80	6.25	10.80	2.60	10.16

TABLE 5-4. Monthly and Annual Averages for $PM_{2.5}$ (Air) – 2008

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
CPMS	6.2	5.6	7.3	9.6	11.7	9.5	8.1	7.4	7.6	7.3	7.1	5.7	7.7
TA-III	5.4	5.2	7.3	9.3	10.0	9.2	7.6	7.1	7.3	7.1	6.5	5.0	7.2

TABLE 5-5. Averaged Results of PM_{10} Analysis (Air) – 2008

Analyte	Units	A2PM	CPMS	CWPM	A3PM	TLV
Aluminum	$\mu g/m^3$	1.09E-01	9.43E-02	1.29E-01	1.03E-01	2,000
Antimony	$\mu g/m^3$	1.67E-04	3.58E-04	1.25E-04	2.55E-04	500
Arsenic	$\mu g/m^3$	1.27E-05	0.00E+00	6.80E-05	0.00E+00	10
Barium	$\mu g/m^3$	3.62E-03	4.35E-03	3.30E-03	2.76E-03	50
Cadmium	$\mu g/m^3$	1.12E-05	ND	ND	ND	10
Calcium	$\mu g/m^3$	5.02E-01	3.83E-01	3.99E-01	2.86E-01	2,000
Chromium	$\mu g/m^3$	4.30E-04	3.64E-04	4.34E-04	4.31E-04	10
Cobalt	$\mu g/m^3$	2.51E-04	1.58E-04	3.07E-04	3.29E-04	20
Copper	$\mu g/m^3$	1.05E-02	2.03E-02	1.37E-02	1.37E-02	1,000
Iron	$\mu g/m^3$	1.35E-01	1.37E-01	1.38E-01	1.19E-01	5,000
Lead	$\mu g/m^3$	1.17E-03	1.32E-03	1.11E-03	1.04E-03	150
Magnesium	$\mu g/m^3$	6.16E-02	5.47E-02	6.76E-02	5.39E-02	10,000
Manganese	$\mu g/m^3$	3.60E-03	3.41E-03	3.73E-03	3.01E-03	200
Nickel	$\mu g/m^3$	2.48E-04	3.00E-04	2.38E-04	2.27E-04	50
Potassium	$\mu g/m^3$	5.57E-02	5.32E-02	7.13E-02	5.47E-02	2,000
Selenium	$\mu g/m^3$	1.79E-04	5.04E-04	1.75E-04	1.04E-04	200
Silver	$\mu g/m^3$	5.53E-05	5.87E-05	ND	2.31E-05	10
Sodium	$\mu g/m^3$	8.58E-02	6.19E-02	1.78E-01	8.24E-02	5,000
Thallium	$\mu g/m^3$	1.51E-04	2.09E-04	1.72E-04	ND	100
Vanadium	$\mu g/m^3$	3.48E-04	3.00E-04	3.92E-04	3.21E-04	50
Zinc	$\mu g/m^3$	5.46E-03	5.92E-03	3.54E-03	4.07E-03	10
Uranium	$\mu g/m^3$	1.29E-05	1.11E-05	1.01E-05	7.97E-06	200
Gross Alpha	pCi/m^3	4.05E-03	3.12E-03	2.09E-03	2.84E-03	
Gross Beta	pCi/m^3	1.80E-02	1.74E-02	1.80E-02	1.78E-02	
Actinium-228	pCi/m^3	6.81E-03	4.77E-03	1.78E-03	3.31E-03	100
Beryllium-7	pCi/m^3	1.71E-01	1.39E-01	1.72E-01	1.69E-01	40,000
Bismuth-212	pCi/m^3	6.31E-03	5.57E-03	6.84E-03	3.34E-03	700
Bismuth-214	pCi/m^3	1.39E-03	2.02E-03	3.91E-03	ND	2,000
Cesium-137	pCi/m^3	ND	ND	9.74E-04	3.62E-04	400
Cobalt-60	pCi/m^3	6.56E-04	1.26E-03	1.35E-03	1.58E-03	80
Lead-212	pCi/m^3	1.44E-03	1.58E-03	ND	1.34E-03	80
Lead-214	pCi/m^3	3.29E-03	3.92E-03	3.30E-03	3.45E-03	2,000
Potassium-40	pCi/m^3	2.71E-02	1.46E-02	2.20E-02	2.54E-02	900
Radium-224	pCi/m^3	ND	1.92E-03	6.00E-02	ND	4
Radium-226	pCi/m^3	6.81E-03	4.77E-03	1.78E-03	3.31E-03	1
Radium-228	pCi/m^3	ND	ND	ND	1.01E-03	3
Thorium-234	pCi/m^3	1.23E-02	ND	1.39E-01	1.59E-02	400
Uranium-235	pCi/m^3	1.79E-03	ND	7.17E-03	1.17E-03	0.1
Uranium-238	pCi/m^3	1.22E-02	ND	1.39E-01	1.59E-02	0.1

NOTES: $\mu g/m^3$ = micrograms per cubic meter

pCi/m^3 = picocuries per cubic meter

TLV = threshold limit value (TLVs are guidelines and not legal standards. TLV guidelines assist in the control of health hazards) (ACGIH 2009). The TLVs listed for radionuclides are derived from DOE Order 5400.5 derived concentration guide values defined for 100 mrem.

ND = not detected

of gases created in the combustion process with other gases in the atmosphere. The data recovery for $PM_{2.5}$ measurements was approximately 99 percent.The monthly and annual averages for $PM_{2.5}$ are listed in Table 5-4. In 2008, the highest concentrations were found in the beginning of the summer and were most likely the result of wildland fire smoke transported from areas outside of SNL/NM. Concentrations in the Sandia area dropped quickly with the onset of rains in late June to early July.

VOCs

The VOCs generally observed at SNL/NM are products or by-products of fossil fuels, or from lab operations. In 2008, the data recovery for VOC monitoring was 98 percent. Monthly VOC samples were analyzed for 23 VOC species plus total non-methane hydrocarbon (TNMHC). Table 5-6 shows the compiled results for compounds detected at four stations.

The concentrations in Table 5-6 reveal that there is not one site with the highest concentration for all analytes, though the greatest numbers of contaminants are found at the CPMS VOC site.

An ANOVA was performed to determine if statistical differences existed between locations for each VOC. The ANOVA revealed that there were three statistically valid differences. The concentrations of n-butane, n-pentane, and acetone measured at the CPMS were higher than at least one other sampling site. These chemicals are commonly used in industrial applications and could be expected to be higher due to the type of operations that take place in the area of the CPMS monitoring station. The concentrations of these chemicals at the CPMS was only slightly higher – though still very low – than the concentrations at the other three sampling sites.

5.3 RADIOLOGICAL AIR EMISSIONS

The EPA regulates radionuclide air emissions in accordance with 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." The EPA has set a maximally exposed individual (MEI) radiological dose limit of 10-millirems per year (mrem/yr) resulting from all radiological air emissions produced from a DOE facility.

5.3.1 Compliance Reporting

Sandia prepares an annual NESHAP report that summarizes radionuclide air emission releases from SNL/NM facilities and presents the results of the annual dose assessment. The DOE National Nuclear Security Administration (NNSA) Sandia Site Office (SSO) submits the annual report to EPA and the City of Albuquerque (COA) Environmental Health Division. The NESHAP report prepared in 2009 includes the NESHAP "Annual Report for Calendar Year (CY) 2008," SNL/NM (SNL 2009c).

5.3.2 SNL/NM NESHAP Facilities

Currently, there are 15 potential NESHAP facilities that may be defined as either point or diffuse emissions sources at SNL/NM. Point sources are produced from an exhaust stack or vent, while diffuse sources emanate from broad areas of contamination, such as radionuclide-contaminated soils present at some Environmental Restoration (ER) sites.

Table 5-7 lists the radionuclides and the total reported emissions (in curies [Ci]) from each SNL/NM NESHAP source in 2008. Of the 15 sources, 14 were point sources and one was a diffuse source (a landfill). Four of the 15 facilities reported no emissions in 2008.

The 15 SNL/NM NESHAP facilities are illustrated in Figure 5-5 and are described below.

TA-I Sources

Radiation Protection Instrument Calibration Laboratory (RPICL) – Calibration on radiation detection equipment resulted in small releases of tritium.

Metal Tritide Shelf-Life Laboratory (MTSLL) – This laboratory conducted research on tritium materials, but it ceased tritium operations in CY 2008. Therefore, there were no emissions from this laboratory for CY 2008 and it will not be discussed in future NESHAP reports.

Neutron Generator Facility (NGF) – The NGF is the nation's principal production facility for neutron generators. This facility currently emits only tritium. The facility has two stacks, but only utilizes the main stack in the Tritium Envelope North Wing. In 2008, the NGF emitted 39.9 Ci of tritium, based on continuous stack monitoring. Although anticipated tritium releases do not exceed the regulatory threshold requiring continuous monitoring, it is performed voluntarily at NGF as a best management practice (BMP).

Process Research Development (PRD) Laboratory – This laboratory is capable of handling and conducting research on tritium materials. It is currently in standby mode, and has yet to become operational; therefore, there were no emissions from this laboratory in CY 2008.

TABLE 5-6. VOC Average Concentrations Compiled from Monthly Results at Four Stations (Air)
2008 Average was computed using only detected results.

Compound	CPMSVOC	CWVOC	MDLVOC	TA-II VOC	TLV
1,1,1-Trichloroethane **	ND	ND	ND	ND	350,000
1,1,2-Trichlorotrifluoroethane **	ND	ND	ND	ND	1,000,000
1-Butene/Isobutene	0.21	0.11	0.10	0.14	NA
2,2,4-Trimethylpentane	0.23	ND	ND	ND	NA
2-Butanone (MEK)	0.51	0.38	0.44	0.39	200,000
2-Methylbutane	0.68	0.46	1.17	0.97	1,770,000
3-Methylpentane	0.06	0.09	0.08	0.09	500,000
Acetone	7.44	2.76	4.04	3.18	500,000
Benzene	0.42	0.12	0.18/	0.15	500
Carbon tetrachloride **	ND	ND	ND	ND	5,000
Chloromethane	0.58	0.50	0.53	0.52	50,000
Dichlorodifluoromethane **	0.58	0.55	0.55	0.55	1,000,000
Ethylbenzene	ND	ND	ND	ND	1,000,000
Isohexane	0.13	ND	0.16	0.11	100,000
Isopentane	0.97	0.47	0.61	0.67	
Methylene chloride	ND	0.18	0.27	ND	50,000
n-Butane	0.73	0.27	0.46	0.37	800,000
n-Hexane	ND	ND	ND	0.16	50,000
n-Pentane	0.58	0.21	0.39	0.31	600,000
o-Xylene	ND	ND	ND	ND	100,000
p-Xylene/m-Xylene	ND	ND	ND	ND	NA
Toluene	0.41	0.35	0.61	0.51	50,000
Trichlorofluoromethane **	0.30	0.28	0.28	0.28	1,000,000
TNMHC	19.47	8.03	12.07	13.74	NA

NOTES: ppbv = parts per billion by volume
ND = not detected
NA = not available
VOC = volatile organic compounds. VOCs may be shown as separate species as well as in combination with another analyte.
TLV= threshold limit value (TLVs are guidelines and not legal standards. TLV guidelines assist in the control of health hazards) (ACGIH 2009)
** Ozone depleting compounds

Radiation Laboratory – Small-scale radiation experiments resulted in the release of air trace amounts activation products and tritium.

Radiation Protection Sample Diagnostics (RPSD) Laboratory – Small-scale radiometric sample analyses on an as-needed basis. In 2008 there were no reportable emissions.

Sandia Tomography and Radionuclide Transport (START) Laboratory – This laboratory is used to perform small-scale experiments.

TANDEM Accelerator – This is an ion solid interaction and defect physics accelerator facility. In 2008, the facility reported emissions of tritium.

TA-II Sources

Explosive Components Facility (ECF) – The ECF conducts destructive testing on neutron generators. In 2008, the facility reported emissions of tritium.

TA-III Sources

Mixed Waste Landfill (MWL) – The MWL was closed in 1988. Although a diverse inventory of radionuclides is present in the MWL, measurements indicate that tritium is the only radionuclide released into the air. In 1992, 1993, and 2003, special studies were conducted to quantify the tritium emissions (Anderson 2004). The most recent value, from 2003, was used for their annual inventory.

Radioactive and Mixed Waste Management Facility (RMWMF) – The RMWMF primarily handles low-level waste (LLW), mixed waste (MW), and some transuranic (TRU) waste. In 2008, the RMWMF reported tritium releases, americium-241, strontium-90, and cesium-137 as determined by continuous stack monitoring. Although anticipated tritium releases do not exceed the regulatory threshold requiring continuous monitoring, it is performed voluntarily at the RMWMF as a BMP.

TA-IV Sources

High-Energy Radiation Megavolt Electron Source - III (HERMES-III) – The HERMES-III accelerator is used to test the effects of prompt radiation on electronics and complete military systems. This facility produces air activation products, primarily nitrogen-13 and oxygen-15. In 2008, the facility reported releases of nitrogen-13 and oxygen-15.

TABLE 5-7. Summary of Radionuclide Releases from the 15 NESHAP Sources – 2008

Source Name, Location	Description	Source Type	Monitoring Method	Radionuclide Emitted	Reported Release (Ci/yr)
ACRR, TA-V	Reactor used to perform in-pile experiments for severe reactor accident research projects.	Point	Periodic	^{41}Ar	3.9
Auxiliary HCF, TA-V	Facility provides full capability to handle and analyze radioactive material.	Point	Periodic	N/A	N/A
ECF, TA-II	Facility used for testing neutron generator design and manufacturing.	Point	Calculation	^{3}H	8.4E-04
HERMES-III, TA-IV	Gamma simulator used primarily for simulating the effects of prompt radiation from a nuclear burst on electronics and complete military systems.	Point	Periodic	^{13}N ^{15}O	6.155E-04 6.15E-05
MTSLL, TA-I	Research and development on tritium.	Point	N/A	Ceased Operations in 2008	N/A
MWL, TA III	Environmental restoration site that acts as a diffuse source of tritium emissions into the atmosphere.	Diffuse	Periodic	^{3}H	9.0E-02
NGF, TA-I	Principal production facility for neutron generators – Tritium Envelope North Wing.	Point	Continuous	^{3}H	3.99E+01
PRD Laboratory, TA-I	Research and Development on tritium.	Point	Calculation	N/A	N/A
Radiation Laboratory, TA-I	Laboratory that performs small-scale experiments.	Point	Calculation	^{3}H ^{13}N ^{16}N ^{41}Ar	1.0E-05 2.0E-07 2.0E-07 1.0E-09
RMWMF, TA-III	Facility that handles radioactive and mixed waste products.	Point	Continuous	^{3}H (oxide) ^{3}H (elemental) ^{241}Am ^{90}Sr ^{137}Cs	3.55E+01 4.84E+01 1.04E-05 4.18E-07 5.16E-08
RPICL, TA-I	Laboratory that performs radiation detection equipment calibration.	Point	Calculation	^{3}H	4.1E-05
RPSD TA-II	Small-scale laboratory analyses, as needed.	Point	Calculation	N/A	N/A
START, TA-I	Small-scale laboratory operation.	Point	Calculation	^{60}Co ^{137}Cs ^{241}Am ^{239}Pu ^{238}U	1.20E-08 3.20E-08 3.10E-08 2.60E-08 1.72E-12
Tandem Accelerator, TA-I	Ion solid interaction and defect physics accelerator facility.	Point	Calculation	^{3}H	1.0E-05
Z Facility, TA-IV	Experimental facility for research on light-ion inertial confinement fusion. Technology involves storing large amounts of electrical energy over a period of minutes and then releasing this energy in an intense, concentrated burst at a target.	Point	Calculation	N/A	N/A

NOTES: *Monitoring Method: Periodic = Based on periodic measurements
Calculation = Calculated from known parameters
Continuous = Based on continuous air monitoring results

ACRR =Annular Core Research Reactor
Ci/yr = curies per year
ECF = Explosive Components Facility
HCF = Hot Cell Facility

HERMES-III = High Energy Radiation Megavolt Electron Source-III

MTSLL = Metal Tritide Shelf-Life Laboratory
MWL = Mixed Waste Landfill

N/A = not available
NGF = Neutron Generator Facility
PRD = Process Research Development
RMWMF = Radioactive and Mixed Waste Management Facility
RPICL = Radiation Protection Instrument Calibration Laboratory
RPSD = Radiation Protection Sample Diagnostics
START = Sandia Tomography and Radionuclide Transport Laboratory
TA = Technical Area

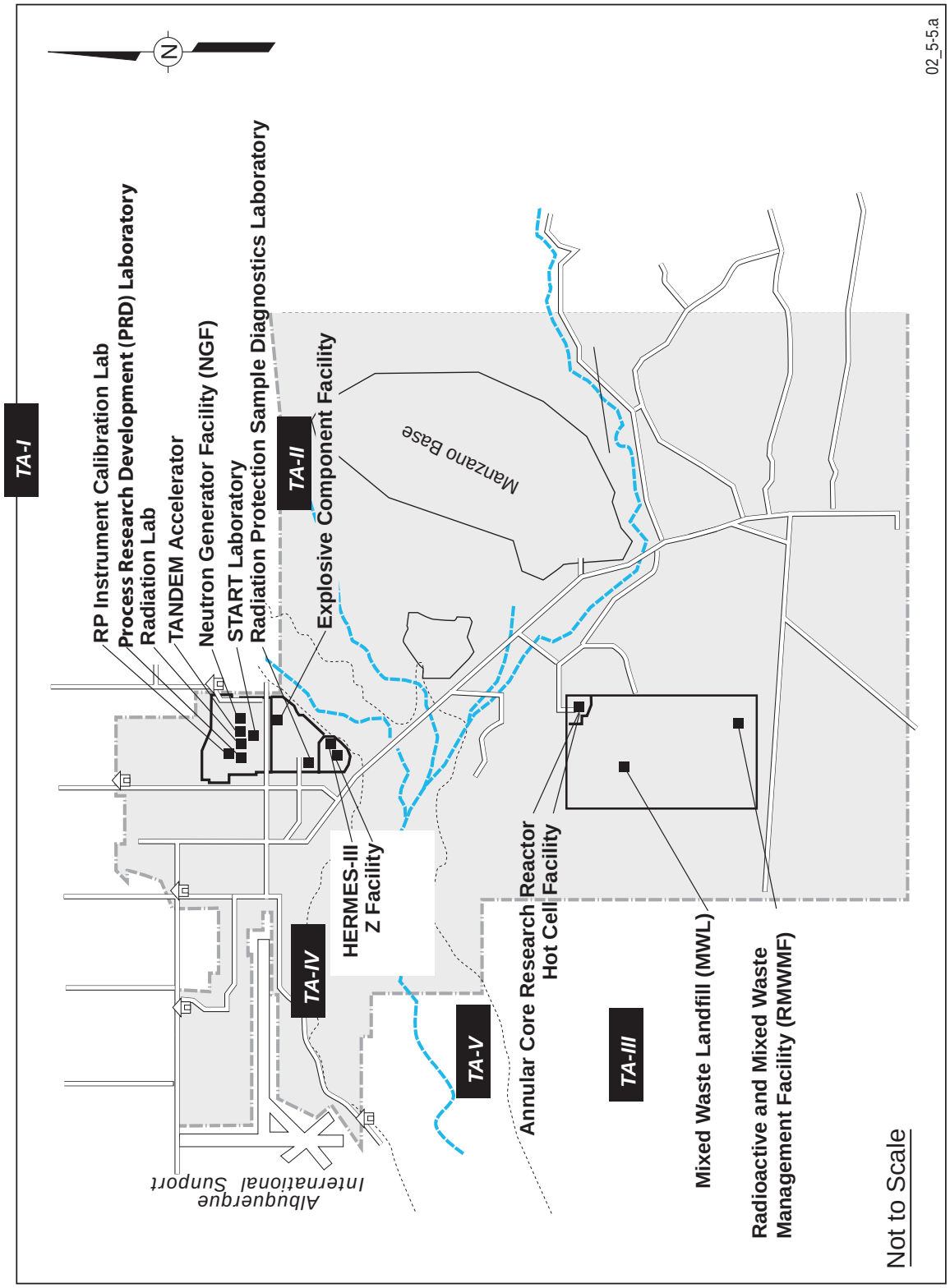


FIGURE 5-5. Locations of the 15 Facilities at SNL/NM that Provided Radionuclide Release Inventories in 2008

Z Facility – The Z Facility is an accelerator used for research on light ion inertial confinement fusion. Large amounts of electrical energy are stored over several minutes and then released as an intense concentrated burst (shot) at a target.

TA-V Sources

Annular Core Research Reactor (ACRR) – This reactor is used primarily to support defense program projects. If required in the future, the facility also has the capability to support the Medical Isotope Production Project (MIPP). Argon-41, an air activation product, was the only reported release in 2008.

Hot Cell Facility (HCF) – The HCF provides full capability to remotely handle and analyze radioactive materials such as irradiated targets. In 2008 there were no reportable emissions.

5.4 ASSESSMENT OF POTENTIAL DOSE TO THE PUBLIC

In general, the dose received by a person is dependent on the distance from the source, the available pathways in the environment (food chain, air, and water), radionuclide quantities and properties, and meteorological conditions. Historically, radioactive releases from SNL/NM have resulted in doses to the public that are several orders of magnitude below the EPA's standard of 10 mrem/yr. Radiation protection standards specific to DOE facilities are provided in Chapter 9.

5.4.1 NESHAP Dose Assessment Input

Emission Sources

To assess compliance, all NESHAP facilities at SNL/NM must submit annual facility emission data to the NESHAP program administrator. The emissions from six "primary" sources (ACRR, HCF, Z Facility, NGF, RMWMF, and MWL) are modeled using EPA's CAA Assessment Package-1988 (CAP88) (EPA 2006) to estimate the annual dose to each of 35 identified public receptors. Primary sources are those that determine their emissions by direct measurements or by calculations based on measured operational parameters. The HCF, was the only primary source that reported no emissions for 2008. Currently the HCF is not in operation.

The NESHAP regulation requires DOE to continuously monitor any radionuclide air emission source that has the potential to produce a dose of 0.1 mrem/yr to the MEI; however, there are no facilities at SNL/NM that exceed this criterion. As a BMP, some SNL/NM facilities perform continuous stack monitoring. Other facilities base their emission estimates on periodic confirmatory measurements or engineering calculations. In 2008, the highest emissions were from tritium. Historically, tritium and argon-41 have been the most significant contributor to the effective dose equivalent (EDE) of the MEI. Figure 5-6 shows the annual reported release (in Ci) of tritium and argon-41 over the past 19 years. The atmosphere contains 72 percent nitrogen, 21 percent oxygen, 0.93 percent argon, 0.03 percent carbon dioxide, and minor concentrations of neon, methane, hydrogen, helium, and krypton. Some of these constituents are susceptible to isotope transformations during high energy processes, which result in air activation products such as Argon-41.

The increase in tritium releases in 2008 were due to increased operations at the RMWMF and the NGF.

Demographic Data

Demographic data includes the resident population, the number of beef and dairy cattle, and the utilized food crop area fraction for a 50-mile (mi) radius study area. The densities for resident population, cattle, and food crops are calculated as the quotient of the most recent county data and the county land area (e.g., cows per acre). In 2008 the NESHAP calculation for resident population was based on the State's 2000 to 2001 estimated urban and county population data and U.S. Census Bureau data (DOC 2009). The beef and dairy cattle numbers and food crop area fraction were calculated using 1998 agricultural statistics. The statistics were supplied by the New Mexico Department of Agriculture (NMDOA 2009). The following values were used in the 2008 CAP88 calculation:

- 1.927 Dairy cattle/km^2
- 1.156 Beef cattle/km^2
- 8.1E0-04 Acres of food crops/m^2
- 793,740 Population (within 50-mi radius)

On-Site and Off-site Public Receptors

A total of 35 receptor locations (24 on-site at KAFB, and 12 off-site) in the vicinity of SNL/NM have been identified as potential locations of maximum exposure to a member of the public. Off-site receptor locations extend to the Isleta Pueblo Indian Reservation, the Four Hills subdivision north of KAFB, the Manzanita Mountains (with east mountain residents), and areas near the Albuquerque International Sunport west of KAFB. On-site receptors include U.S. Air Force (USAF) facilities, offices, and housing areas, as well as other non-DOE and non-U.S. Department of Defense (DoD) facilities on KAFB.

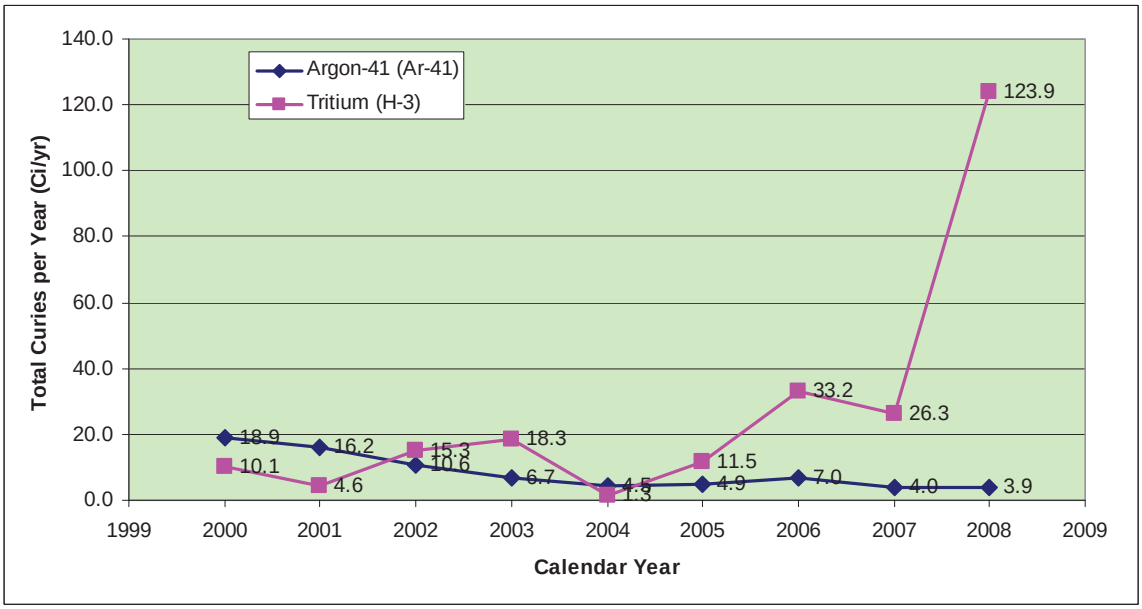


FIGURE 5-6. Summary of Atmospheric Releases of Ar-41 and H-3 from SNL/NM Facilities from 2000 through 2008. (Emissions vary from year to year based on the operations conducted at the various facilities.)

Meteorology

Data from four meteorological towers (CW1, A36, A21, and MW1) in the proximity of NESHAP emission sources were used in 2008. Data from each tower consisted of approximately 35,000 hourly observations of wind direction, wind speed, and stability class (inferred from wind and solar insulation data). The data are compiled into a normalized distribution from which all wind and stability frequency-of-occurrence data were derived.

5.4.2 Dose Assessment Results

CAP88 utilizes a Gaussian plume equation that estimates air dispersion in both horizontal and vertical directions. Individual EDEs to off-site and on-site receptors are presented in Tables 5-8 and 5-9, respectively. Dose assessment results are summarized in Table 5-10.

The total dose at each receptor location is determined by summing the individual doses resulting from each source. The dose to the MEI member of the public is then compared to the EPA limit of 10 mrem/yr.

In 2008, the on-site MEI was located on KAFB at the Honeywell Systems Support Site. The MEI dose of 2.25 E-03 mrem/yr at the Honeywell Systems Support Site resulted primarily from releases of tritium from the nearby NGF. The off-site MEI was located at the Eubank Gate Area. The MEI dose from both primary and secondary sources was 2.29 E-03 mrem/yr.

By comparison, the average person in the Albuquerque area receives 330 to 530 mrem/yr resulting primarily from radon emanating from earth materials, medical procedures, consumer products, and cosmic radiation (Brookins 1992).

Collective Dose

The collective population dose resulting from all SNL/NM radiological emissions was calculated for both KAFB and the regional area (Table 5-10). Collective dose calculations are not required by NESHAP regulations; however, it provides a useful numerical comparison of the public dose from year to year. Collective dose is calculated by multiplying a representative individual dose within a population, by the total population. Sandia calculates the collective population dose for both the KAFB housing areas and the general Albuquerque area population within an 80-kilometer km (50-mi) radius.

Regional

The Albuquerque regional collective population dose in 2008 was 1.92 E-01 person-mrem/yr. This is comparable with the average over the past five years of regional collective population dose data. For the purpose of calculating the collective dose, all releases

TABLE 5-8. Annual Source-Specific Effective Dose Equivalent (EDE) from Primary Sources to Off-site Receptors - 2008

Facility	ACRR	MWL	NGF	RMWMF	Z Facility	TOTAL from Primary Sources (mrem/yr)
	Emission (mrem/yr)	Emission (mrem/yr)	Emission (mrem/yr)	Emission (mrem/yr)		
Albuquerque City Offices	1.30E-05	7.40E-07	8.90E-04	4.20E-04	1.80E-08	1.32E-03
East Resident	9.90E-06	7.00E-07	8.80E-04	4.10E-04	1.80E-08	1.30E-03
Eubank Gate Area (Building 8895)	8.10E-05	9.40E-07	1.70E-03	5.00E-04	3.10E-08	2.28E-03
Four Hills Resident	7.70E-06	7.00E-07	8.80E-04	4.10E-04	1.80E-08	1.30E-03
Isleta	1.20E-05	7.30E-07	8.90E-04	4.20E-04	1.90E-08	1.32E-03
La Luz Childcare	3.90E-05	7.80E-07	9.20E-04	4.60E-04	2.00E-08	1.42E-03
Manzano Mesa Apartments	1.60E-05	7.30E-07	9.00E-04	4.20E-04	1.90E-08	1.34E-03
Tijeras Arroyo (West)	1.30E-05	7.4E-07	8.90E-04	4.20E-04	1.80E-08	1.32E-03
U.S. Geological Survey	3.20E-05	7.60E-07	9.00E-04	4.80E-04	1.90E-08	1.41E-03
Veteran's Hospital	2.70E-05	8.00E-07	9.00E-04	4.50E-04	1.90E-08	1.38E-03
Willow Wood Housing	2.00E-05	7.40E-07	8.90E-04	4.30E-04	1.90E-08	1.34E-03
TOTALS	**2.71E-04**	**8.36E-06**	**1.06E-02**	**4.82E-03**	**2.18E-07**	**1.57E-02**

NOTES: mrem/yr = millirem per year
ACRR = Annular Core Research Reactor
MWL = Mixed Waste Landfill

are assumed to occur from a location centered in TA-V. The population dose was calculated by multiplying 793,740 residents by doses per sector.

KAFB

A collective population dose for KAFB residents was calculated based on three main housing areas (Maxwell, Pershing Park, and Kirtland Family). Housing demolition and new housing construction at KAFB resulted in fewer residential structures during 2008. However, the overall population increased as additional new housing was completed. The total population dose for KAFB was obtained by summing the three areas based upon a total residential population of 4,021, which is a 12 percent increase over the previous year's population. The CY 2008 calculation resulted in an estimated population dose of 1.81 E0-03 person-mrem/yr.

5.5 AIR QUALITY REQUIREMENTS & COMPLIANCE STRATEGIES

Air quality standards are implemented by regulations promulgated by local and federal governments in accordance with the CAA and the CAA Amendments (CAAA) of 1990. The Albuquerque Bernalillo County Air Quality Control Board (ABC/AQCB), the State of New Mexico, and the EPA determine applicable air quality standards for non-radiological pollutants. Radionuclide air emissions are currently regulated by the EPA under NESHAP, as discussed in Section 5.4.1. A complete list of air quality regulations applicable to SNL/NM is provided in Chapter 9.

5.5.1 SNL/NM Air Emission Sources

As discussed in Section 5.2.1, criteria pollutants include SO_2, NO_2, CO, O_3, PM, and Pb. For these criteria and other pollutants, the EPA:

- Sets ambient air quality standards – including those for motor vehicle emissions,
- Requires state implementation plans for protection and improvement of air quality,
- Institutes air quality programs to prevent the nation's air from deteriorating, and
- Establishes hazardous air pollutant (HAP) control programs.

EPA standards for criteria pollutants are given in 40 CFR 50, NAAQS and implemented in (20.11.08 NMAC). NMAAQS with criteria pollutant standards for ambient air is met through on-going applicability determinations on potential criteria pollutant emission sources that require the following: acquisition of the necessary permits and registrations for applicable sources from the appropriate regulatory agencies;

TABLE 5-9. Annual Source-Specific Effective Dose Equivalent (EDE) to On-site Receptors – 2008

Facility	ACRR Emission (mrem/yr)	MWL Emission (mrem/yr)	NGF Emission (mrem/yr)	RMWMF Emission (mrem/yr)	Z Facility Emission (mrem/yr)	TOTAL (mrem/yr)
Airport Bldg. 761	1.50E-04	3.20E-07	4.40E-04	1.00E-04	1.40E-08	6.90E-04
Air National Guard Communications Flight	8.70E-05	2.60E-07	3.40E-04	8.60E-05	1.20E-08	5.13E-04
Bernalillo County Sheriff Training	1.40E-04	2.70E-07	8.90E-05	1.50E-04	2.60E-09	3.79E-04
Capeheart West	1.90E-05	6.40E-08	2.30E-05	3.40E-05	8.30E-10	7.61E-05
Chestnut Site	1.70E-04	6.20E-07	5.60E-05	1.30E-03	2.60E-09	1.53E-03
Child Development Center	1.90E-05	6.60E-08	2.00E-05	2.90E-05	7.10E-10	6.81E-05
Golf Course Club House	3.80E-04	5.70E-07	1.50E-04	1.70E-04	1.30E-08	7.01E-04
Golf course Maintenance Area	2.40E-04	4.40E-07	2.10E-04	1.40E-04	1.40E-08	5.90E-04
Honeywell Systems Support Site	9.30E-05	2.20E-07	1.90E-03	8.30E-05	3.60E-08	2.08E-03
ITRI/Lovelace	6.70E-05	1.70E-07	3.60E-05	1.30E-04	1.50E-09	2.33E-04
KAFB Fire Station	8.80E-05	1.80E-07	6.80E-04	7.20E-05	1.70E-08	8.40E-04
KAFB Landfill	4.60E-05	1.00E-07	4.90E-05	6.50E-05	2.10E-09	1.60E-04
Kirtland Elementary	1.80E-05	6.20E-08	1.90E-05	2.70E-05	6.60E-10	6.41E-05
Kirtland Storage Site	7.50E-04	1.20E-06	1.50E-04	2.00E-04	1.20E-08	1.10E-03
Manzano Offices (Fire Station)	1.70E-04	2.80E-07	8.60E-05	1.60E-04	2.50E-09	4.16E-04
Maxwell Housing (SE Corner)	2.00E-05	6.70E-08	2.00E-05	2.90E-05	7.20E-10	6.91E-05
Kirtland Family Housing	6.70E-05	1.60E-07	3.90E-04	6.50E-05	6.30E-09	5.22E-04
Pershing Park Housing	7.00E-05	1.50E-07	3.20E-04	6.20E-05	9.50E-09	4.52E-04
Riding Club	3.80E-04	5.30E-07	1.10E-04	2.10E-04	3.70E-09	7.01E-04
Sandia Area Federal Credit Union	1.00E-04	2.10E-07	1.30E-03	7.90E-05	2.70E-08	1.48E-03
Sandia Elementary School	6.60E-05	1.60E-07	4.90E-04	6.50E-05	1.20E-08	6.21E-04
Shandiin Childcare	9.60E-05	2.10E-07	6.30E-04	7.90E-05	2.10E-08	8.05E-04
Vehicle Maintenance Flight	8.60E-05	2.60E-07	3.20E-04	8.60E-05	1.10E-08	4.92E-04
Wherry Elementary	3.90E-05	1.30E-07	4.50E-05	5.70E-05	1.60E-09	1.41E-04
TOTAL	3.36E-03	6.70E-06	7.87E-03	3.48E-03	2.24E-07	1.47E-02

NOTES: ACRR = Annular Core Research Reactor
MWL = Mixed Waste Landfill
RMWMF = Radioactive Mixed Waste Management Facility
NGF = Neutron Generator Facility
mrem/yr = millirem per year
LRRI = Lovelace Respiratory Research Institute
ANG = Air National Guard
KAFB = Kirtland Air Force Base

TABLE 5-10. Calculated Dose Assessment Results for On-site and Off-site Receptors and for Collective Populations – 2008

Dose to Receptor	Location	2008 Calculated Dose	NESHAP Standard
Individual Dose			
On-site Receptor EDE to the MEI	Honeywell Systems Support Site	2.25 E -03 mrem/year (2.25 E -05 mSv/yr)	10 mrem/yr (0.1 mSv/yr)
Off-site Receptor EDE to the MEI	Eubank Gate Area	2.29 E-03 mrem/yr (2.29 E-05 mSv/yr)	10 mrem/yr (0.1 mSv/yr)
Collective Dose			
Collective Regional Population	Residents within an 80-km (50 mi) radius	1.92 E-01 mrem/yr (1.92 E-03 mSv/yr)	No Standard Available
Collective KAFB Population	KAFB Housing	1.81 E -03 mrem/yr (1.81 E -05 mSv/yr)	No Standard Available

NOTES: [1] Based on a population of 793,740 people estimated to be living within an 80-km (50-mi) radius.
[2] Based on a population of 4,021 people estimated to be living in permanent on-base housing.
NESHAP = National Emissions Standards for Hazardous Air Pollutants
mSv/yr = millisievert per year
EDE = effective dose equivalent
person-Sv/yr = person-sievert per year
MEI = maximally exposed individual

fuel throughput tracking, monitoring, and reporting; ambient air surveillance; and periodic direct emission sampling. As discussed previously, ambient air measurements taken in the vicinity of SNL/NM facilities have been well below maximum threshold limit values (TLVs) and standards for criteria pollutants.

The signficant sources of criteria pollutants at SNL/NM are defined as sources that require a permit or registration from a regulatory agency.

A majority of the permits and registrations held by SNL/NM are multi-source (including a combination of criteria pollutant emission sources). Significant sources at SNL/NM are listed, below.

Boilers
During CY 2008, SNL/NM maintained eight permits and registrations for applicable boilers site wide. Table 5-11 illustrates the annual fuel usage and associated emissions for CY 2008. The boilers associated with the permits and registrations are shown in Table 5-12.

During CY 2008, Phase Two of the Heating System Modernization (HSM) project was completed which included the installation and startup of 33 of the 123 boilers. Phase One completed 53 boilers, after the completion of the 33 boilers in Phase Two, there will be 25 boilers remaining for completion in Phase Three. The total number of boilers to be installed for the HSM project has been decreased from the original 123 to 111. Once Phase Three is complete, the substituted boilers in Permit #1705-M2 will be decomissioned and the Steam Plant will be demolished.

Emergency Generators
During CY 2008, SNL/NM maintained eleven permits and registrations for applicable generators site wide. Table 5-13 illustrates the annual hours of operation and associated emissions for CY 2008. The generators associated with the permits and registrations are shown in Table 5-14.

In CY 2008, the generator at the Steam Plant (Permit #1705-M2) was disconnected and decommissioned. There was no usage associated with this unit for CY 2008.

Chemical Usage
During CY 2008, SNL/NM maintained ten permits and registrations for applicable HAPs chemical usage site wide. The HAP chemical usage associated with the permits and registrations is for general laboratory usage for R&D purposes. Table 5-15 illustrates the amount of chemicals purchased at the associated facility for CY 2008. The facilities that have permits or registrations for chemical usages are listed in Table 5-16.

Miscellaneous New Source Review (NSR) Permits
The document disintegrator is an industrial-size, classified document shredder. There is one pollutant of concern with this permit, which is particulate emissions. The document disintegrator operated 604 hours in CY 2008 which calculated an estimated 3.6 tons of total suspended particulate (TSP).

Thermal Test Complex (TTC) is an enclosed R&D fire test complex and an important element in the revitalization of SNL/NM test capabilities needed for test article qualification, development, surveillance, investigation, and modeling. Table 5-17 illustrates the reportable emissions associated with the TTC for CY 2008.

Open Burn Permits
Open burn permits are required for:

- Disposal of Explosives by Burning (avoids the hazards of transport and handling),
- Aboveground Detonation of Explosives (over 20 lb),
- Burning Liquid Fuel (2,000 gallons or more, or solid fuel of 5,000 lb in a single event, R&D activity), and
- Igniting Rocket Motors (with greater than 4,000 lb of fuel).

A list of 2008 permits can be found in Chapter 9, Table 9-1.

Fugitive Dust
As required by 20.11.20 NMAC, Fugitive Dust Control, DOE obtains fugitive dust permits for each of Sandia's applicable projects that will disturb greater than ¾ acre of soil. For a list of 2008 permits refer to Chapter 9, Table 9-1 of this report.

Vehicles
The majority of government vehicles at SNL/NM are owned and managed by the General Services Administration (GSA). All GSA vehicles must comply with the same emission standards set for all personal and non-personal vehicles that are issued KAFB vehicle passes. As required by 20.11.100 NMAC, Motor Vehicle Inspection Decentralized, Sandia submits an annual vehicle inventory update and inspection plan to the COA for the applicable SNL/NM owned vehicles.

TABLE 5-11. Boiler Usage and Emission Data - 2008

Permit #	Fuel Usage	Emissions (tpy)				
		NO_x	CO	PM_{10}	SO_2	VOC
R#936-M1	14,882,647 scf	0.74	0.63	0.06	0.01	0.04
R#1406-M1	3,461,095 scf	8.7E-02	1.5E-01	1.3E-02	1.0E-03	9.5E-03
#1705-M2	191,287,231 scf	7.25	8.03	0.73	0.13	0.53
	0 gallons	0	0	0	0	0
#1725	11,297,088 scf	0.56	0.47	0.04	0.003	0.03
#1820	31,115,070 scf	0.78	1.31	0.12	0.03	0.09
#1823	10,902,200 scf	0.55	0.46	0.04	0.003	0.03
#1830	108,010,831 scf	2.7	4.5	0.4	0.1	0.3

NOTES: tpy = tons per year scf = standard cubic feet
scf = standard cubic feet tpy = tons per year

TABLE 5-12. Boilers Associated with Permits and Registrations – 2008

Permit	Description	Size	Fuel Type
R#547	Explosives Components Facility (ECF) Boilers used to heat the facility.	Two (2) 4.3437 MMBtu	Natural Gas
R#936-M1	Processing and Environmental Technology Laboratory (PETL) Boilers used to heat the facility.	Ten (10) 1.4 MMBtu/hr	Natural Gas
R#1406-M1	Advanced Manufacturing Prototype Facility (AMPF) Boilers used to heat the facility.	Two (2) 1.8 MMBtu/hr	Natural Gas
1705-M2	Steam Plant Boilers produce steam heat for buildings in Technical Area I. Original 5 boilers were all decomissioned throughout CY208 and four package boilers were installed as substituted equipment until the completion of the Heating System Modernization (HSM) boiler installations in TA-I..	Three (3) 78.57 MMBtu/hr One (1) 117.09 MMBtu/hr One (1) 214.2 MMBtu/hr Four (4) 9.0 MMBtu/hr	Natural Gas (primary) / Diesel Natural Gas
1725	Center for Integrated Nanotechnologies (CINT) Boilers used to heat the facility.	Two (2) 6 MMBtu	Natural Gas
1820	Microsystems and Engineering Sciences Applications (MESA) Complex Boilers used to heat the facility.	Two (2) 20.412 MMBtu/hr One (1) 10.206 MMBtu/hr	Natural Gas
1823	Weapons Integration Facility (WIF) Boilers used to heat the facility	Two (2) 8.17 MMBtu/hr One (1) 3.68 MMBtu/hr	Natural Gas
1830	HSM Boilers used to heat buildings in Technical Area I, and will eventually allow for the decommissioning of the Steam Plant Boilers.	One-Hundred-Twenty-Three (123) 2.0 MMBtu/hr or less	Natural Gas

NOTES: MM Btu = Million British Thermal Units

TABLE 5-13. Generator Hours and Emission Data - 2008

Permit Number	Hours/CY08	Emmissions (tpy)				
		NO_x	CO	PM_{10}	SO_2	VOC
#374-M1	7	5.1E-02	1.1E-02	3.6E-03	3.3E-03	4.0E-03
#402a	9.5	3.8E-01	1.0E-01	1.0E-02	5.0E-02	1.0E-02
	10.7					
	11					
	11.2					
#415-M1	4.4	1.3E-02	2.8E-03	9.3E-04	8.6E-04	1.0E-03
#924	7	6.3E-02	4.7E-02	1.1E-03	8.0E-03	1.8E-03
#925-M1	10	7.5E-02	2.0E-02	1.3E-03	6.8E-03	2.1E-03
#1678-M1	15	1.7E-01	4.5E-02	1.6E-02	1.5E-02	1.9E-02
	13	2.3E-01	6.2E-02	2.3E-02	2.1E-01	2.6E-02
#1705-M2	0	0	0	0	0	0
#1725	16	8.7E-02	1.9E-02	6.2E-03	5.7E-03	6.9E-03
#1828	10.4	9.4E-02	2.1E-02	2.7E-03	3.2E-02	2.7E-03
#1900b	4.3	5.4E-03	4.7E-03	2.5E-04	1.7E-03	N/A

NOTES: a = The emission limits stated in the permit are combined emissions, therefore they are calculated annually as a summed emission for all four units.

b = City of Albuquerque has started issuing generator permits with combined NOx and VOC emissions. Permit #1900 is the first permit to have this combination for Sandia.

tpy = tons per year

TABLE 5-14. Emergency Generators Associated with the Permits and Registrations – 2008

Permit	Description	Size	Fuel Type
R#547	ECF Emergency Generator provides emergency power during unplanned power outages.	One(1) 134.1 hp	Diesel
374-M1	NGF Emergency Generator provides emergency power during unplanned power outages.	One (1) 469 hp	Diesel
402	Emergency Generator Plant provides back-up power to various buildings in TA- I of SNL/NM.	Four (4) 805 hp	Diesel
415-M1	RMWMF Emergency Generator provides emergency power during unplanned power outage.	One (1) 192 hp	Diesel
924	TA- I East L Avenue Emergency Generator provides emergency power during unplanned power outages	One (1) 805 hp	Diesel
925-M1	PETL Emergency Generator provides emergency power during unplanned power outages.	One (1) 671 hp	Diesel
1678-M1	MESA Complex Emergency Generators provide emergency power during unplanned power outages.	One (1) 999hp One (1) 1609 hp	Diesel
1705-M2	Steam Plant Emergency Generator provides emergency power during unplanned power outages.	One (1) 603 hp	Diesel
1725	CINT Emergency Generator provides emergency power during unplanned power outages.	One (1) 469 hp	Diesel
1828	South-East TA- I Back-up Generator provides emergency power during unplanned power outages.	One (1) 750 hp	Diesel
1900	SDF emergency generator provides emergency power during unplanned power outages.	One (1) 380 hp	Diesel

NOTES: hp = Horse Power

TABLE 5-15. HAP Chemical Usage Reportable Data – 2008

Permit #	Pounds/Year	Tons/Year
R#936	1,546	0.8
R#1406	0	0
#374-M1	30	0.02
R#1888	1,190	0.6
R#1901	248	0.5
R#1902	68	0.03
R#1903	4	0.002
R#1905	1.3	0.001
R#1906	519	0.2

TABLE 5-16. Facilities with Permits or Registrations for Chemical Use in 2008

Permit #	Description	Chemical Type
R#547	ECF general chemical exhaust from fume hoods.	HAP, VOC
R#936	PETL general chemical exhaust from fume hoods	HAP, TAP, VOC
R#1406	AMPF general chemical exhaust from fume hoods	HAP, VOC
415-M1	RMWMF general chemical exhaust from fume hoods	HAP, VOC
R#1888	AMPL general chemical exhaust from fume hoods	HAP, VOC
R#1901	Miscellaneous Buildings general chemical exhaust from fume hoods	HAP, VOC
R#1902	TWT general chemical exhaust from fume hoods	HAP, VOC
R#1903	Solar Tower general chemical exhaust from fume hoods	HAP, VOC
R#1905	EHL general chemical exhaust from fume hoods	HAP, VOC
R#1906	AML general chemical exhaust from fume hoods	HAP, VOC

NOTES:
ECF = Explosive Components Facility
PETL = Processing Environmental Technologies Laboratory
AMPF = Advanced Manufacturing Prototyping Facility
RMWMF = Radioactive Mixed Waste Management Facility
TWT = Trisonic Wind Tunnel
EHL = Environmental Health Laboratory
AML = Advanced Materials Laboratory
HAP = hazardous air pollutant

5.5.2 Title V

The CAAA of 1990 contained provisions under Title V requiring all existing major air emission sources to obtain an operating permit. A major source is defined as the combined emissions from any facility with the potential to emit:

- 100 tons per year (tpy) or greater of any criteria pollutant,
- 10 tpy of any single HAP,
- 25 tpy of any combination of HAPs.

Background

The DOE/NNSA/SSO submitted Operating Permit application 515 (DOE 2002) on March 1, 1996, since potential emissions for SNL/NM were greater than 100 tpy of criteria pollutants. The COA has yet to issue the final permit. An updated application is currently being negotiated with the COA.

Permit Fee Structure

The COA regulations require source owners to pay air emission fees, which are implemented under 20.11.02 NMAC, Permit Fees. The sources included in the fee determination for SNL/NM include the COA NSR permitted and registered sources, as summarized in Chapter 9 Table 9-1. Total fees are based on the permitted emission limits that are requested in the NSR permit/registration applications, which are incorporated into the issued NSR permit/registration. In 2008, Sandia paid an annual fee of $10,065 based on a rate of $31 per ton of permitted emissions.

TABLE 5-17. TTC Reportable Emissions – CY 2008

Pollutant	Emissions (tpy)
NO_x	2.4E-04
CO	1.3E-02
PM_{10}	1.2E-02
SO_x	6.3E-04
VOC	2.2E-02
HAP	4.0E-03

Stratospheric Ozone Protection

Title VI of the CAAA of 1990 required EPA to establish regulations to phase out the production and consumption of ozone depleting substances (ODSs). ODSs are defined as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and other halogenated chemicals that have been found to contribute to the depletion of the stratospheric ozone layer. EPA has established regulations in 40 CFR Part 82 that require the following: recycling of ODSs during servicing of equipment; establishment of requirements for recycling and recovery equipment, technicians, and reclaimers; repair of substantial leaks in refrigeration equipment containing greater than 50 pounds of refrigerant; and establishment of safe disposal standards.

At SNL/NM, ODSs are mainly used for comfort cooling for buildings, air conditioning units in vehicles, and water cooling units in drinking fountains. Halon is contained in some fire suppression systems and some fire extinguishers.

Sandia remains committed to the reduction of ODS and has been working towards replacing Class I refrigerant chillers with a cooling capacity of 150 tons or greater—a secretarial goal set by the DOE. Replacement is part of a larger upgrade to improve the reliability and overall efficiency of the associated chilled water systems. There are currently 92 refrigerant chillers greater than 50 lbs that exist at SNL/NM. Of the existing chillers, twelve of those contain Class I refrigerants and are on the list for replacement.

5.5.3 Compliance Strategies

DOE/NNSA/SSO and Sandia has met the condition of its permits and registrations.

6.0 WASTEWATER, SURFACE DISCHARGE, STORM WATER MONITORING, OIL STORAGE & SPILL CONTROL

This chapter provides a summary of the following:

- Wastewater Discharge Program
- Surface Discharge Program
- Storm Water Program
- Oil Storage and Spill Control

Personnel at Sandia National Laboratories, New Mexico (SNL/NM) conduct effluent monitoring through wastewater, surface water, and storm water monitoring and surveillance programs. Sandia Corporation (Sandia) complies with water quality regulations established by local, state, and federal agencies. U.S. Environmental Protection Agency (EPA) standards are implemented at the state and local level by the New Mexico Environment Department (NMED) and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA). Currently, EPA Region VI implements storm water regulations under the National Pollutant Discharge Elimination System (NPDES). SNL/NM's six wastewater monitoring stations are permitted by the ABCWUA. Storm water is the only discharge at SNL/NM regulated by NPDES. Sandia also adheres to the water quality guidelines contained in U.S. Department of Energy (DOE) Orders 450.1A, Environmental Protection Program (DOE 2008) and 5400.5, Chg 2, Radiation Protection of the Public and the Environment (DOE 1993).

6.1 WASTEWATER DISCHARGE PROGRAM

Wastewater that is discharged to the public sewer system from SNL/NM facilities is divided into two categories: sanitary discharges and industrial discharges. Sanitary waste streams include wastewater from restrooms and showers, food service establishments, and other domestic-type activities. Industrial discharges are produced from general laboratory research operations, including electroplating, metal finishing, microelectronic development, and photographic processes.

Sandia closely monitors its liquid effluent discharges to meet regulatory compliance. Sandia further reduces its toxic discharges by implementing Toxic Organic Management Plans (TOMPs) and general good housekeeping and engineering practices. Pollution Prevention (P2) measures to reduce, substitute, or eliminate toxic chemicals are implemented, where feasible, as discussed in Section 3.4.

6.1.1 SNL/NM and the ABCWUA

ABCWUA Publicly-Owned Treatment Works (POTW)

SNL/NM's sewer system connects to the ABCWUA's sanitary sewer line at six permitted outfalls. It should be noted that SNL/NM Permit 2069G for activities conducted at the Microelectronics Development Laboratory (MDL) is upstream of the final discharge location, ABCWUA Permit 2069A. Wastewater effluent discharged from any of the six outfalls must meet the ABCWUA's Sewer Use and Wastewater Control Ordinance (SUWCO) requirements. SUWCO information can be found at the American Legal Publishing Corporation's website, which publishes the ABCWUA's Code of Ordinances:

www.amlegal.com/albuquerque_nm/

All SNL/NM effluent discharge standards were within the ABCWUA's SUWCO established limits during 2008.

Wastewater Compliance Awards

The ABCWUA's reporting requirements are defined under its SUWCO. The SUWCO specifies the discharge quality and requirements that the ABCWUA will accept at its POTW. Sandia received six "Gold Pre-treatment Awards" from the ABCWUA for the 2007 to 2008 reporting year (November 2007 through November 2008). A "Gold Pre-treatment Award" is given based on a facility's 100 percent compliance with reporting requirements and discharge limits set in its permits, or exceptional source reduction and P2.

6.1.2 Permitting and Reporting

The ABCWUA Water Utility Department, Water Reclaimation Division, implements the EPA's water quality standards under the authority of the SUWCO. Sandia submits semi-annual wastewater reports to the ABCWUA. The primary regulatory drivers for the Wastewater Program and important program documents and reports are listed in Chapter 9.

Discharge Control Program

The Water Quality Group (WQG) at SNL/NM maintains a Discharge Control Program to track wastewater discharges resulting from ongoing chemical, manufacturing, and industrial processes conducted at SNL/NM facilities. Facility processes are reviewed for contaminants, concentrations, and discharge frequencies to determine if the effluent will meet regulatory criteria. Once approved, a facility is issued an internal SNL/NM permit, which is reviewed annually. Generally, processes are well characterized and any constituents that are detected over the limits at a wastewater monitoring station can usually be tracked back to the source facility. Corrective actions to mitigate further releases are implemented, as necessary.

One-time releases are approved on a case-by-case basis. Buildings that only produce domestic sewage, such as from lavatories, sinks, and fountains, are not required to obtain an internal permit.

6.1.3 Wastewater Monitoring Stations

SNL/NM has six on-site monitoring locations permitted by the ABCWUA (Figure 6-1). Wastewater permits are listed in Chapter 9, Table 9-1. All of the wastewater from SNL/NM's six permitted monitoring stations contain a mixture of sanitary and industrial, which flows into the Tijeras Arroyo Intercept.

The EPA has established categorical pre-treatment standards for specified classes of industrial discharges. Station WW007 (ABCWUA Permit 2069G) monitors the wastewater discharged from the Acid Waste Neutralization (AWN) System within the MDL in Technical Area (TA) I. Laboratory discharges from the MDL and two new buildings which comprise the Microsystems and Engineering Sciences Applications (MESA) complex may also be configured to discharge to this AWN system. The Center for Integrated Nano Technologies (CINT) facility also utilizes an AWN system for pre-treatment of its process wastewater. SNL/NM discharges approximately 800,000 - 1,000,000 gallons (gal) of wastewater per day to the public sewer system.

Wastewater Monitoring

All outfall stations are equipped with flow meters which control automatic sampling units and potential of hydrogen (pH) sensors that continuously monitor wastewater 24-hours-a-day, 365-days-a-year. When pH limits are outside regulatory limits, an auto-dialer notifies SNL/NM personnel that pH limits have been exceeded. SNL/NM personnel will notify the DOE/National Nuclear Security Administration (NNSA) Sandia Site Office (SSO) personnel of the exceeded limit and DOE/NNSA/SSO are required to report the exceeded limit to the ABCWUA within 24 hours. Wastewater Discharge Permits and Station Characteristics are listed in Table 6-1.

Discharge monitoring stations WW001 (permit 2069A), WW006 (permit 2069F), WW008 (permit 2069I), and WW011 (permit 2069K) are manhole-type installations with permanently installed continuous flow measuring and pH recording instrumentation. Wastewater monitoring stations WW007 (permit 2069G) and CINT are located within buildings and are also equipped with installed continuous flow measuring and pH recording instrumentation.

Sandia splits wastewater samples taken from SNL/NM permitted outfalls with the ABCWUA to determine compliance with permit requirements. NMED is notified when sampling is scheduled to occur and is offered the opportunity to obtain samples for analysis. All samples are obtained as 24-hour flow proportional or time-weighted composites. Sandia sends SNL/NM split samples to an EPA-approved laboratory for analysis. Sampling results are compared with results obtained by the ABCWUA. Currently, the procedure is to sample randomly from a list of potential pollutants. The ABCWUA determines which parameters it plans to analyze. Monitoring parameters are listed below.

Wastewater Analyte Parameters

Metals

Aluminum, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Zinc

Radiological

Gamma spectroscopy, Gross alpha, Gross beta, Tritium

General Chemistry

Chemical oxygen demand (COD), Cyanide, Formaldehyde, Oil and Grease, Phenolic Compounds, Semi-volatile Organic Compounds (SVOCs), Soluble fluoride, Volatile Organic Compounds (VOCs)

Septic Systems

Sandia maintains four active septic tank systems in remote areas on Kirtland Air Force Base (KAFB), which are used only for domestic sanitary sewage collection. Since these tanks receive only domestic sewage and no industrial discharges, they do not require sampling prior to pumping and discharge to the public sewer. However, as a Best Management Practice (BMP), Sandia periodically obtains samples from these active septic tank systems prior to pumping and discharge.

6.1.4 TA-V Radiological Screening

SNL/NM maintains research and engineering reactors in TA-V. These reactors and support facilities have the potential to produce radioactive process wastewater that includes liquids from floor drains, lab sinks and other drains located in buildings that use, process or store radioactive materials. To ensure that all wastewater from these facilities meets regulatory standards, liquid effluent is separated into two process streams defined as reactor and non-reactor wastewater. Non-reactor wastewater is water from restrooms and non-radioactive laboratory activities. Reactor process wastewater from areas that use, process or store radioactive materials is channeled to holding tanks where it can be screened for radiological contaminants within the Liquid Effluent Control System (LECS).

LECS was developed as a control system to maintain the integrity of the ABCWUA's sanitary sewer system by collecting, analyzing, and handling SNL/NM reactor process wastewater from TA-V reactor

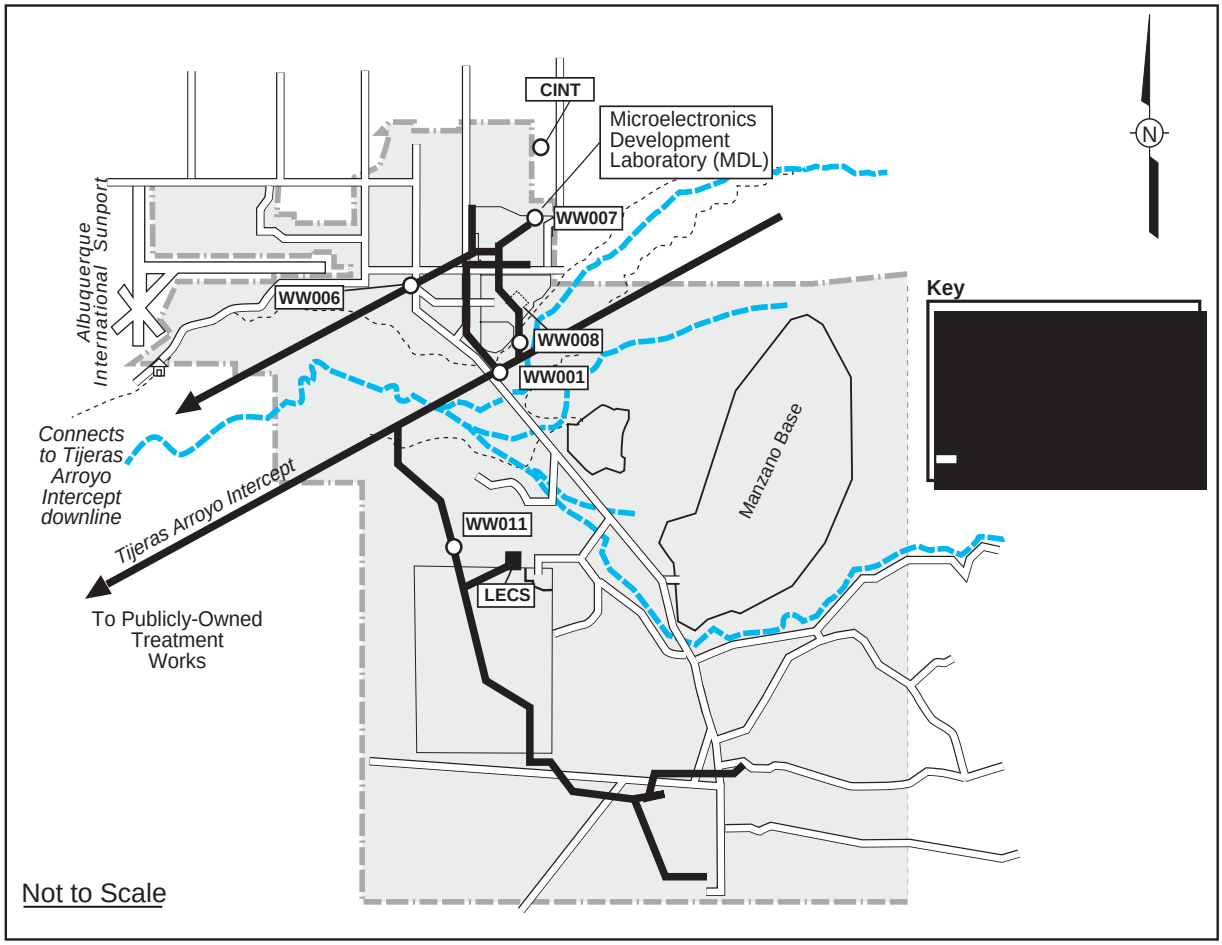


FIGURE 6-1. Wastewater Monitoring Station Locations

TABLE 6-1. SNL/NM Wastewater Discharge Permits and Station Characteristics

Permit	Waste Stream Process
General Outfall	
2069A (WW001)	All waste streams
2069F (WW006)	All waste streams
2069I (WW008)	All waste streams
2069K (WW011)	All waste streams
Categorical	
2069G (WW007)	Laboratory industrial processes Acid waste from MDL activities
2238A (CINT)	Laboratory industrial processes Acid waste from CINT activities
Not Permitted	
LECS	Radiological screening of TA-V process water

NOTES: "All waste streams" include both domestic and industrial discharges.
TA-V = Technical Area V
LECS = Liquid Effluent Control System
MDL = Microelectronics Development Laboratory
CINT = Center for Integrated Nano-Technologies

activities. Water samples are analyzed for tritium, gross alpha, gross beta, and gamma spectroscopy to ensure radiological levels meet regulatory standards before the water is released to the public sewer system. If radioactivity levels are detected above regulatory limits, the water will not be released to the sanitary sewer system and an alternative disposal path will be found or the radionuclides will be allowed to decay in place over a matter of days or weeks if the contamination is due to short-lived medical radioisotopes. Once the activity is at or below regulatory levels, the water can be safely discharged to the public sewer system. The LECS consists of three 5,000 gal holding tanks with liquid level and radioactive alarm systems, a control room, and an ion exchange/filtration unit (treatment processor). The LECS is an engineered facility operating within an established safety envelope. Discharges to the sanitary sewer from the LECS and other SNL/NM activities have not exceeded standards for radionuclides at any of SNL/NM's wastewater monitoring stations.

6.1.5 Summary of Monitoring Results

During 2008, Sandia split wastewater samples with both the ABCWUA and the NMED. In 2008, laboratory analytical results for these wastewater samples, based on the parameters shown in Section 6.1.3, confirmed that Sandia was in compliance with all ABCWUA regulations. Sampling of SNL/NM facilities was conducted during the months of February, April, June and October of 2008. The ABCWUA staff also inspected SNL/NM facilities during the months of February, April, June, August and October to ensure that Sandia was in compliance with the ABCWUA's discharge requirements. All water discharged from the LECS in 2008 also met federal regulatory standards and DOE Orders for radiological levels in wastewater. All analytical results from sampling conducted in 2008 can be found in Appendix A.

6.1.6 Sanitary Sewer System Releases in 2008

Reportable occurrences and environmental releases in 2008 are discussed in Sections 2.2.1 and 2.2.2. There were no reportable events (ABCWUA permit violations) in 2008.

6.2 SURFACE DISCHARGE PROGRAM

All water and water-based compounds that discharge to the ground surface are evaluated for compliance with New Mexico Water Quality Control Commission (NMWQCC) regulations as implemented by the NMED's Groundwater Bureau. These regulations are designed to protect the groundwater and surface water of the state for potential use as a domestic potable water source. The primary regulations and important program documents are listed in Chapter 9.

6.2.1 Surface Discharge Approval and Permitting

Surface discharges are releases of water and water-based compounds made to roads, open areas, or impoundments. Surface discharges are only made with the approval of the Internal Surface Discharge Program. Proposed discharges are evaluated for potential contaminants and concentration levels to determine if the discharge complies with strict water quality guidelines for surface releases. Uncontaminated water discharges must also be approved, since large volumes of water discharged in areas of prior contamination (such as Environmental Restoration [ER] sites) could increase infiltration rates and move contaminants deeper into the soil column. If any discharges do not meet surface water quality standards, alternative methods of disposal are found.

2008 Surface Discharge Activities

Surface discharge requests are generally made when access to a sanitary sewer line is not available, such as in remote locations on KAFB where no sewer lines exist. Typical surface discharge requests include discharges made by the Groundwater Protection Program (GWPP) to dispose of well purge water from groundwater monitoring wells. Wells are purged before a representative groundwater sample can be taken. Other surface discharges are requested as a result of fire training activities, the need to flush eyewash stations, and the cleaning of building exteriors. In 2008, 23 individual surface discharge requests were made; all met state standards and were approved.

6.2.2 Surface Discharge Releases in 2008

The Surface Discharge Program must be contacted in the event of an accidental release or spill to the ground surface. In 2008, two met the reporting requirements established by NMED. These releases are summarized below and in Chapter 2, Section 2.2.2.

In January 2008, Sandia field personnel identified the existence of a debris pile in a retention basin north of the Chemical Waste Landfill in Technical Area 3. The pile was comprised primarily of cables. In March some potential explosives were identified. NMED was notified. The depth to groundwater in the area is approximately 500 feet. A Voluntary Correction Plan (VCP) was submitted to the NMED on May 2008.

All field activities are to be completed by January 30, 2009, including demobilization and validation of the confirmatory soil sampling analytical results.

A release was discovered on November 16, 2008 at approximately 4:30 AM on KAFB, Bernalillo County, New Mexico in the northeast quadrant of TA I, west of Building 858 in the deionized water tank farm. The source of the release was from a water blending tank that is part of the high purity water system when a pneumatic control valve failed to operate due to a loss of pressure from the main nitrogen plant causing the blend water tank to overfill. The building operators were alerted to the release by an automated phone message and responded to the site. Although the duration of the release is unknown it is estimated that approximately 4,000 gallons of domestic water blended with deionized water entered a storm water drop inlet near the loading dock of Building 858. The location of this release does not contain any ER Sites. This release was reported to the NMED as an unallowable discharge under the Multi-Sector General Permit (MSGP) for Industrial Activities. The water did not contain any chemicals that could be harmful to the environment, plant or animal life, or human health. The following corrective actions were taken: the nitrogen plant has been repaired and is fully operational.

6.2.3 Pulsed Power Evaporation Lagoons

The Surface Discharge Program at SNL/NM reports water quality results from routine samples taken from two surface discharge lagoons in TA-IV. Both lagoons are permitted through NMED in Discharge Plan (DP-530). The two surface discharge lagoons are primarily used to contain and evaporate water that collects in the secondary containments around seven outdoor oil storage tanks used to store dielectric oil. The secondary containments are designed to hold the entire content of the tanks in the event of an accidental release. Significant volumes of precipitation can collect in the containments during storm events. The water is visually inspected for oil contamination and any oil present is skimmed off prior to discharge to the TA-IV lagoons.

The original DP-530 was issued to SNL/NM for discharges from the Pulsed Power Development Facilities (PPDF) located in TA-IV to Lagoons #1 and #2 on March 8, 1988. The DP-530 was submitted pursuant to New Mexico Administrative Code (NMAC) 20.6.2.3106 of NMWQCC regulations, and was approved pursuant to 20.6.2.3109 NMAC. A permit renewal application for DP-530 was submitted to NMED and was approved on September 12, 2007, and will expire on September 12, 2012. The monitoring and reporting requirements are listed in Table 6-2.

During 2008, Lagoon #1 was sampled on June 17, 2008 prior to being discharged to the ABCWUA sanitary sewer system after analysis of the results indicated that all detected constitutes met ABCWUA discharge requirements. Lagoon #1 was cleaned and the liner inspected on June 21, 2008. Monthly inspections were performed and documented in checklists filed in the Customer Funded Record Center (CFRC) and with DOE/NNSA/SSO. The Lagoon's #2 liner was inspected during July of 2008 and monthly inspections were performed and documented. No sampling of Lagoon #2 was conducted since only storm water was collected within the lagoon from storm events. No discharges to Lagoon #2 from PPDF occurred during 2008 and no surface discharges occurred.

6.3 STORM WATER PROGRAM

6.3.1 STORM DRAIN SYSTEM

Storm water runoff flowing over the ground surface has the potential to pick up and transport contaminants. The Storm Water Program works in coordination with the P2 Group, the Surface Discharge Program, Facilities Engineering, and the ER Project to implement measures and BMPs to prevent or reduce potential contaminants from being transported in storm water runoff. Potential contaminants may derive from:

- Oils and solvents from machine shops and manufacturing areas,
- Vehicle residues from streets and parking lots,
- Hazardous chemicals and metals from waste handling facilities,
- Residual radioactive and hazardous constituents from Solid Waste Management Units (SWMUs),
- Building material contaminants from construction activities, and
- Pesticides and fertilizers from landscaped areas.

Sandia controls the potential contaminants that may be picked up by storm water runoff by routing all industrial waste water to the sanitary sewer and storing most chemicals indoors. Sandia also limits storm water contact with chemical storage containers and carefully controls runoff in areas where wastes, chemicals, and

TABLE 6-2. NMWQCC Monitoring and Reporting Requirements

Action	Frequency	Reporting
Inspection of Lagoons	Monthly	Documented in checklists
Drain, clean and inspect lagoon and liner	Annually	Annually
Water-level readings	Monthly	Annually
Inspect sump stations and clean as needed	Quarterly	Annually
Major cations, anions, and TDS	Biennially	Biennially
Purgeable organics using EPA Method 8240	Biennially	Biennially
Extractable organics using EPA Method 8270	Biennially	Biennially

NOTES: NMWQCC = New Mexico Water Quality Control Commission
TDS = total dissolved solids

oils are stored or handled. Secondary containments for all outdoor oil storage tanks and chemical containers prevent potential pollutants from being transported in storm water runoff. Some facilities, such as the Hazardous Waste Management Facility (HWMF) and the Radioactive and Mixed Waste Management Facility (RMWMF) are designed to divert all runoff from the facility to a lined catchment basin. Water that accumulates in these basins evaporates. If evaporation is not adequate due to meteorological conditions, the accumulated water is evaluated and pumped to either the storm drain system or to the sanitary sewer for disposal. Appropriate approvals must be granted by the state for discharges to the storm drain system or by the ABCWUA for discharges to the sanitary sewer. Required approval to outside agencies is obtained through the DOE/NNSA/SSO.

NPDES Regulations

NPDES regulations, under the Clean Water Act (CWA), require any point source discharges to be permitted. Any runoff that flows into the Tijeras Arroyo through a channel, arroyo, conduit, or pipe is considered a discharge point. Overland surface flow or "sheet" flow that drains into Tijeras Arroyo is not considered a point source discharge.

The State of New Mexico has defined "Surface Waters of the State" to include "Waters of the U.S." and all other surface water in the State. In order to assist New Mexico in protecting its water resources, the EPA can apply NPDES regulations to discharges to New Mexico's surface waters, even if those waters are not "Waters of the U.S."

As shown in Figure 6-2, Tijeras Arroyo enters KAFB from the northeast, flows just south of TA-I, TA-II, and TA-IV, exits at KAFB's west boundary, and continues about eight miles to its discharge point at the Rio Grande River. The arroyo has created a significant topographic feature across KAFB where erosion of unconsolidated basin sediments has resulted in a channel over one half mile wide in some areas.

Watersheds at SNL/NM

NPDES permits are required if storm water runoff discharges to "Waters of the U.S." or "Surface Waters of the State." Sandia facilities in TA-I, TA-II, and TA-IV have storm drains, culverts, and channels that divert storm water runoff to discharge points on the north side of Tijeras Arroyo, which is classified as "Waters of the U.S." Sandia also conducts various activities in remote mountain and canyon areas in the Arroyo del Coyote watershed, which empties into Tijeras Arroyo northwest of the KAFB Golf Course. Activities in all of these areas are evaluated for possible NPDES permitting.

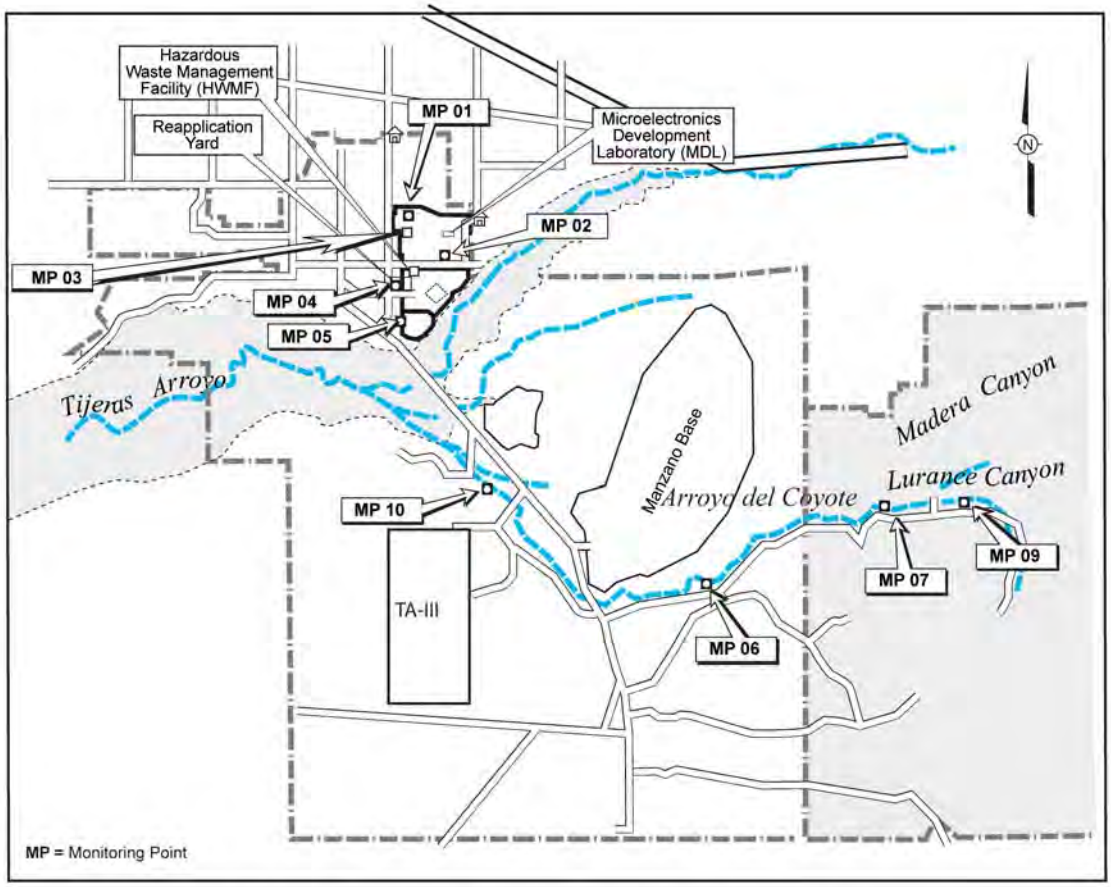


FIGURE 6-2. Storm Water Monitoring Point Locations at Nine Sites

Drainages south of the Arroyo del Coyote watershed are generally short and undeveloped. Runoff in this area infiltrates quickly into highly permeable soils. Discharges from these areas do not reach any designated "Waters of the U.S.;" but they do discharge to "Surface Waters of the State;" therefore, NPDES permits are also required for facilities in these areas. TA-III, TA-V, and several remote sites are located in this area.

NPDES Permit

The EPA provides regulatory oversight for SNL/NM's Storm Water Program. In 2008, SNL/NM facilities were covered under the NPDES MSGP for Storm Water Discharges Associated With Industrial Activities issued by the EPA in 2001 (EPA 2001). This new permit replaced the previous permit that was issued on October 30, 2000. Operators must submit a Notice of Intent (NOI), implement control measures, sample storm water runoff for comparison to national benchmark values, and develop site-specific Storm Water Pollution Prevention Plans (SWP3). MSGP 2000 was issued for a five-year term, and was administratively extended by EPA until the new MSGP was issued September 29, 2008 and became effective on January 5, 2009. Facilities are not eligible for coverage under the 2008 MSGP until their NOI is posted for 30 days on the EPA website. The existing SWPPP was updated to comply with the new MSGP requirements.

As a result of the new permit, Sandia plans to add several new monitoring locations for compliance with this new permit. Key facilities affected by NPDES regulations are listed in Table 6-3. Chapter 9 lists all applicable regulations and program documents.

A construction permit requires protection of storm water runoff during and after construction. All areas of the site that are susceptible to erosion must be stabilized upon completion of the project. A General Construction Permit (GCP) 2003 was issued for a five-year term, and expired July 1, 2008. The EPA issued a GCP in 2008 that is in effect from June 30, 2008 to June 30 2010.

In December 2008, 15 storm water construction permits were active. Construction permits are listed in Chapter 9, Table 9-1.

6.3.2 Storm Water Monitoring Stations

Figure 6-2 illustrates nine Monitoring Point (MP) locations. MP 1 through MP 10 monitor runoff from the majority of industrial activities in TA-I, TA-II, and TA-IV. MPs 6, 7, 9, and 10 monitor discharges in Arroyo del Coyote. One monitoring point (MP 3) is only inspected visually.

6.3.3 Routine Inspections

All routine inspection results are attached to the SWP3. Routine inspections include the following:

- Monitoring station inspections are conducted monthly to ensure that samplers and other equipment are functioning properly.
- Material storage area inspections are conducted quarterly. All waste handling areas, vehicle and equipment cleaning areas, and loading and unloading areas are inspected for uncovered and unprotected potential contaminant sources and spills. These inspections increase personnel awareness and responsibility for storm water P2.
- Wet weather inspections (visual monitoring) are conducted quarterly during a storm event, if possible, but generally during the rainy season from April through September. Samples are collected and visually inspected for foaminess, clarity, and the presence of oil. The pH of the discharge is also measured and recorded. These inspections also provide an opportunity to check for broken levees and floating debris.
- Dry weather inspections are conducted quarterly when storm drains and ditches are dry, primarily to detect illicit discharges. In general, only storm water is allowed in the storm drain system; however, with approval from the Surface Discharge Program, water that meets NPDES permit conditions can be discharged to storm drains. An example of NPDES permit-approved discharges would be water used during fire training exercises or fire hydrant testing. Dry weather inspections also provide an opportunity to inspect ditches for excess vegetation, accumulated sediment, and debris. Storm channels are cleaned out annually, or as necessary.
- Annual inspections of all permitted facilities and the entire storm water system are conducted. After the inspections have been completed, a report is generated indicating the extent of the inspections and certifying that is in compliance with the NPDES permit. Any inconsistency between the SWP3 and conditions at the facilities is noted in the report. If changes to the SWP3 are required as a result of these inspections, revisions are initiated. If potential pollution problems are uncovered, they are noted in the report along with a schedule for addressing those problem areas.

Sampling Protocols

Storm water associated with industrial activities is and has been monitored in accordance with the requirements of MSGP 2000; this consisted of quarterly analytical sampling to be conducted in the second and fourth year of the five year permit, weather permitting. Thus samples were collected during 2002 and 2004. Due to Albuquerque's semi-arid climate and high infiltration rates, precipitation rarely produces adequate runoff for monitoring in the months of October through March (please see the link at the end of this section for Albuquerque's precipitation) with the most consistent rain occurring from April through September. The new MSGP issued in January of 2009 requires sampling to occur beginning April 1, 2009. Fiscal Year (FY) 2004 was the fourth year of the permit and was the last year analytical monitoring was required except for fecal coliform.

After a rainfall of sufficient intensity and duration (as defined in the regulation), storm water runoff flowing through each monitoring station is collected as a grab sample by the automatic sampler. The discharge is collected within the first 30 minutes of the runoff event to allow for the sampling of any residues picked up in the soil upstream of the station. All samples are sent to off-site laboratories and analyzed according to protocols established by the EPA.

http://www.weather.gov/climate/index.php?wfo=abq

6.3.4 2008 Activities

2008 Sampling Results

Quarterly visual sampling was conducted in 2008. Analytical sampling was not required for this year of the permit.

Visual observations are not conducted at the remote MPs due to safety concerns for personnel in remote areas during inclement weather.

A fecal coliform sample was last collected in October 2008 to comply with New Mexico requirements in the MSGP. The lab reported a positive result for fecal coliform. The method used in 2008 only reported

TABLE 6-3. SNL/NM Facilities Subject to Storm Water Permitting

These facilities are in areas where storm water can potentially drain to Tijeras Arroyo.

Description of SIC Code*	Potential Pollutants and Impacts	Applicable SNL/NM Facilities **
NPDES Multi-Sector Storm Water Permit		
Scrap and Waste Recycling	- Various solid objects with potential residual surface contamination	- Reapplication and Storage Yard
Hazardous Waste Treatment, Storage, or Disposal Facilities	- Regulated hazardous chemical and radioactive waste	- HWMF - Manzano Storage Complex - SWMUs (including those in Lurance and Madera Canyons)
Electronic and Electrical Equipment Manufacturing	- Raw chemical storage such as acid and sodium hydroxide - Electroplating processes	- MDL - AMPL - CSRL
Fabricated Metal Products	- Metal Fabrication - Turnings	- Machine Shop
Short-Term Construction Permits		
Construction Permits - 2008	- Building material pollutants - Disturbed soil	- MESA - 20th Street Stockpile Area - Mixed Waste Landfill Cover - TA-III Borrow Site - TA-III Cable Debris - Heating Systems Moderization - Building 807 - TA-II Fence Removal - DS&A Modular Office - G, H, 11th Street - Liquid Natural Gas - Thunder Range - TA II Escarpment - 18th Street & K Avenue - Ion Beam Laboratory

NOTES: *The EPA requires a National Pollution Discharge Elimination System (NPDES) Storm Water Permit for all industrial facilities that have processes defined in the Standard Industrial Classification (SIC) codes listed in Appendix A of 40 CFR 122.

**Applicable facilities are monitored under the expanded Storm Water Program, which was in effect in October 2001. The expanded program is documented in the revised Storm Water Pollution Prevention Plan (SWP3) (SNL 2008a).

AMPL = Advanced Manufacturing Process Laboratory
CSRL = Compound Semi-Conductor Research Laboratory
HWMF = Hazardous Waste Management Facility
SNL/NM = Sandia National Laboratories, New Mexico
MDL = Microelectronics Development
SWMU = Solid Waste Management Unit
WIF = Weapons Integration Facility

whether fecal coliform is present or not. In 2009, a different method will be used and the results will be in colony forming units (cfu) per 100 ml.

6.4 OIL STORAGE & SPILL CONTROL

There is an oil storage capacity of 3.6 million gal in 51 Aboveground Storage Tanks (ASTs) and five Underground Storage Tanks (USTs). This does not include oil-containing equipment and transformers. Additional oil storage capacity in 55 gal drums occurs throughout the site on an as needed basis. All oil storage sites with regulated containers must be equipped with secondary spill containment. Secondary containment structures include concrete-lined basins, retaining walls, containment reservoirs, earthen berms, sloped pads, trenches, and containment pallets.

A Spill Prevention Control and Countermeasures (SPCC) Plan is required under the CWA. SNL/NM's SPCC Plan was revised in 2005 to incorporate changes to 40 Code of Federal Regulations (CFR) 112 and 20.5 NMAC. The focus of these regulations is to protect specifically defined waterways, or "navigable waters of the United States" from potential oil contamination. "Navigable waters" is a broad term that includes rivers, lakes, oceans, and water channels (tributaries), such as streambeds and arroyos, that connect to a river. This applies to the Tijeras Arroyo, which discharges to the Rio Grande.

SNL/NM's SPCC Plan describes oil storage facilities and the mitigation controls in place to prevent inadvertent discharges of oil. Facilities at SNL/NM subject to the regulations include:

- Oil storage tanks (USTs and ASTs)
- Bulk storage areas (multiple containers)
- Temporary or portable tanks

Table 9-1 lists the permit numbers for those tanks that are registered with NMED. SNL/NM's State of New Mexico Owner ID Number is 14109.

USTs

Five USTs are currently operating at SNL/NM. Two 20,000 gal fiberglass USTs at SNL/NM are registered with NMED; one additional UST, used solely for emergency power generation, is exempt from New Mexico requirements, but is covered by federal regulations in 40 CFR 280; and two USTs in TA-III are exempt from state and federal requirements because they contain insignificant quantities of regulated substances.

ASTs

Fifty-one ASTs are currently operating at SNL/NM. In 2002, the State of New Mexico passed oil storage regulations that required the registration of all oil storage tanks with a storage capacity greater than 1,320 gal, but less than 55,000 gal. Seven ASTs at SNL/NM are registered with NMED.

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7.0 Groundwater

This chapter provides a summary of the following:

- Overview of Groundwater Programs at SNL/NM
- Groundwater Quality Analysis Results
- Water Levels

The Groundwater Protection Program (GWPP) and the Environmental Restoration (ER) Project collect groundwater data at Sandia National Laboratories, New Mexico (SNL/NM). Both programs coordinate to monitor wells throughout SNL/NM operational areas and ER sites. Groundwater monitoring is conducted on a quarterly, semi-annual, or annual basis, depending on individual project areas. Water level measurements are conducted monthly and quarterly.

Specific tasks performed in Calendar Year (CY) 2008 by the GWPP and ER are shown in Figure 7-1. It illustrates the coordination with outside groundwater monitoring agencies as a key component of the GWPP and the ER Project.

Groundwater wells located on and around Kirtland Air Force Base (KAFB) are illustrated in Figure 7-2. The wells include ER monitoring wells, GWPP surveillance wells, City of Albuquerque (COA) production wells, KAFB production wells, U.S. Geological Survey (USGS) monitoring wells, and KAFB Installation Restoration Program (IRP) wells. In CY 2008, 70 wells and one spring were sampled at the SNL/NM Albuquerque site by Sandia.

Note that the groundwater data reported in this chapter was collected over the period from October 2007 through December 2008. The three additional months of data being reported (October – December 2007) bridge the gap between the end of the Fiscal Year (FY) 2007, September 31, 2007 and the beginning of CY 2008, January 1, 2008 and facilitate a change from reporting data on a FY basis to a CY basis.

7.1 OVERVIEW OF GROUNDWATER PROGRAMS SNL/NM

7.1.1 GWPP Activities

The primary function of the GWPP is to conduct groundwater surveillance to detect possible groundwater contamination from current operations or undiscovered legacy contamination. The purpose of groundwater monitoring involves completing the following objectives:

- Establish baseline water quality and groundwater flow information for the groundwater system at SNL/NM,
- Determine the impact, if any, of SNL/NM's operations on the quality and quantity of groundwater, and
- Demonstrate compliance with all federal, state, and local groundwater requirements.

The GWPP is responsible for tracking information on all wells owned by Sandia, including ER Project wells and characterization boreholes. The primary purpose of the GWPP Well Registry and Oversight Task is to ensure that all wells owned by SNL/NM are properly constructed and maintained to protect groundwater resources, and ensure groundwater sample representativeness. The GWPP works together with well owners to review new well design proposals, record construction information, track well ownership and maintenance records, perform annual well inspections, and consult with owners if, and when, plugging for the abandonment or replacement of a well or borehole is required.

In CY 2008, groundwater surveillance sampling was conducted at 14 wells and one spring.

U.S. Department of Energy (DOE) Orders and the Compliance Order on Consent (COOC) – such as the requirements applicable to the GWPP – are listed in Chapter 9, and discussed in Chapter 2.

Trend Data

The GWPP performs trending on groundwater surveillance results by comparing past years' data with the current year's results. Multi-year trend plots for analytes exceeding maximum contaminant levels (MCLs) and human health related maximum allowable concentrations (MACs) are presented in Appendix B, which provides data trends and graphical representation. The data is analyzed to determine if the results are within the normal range of expected values, or if a significant difference is present — this allows early detection and possible source identification when contaminants are at levels below regulatory concern. Conversely, unchanging baseline levels demonstrate Sandia's successful implementation of best management practices (BMPs) for groundwater protection.

7.1.2 ER Project Groundwater Activities

ER Project activities are conducted per the Resource Conservation and Recovery Act (RCRA) regulations, which mandate the cleanup and management of active and inactive treatment, storage, and disposal (TSD) facilities. The COOC imposes additional requirements. Applicable regulations are listed in Chapter 9, and the regulatory basis for the ER Project is discussed in Section 3.2.

There are currently five ER Project areas with ongoing groundwater investigations:

- Chemical Waste Landfill (CWL),
- Mixed Waste Landfill (MWL),

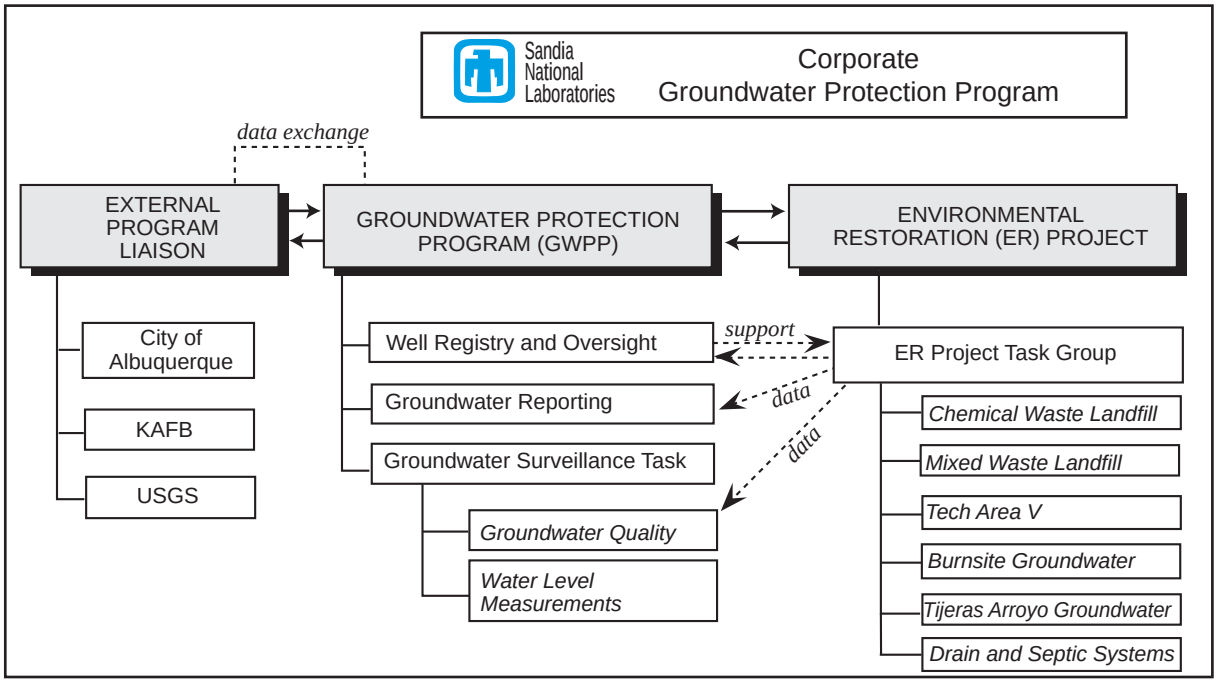

FIGURE 7-1. SNL/NM's Groundwater Programs and Interfaces, for tasks performed in CY 2008

- Technical Area V (TA-V) Groundwater Investigation,
- Tijeras Area Groundwater (TAG) Investigation (TA-I, TA-II, & Tijeras Arroyo), and
- Burn Site Groundwater (BSG) Investigation (Lurance Canyon).

CWL – The CWL is a 1.9 acre former disposal site at the southeast corner of TA-III. From 1962 until 1981, the CWL was used for the disposal of chemical, radioactive, and solid waste generated by SNL/NM research activities. From 1981 through 1985, only solid waste was disposed of at the CWL. In addition, the CWL was used as a hazardous waste drum storage facility from 1981 to 1989. A comprehensive summary of the CWL disposal history is presented in the NMED approved Closure Plan (SNL 1992) and Landfill Excavation Voluntary Corrective Measure (LE VCM) Final Report (SNL 2003). Groundwater contaminants of concern (COC) include Volatile Organic Compounds (VOC) and chromium. The monitoring network at the CWL consists of 13 wells. Nine monitoring wells were sampled in FY 2008, including two background wells and seven downgradient monitoring wells. During CY2008 four wells were plugged and abandoned at the MWL (MWL-BW1, MW1, MW2, & MW3); four new wells were installed (MWL-BW2, MW-7, MW-8, & MW9)

MWL – The MWL is a 2.6 acre former disposal site located in TA-III. It was operational from 1959 to 1988, and was used to dispose of low-level radioactive and mixed waste (MW). Tritium is the only COC that has been released to adjacent soils from the MWL. Seven monitoring wells at the MWL were sampled in FY2008, including one upgradient well, one on-site monitoring well, and five downgradient monitoring wells.

TA-V – The Gamma Irradiation Facility (GIF), the Hot Cell Facility (HCF), and two reactor facilities are located in TA-V. From 1967 to 1971, the Liquid Waste Disposal System (LWDS) located in TA-V was used to dispose of reactor coolant water in the subsurface. Groundwater COCs at the LWDS are nitrate and VOCs such as trichloroethene (TCE), which was first detected in the groundwater in 1993. There are currently 12 active monitoring wells at this site that were sampled from October 2007 through December 2008. During CY2008 one well, TAV-MW1 was plugged and abandoned; one new well, TAV-MW10 was installed.

TAG – The TAG Investigation includes groundwater beneath TA-I, TA-II, and Tijeras Arroyo. There were 21 monitoring wells routinely sampled in the TAG study area from October 2007 through December 2008. Of these, 11 are regional aquifer wells, and ten are perched groundwater system wells. The perched groundwater system consists of water-bearing sediments located

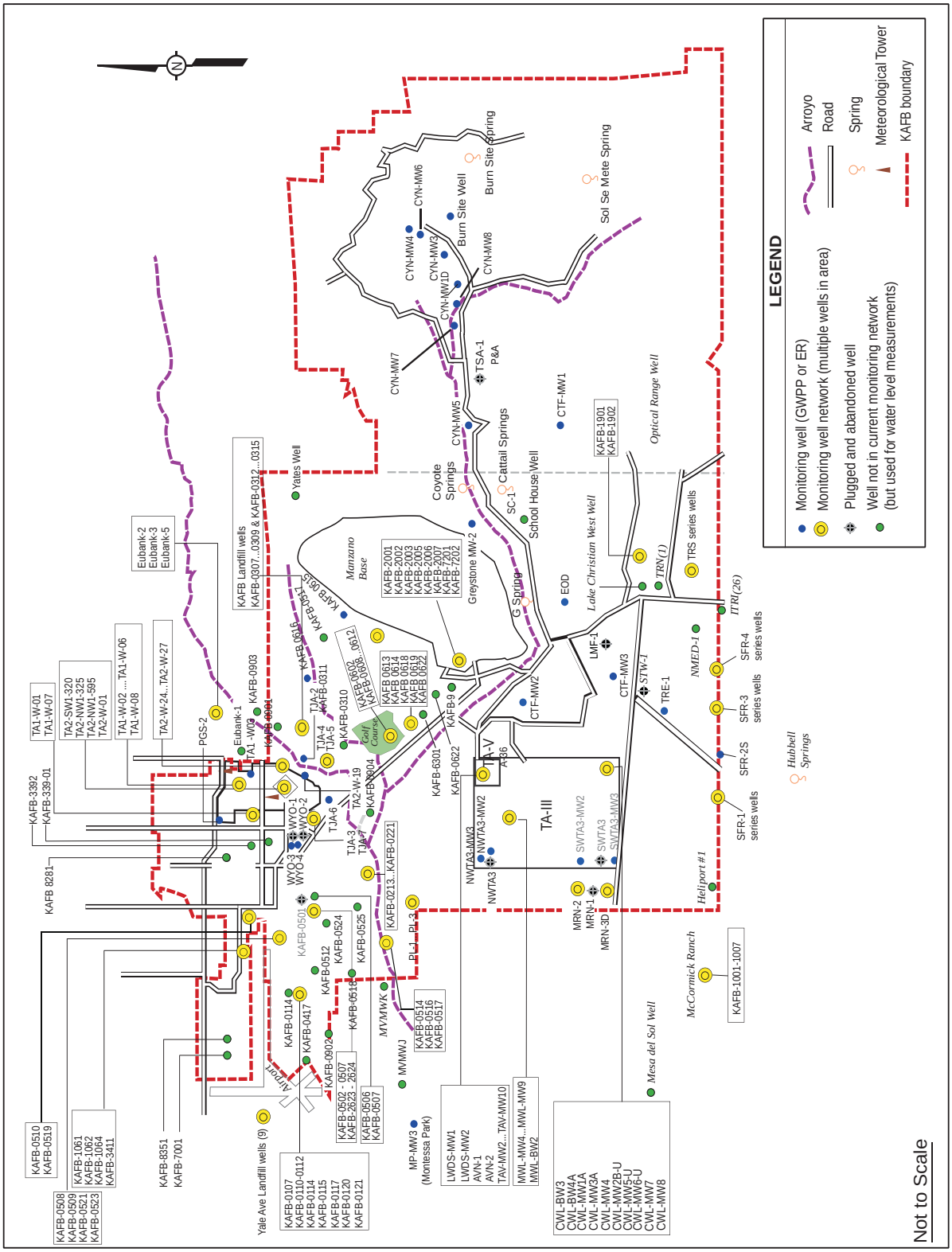

FIGURE 7-2. Wells and Springs on SNL/NM and KAFB

TABLE 7-1. Guidelines Used for Groundwater Quality Sample Comparisons

Regulation/Requirements	Standards and Guides	Regulating Agency
National Primary Drinking Water Regulations (40 CFR 141)	Maximum contaminant level (MCL)	U.S. Environmental Protection Agency (EPA)
New Mexico Water Quality Control Commission (NMWQCC) [1] Standards for Groundwater (20 6.2.3103A NMAC Human Health Standards)	Maximum allowable concentration (MAC)	NMWQCC
DOE Drinking Water Guidelines for Radioisotopes [2] (DOE Order 5400.5)	Derived concentration guide (DCG)	Department of Energy (DOE 1993)

NOTES: [1] MACs for Human Health and Domestic Water Supply Standards are identified in the analytical results tables in the appendices. Domestic water supply standards are based on aesthetic considerations, not on direct human health risks.

[2] DOE drinking water guidelines set allowable radionuclide levels in drinking water. The levels are calculated based on published DCGs and correspond to a 4 millirem-per-year (mrem/yr) dose from chronic exposures. This is equivalent to 4 percent of the DCG for ingestion, which is based on an exposure of 100 mrem/yr. These may be different than EPA's standards, where established.

CFR= Code of Federal Regulation

TABLE 7-2. Sample Collection Periods for Groundwater Quality Monitoring at SNL/NM from October 2007 through December 2008

Sampling Period	GWPP	CWL	MWL	TA-V	TAG	BSG
Oct 07		√			√	
Nov 07		√		√		
Dec 07				√		√
Jan 08				√	√	
Feb 08				√		
Mar 08	√					√
Apr 08	√		√	√	√	
May 08				√	√	
Jun 08		√				√
Jul 08	√*		√		√	
Aug 08				√	√	
Sep 08				√		√
Oct 08		√	√			
Nov 08				√	√	
Dec 08		√		√		

NOTES: GWPP= Groundwater Protection Program
CWL= Chemical Waste Landfill
MWL= Mixed Waste Landfill
TA-V= Technical Area Five
TAG= Tijeras Area Groundwater
BSG= Burn Site Groundwater
*One well was resampled in July 2008.

TABLE 7-3. Summary of SNL/NM Groundwater Monitoring Results During CY 2008

	SNL/NM Groundwater Monitoring
Number of Active Wells Monitored	70
Number of Analyses Performed	14,604
Percent of Non-Detected Results	84.29 %

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
Summary of Field Water Quality Parameters (units as indicated below)							
Potential of Hydrogen in pH	179	0	6.05	8.52	7.37	0.32	NE
Specific Conductivity in mhos/cm	179	0	374	4,218	767	497	NE
Temperature in ^{0}C	179	0	12.06	23.91	18.88	2.57	NE
Turbidity in NTU	179	0	0.13	85.9	2.37	7.44	NE
Detected Organic Compounds in µg/L							
Acetone	6	150	1.37	3.82	2.435	0.969	NE
Carbon disulfide	5	177	1.26	5.06	2.452	1.607	NE
Chloroform	17	183	0.271	0.867	0.4344	0.1585	NE
Chloromethane	1	199	0.711	0.711	0.711	N/A	NE
Dibromochloromethane	1	199	0.363	0.363	0.363	N/A	NE
Dichloroethane, 1,1-	18	182	0.413	0.863	0.6194	0.159	NE
Dichloroethene, 1,1-	1	199	0.551	0.551	0.551	N/A	7.0
Dichloroethene, cis-1,2-	33	138	0.42	2.83	1.392	0.764	70
Ethyl benzene	1	199	0.301	0.301	0.301	N/A	700
bis(2-Ethylhexyl) phthalate	2	26	2.75	4.97	3.86	1.57	6.0
RDX	4	7	0.183	0.508	0.276	0.1559	NE
Tetrachloroethene	7	193	0.278	0.873	0.671	0.2552	5.0
Toluene	8	192	0.251	1.38	0.592	0.348	1,000
Trichloroethene	82	118	0.258	16.2	3.902	4.266	5.0
Xylene	10	173	0.269	0.767	0.5862	0.1386	10,000
Diesel Range Organics	1	19	50.8	50.8	50.8	N/A	NE
Gasoline Range Organics	1	19	37.6	37.6	37.6	N/A	NE

Refer to footnotes at end of table.

TABLE 7-3. Summary of SNL/NM Groundwater Monitoring Results During CY 2008 (continued)

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
Detected Metals in mg/L							
Aluminum	43	46	0.0059	0.516	0.0824	0.1109	NE
Arsenic	20	98	0.00152	0.0507	0.0115	0.01941	0.010
Barium	118	0	0.01	0.433	0.08187	0.04908	2.0
Beryllium	10	108	0.000106	0.00721	0.002221	0.002208	0.004
Cadmium	23	95	0.000118	0.000928	0.000324	0.000243	0.005
Calcium	94	0	11	395	97.36	78.67	NE
Chromium	33	95	0.00158	0.218	0.01414	0.03842	0.100
Cobalt	87	31	0.0001	0.0114	0.001009	0.002282	NE
Copper	109	9	0.000414	0.0474	0.001823	0.004555	NE
Iron	117	1	0.074	20.8	0.709	1.991	NE
Lead	5	113	0.0007	0.0525	0.0122	0.0225	NE
Magnesium	94	0	3.67	93.8	24.14	17.87	NE
Manganese	51	38	0.001	3.48	0.315	0.924	NE
Mercury	2	135	0.000035	0.000049	0.000042	0.00001	0.002
Molybdenum	15	0	0.0021	0.0241	0.00638	0.00592	NE
Nickel	116	2	0.00067	0.221	0.01569	0.04566	NE
Potassium	94	0	1.58	47.1	5.865	9.19	NE
Selenium	78	40	0.00101	0.0293	0.003222	0.004604	0.050
Silver	5	113	0.0002	0.0125	0.00314	0.00525	NE
Sodium	94	0	9.8	968	78.2	135.8	NE
Thallium	36	82	0.000303	0.00167	0.000529	0.000318	0.002
Tin	5	24	0.00104	0.0224	0.00615	0.00913	NE
Uranium	59	0	0.00104	0.0132	0.005174	0.003092	0.030
Uranium-235	61	9	0.00001	0.000211	0.000054	0.000043	NE
Uranium-238	69	1	0.000298	0.0291	0.00687	0.006	NE
Vanadium	34	84	0.00318	0.0199	0.006108	0.003802	NE
Zinc	81	37	0.00261	0.454	0.01526	0.05085	NE

Refer to footnotes at end of table.

TABLE 7-3. Summary of SNL/NM Groundwater Monitoring Results During CY 2008 (concluded)

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
Detected Inorganic Parameters in mg/L							
Nitrate	12	0	2.25	25	9.5	8.43	10
Nitrate plus nitrite as N	154	18	0.303	29.8	7.901	7.089	10
Bromide	38	0	0.19	2.24	0.6618	0.5624	NE
Chloride	38	0	11.1	497	89.7	114.2	NE
Fluoride	38	0	0.37	2.53	1.0597	0.5554	4.0
Sulfate	38	0	35.4	1880	130.5	302.4	NE
Sulfides	5	5	0.81	1.87	1.206	0.453	NE
Total Organic Halogens	2	15	0.0039	0.027	0.0154	0.0163	NE
Total Phenols	3	15	0.00297	0.0181	0.00881	0.00813	NE
Perchlorate	5	11	0.0062	0.00725	0.006706	0.000386	NE
Alkalinity as CACO3	32	0	111	1550	343.7	357.7	NE
Detected Radiochemistry Activities in pCi/L							
Alpha, gross	75	5	0.78	106	13.81	20.66	15.0
Beta, gross	68	6	1.58	86.2	10.32	15.49	4 mrem/yr
Potassium-40	6	61	47.6	98.9	68.55	19.91	NE
Radium-226	15	4	0.41	4.56	1.703	1.517	5.0
Radium-228	14	5	0.38	10	3.28	4.15	5.0
Tritium	1	54	150	150	150	N/A	NE

NOTES: CACO3 = calcium as carbon dioxide
MCL = Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11(b)), and subsequent amendments or the New Mexico Environmental Improvement Board in Title 20, Chapter 7, Part 1 of the New Mexico Administrative Code (20MAC 7.1)
mg/L = milligrams per liter
N = nitrogen
NE = not established
pCi/L = picocuries per liter
µg/L = micrograms per liter
^{O}C = degrees Celsius
N/A = not applicable
NTU = nephelometric turbidity units
pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration)
µmho/cm = micromhos per centimeter
% = percent
4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate)

TABLE 7-4. Summary of Exceedences at Sampling Wells - October 2007 through December 2008

Analyte	Well	Exceedance	Date
ARSENIC MCL = 0.010 mg/L	CTF-MW2	0.0507 mg/L	March 2008
	CTF-MW2 (unpreserved)	0.0495 mg/L	March 2008
	CTF-MW2 (dup)	0.0483 mg/L	March 2008
	CTF-MW2 (dup unpreserved)	0.0488 mg/L	March 2008
BERYLLIUM MCL = 0.004 mg/L	Coyote Springs	0.00721 mg/L	March 2008
CHROMIUM MCL = 0.10 mg/L	CWL-MW2BU	0.218 mg/L	November 2007
NITRATE (AS NITROGEN) MCL = 10.0 mg/L	TA2-SW1-320	21.6 mg/L	January 2008
	TJA-4	25.0 mg/L	January 2008
	TJA-7	22.0 mg/L	January 2008
NITRATE PLUS NITRITE (AS NITROGEN) MCL = 10.0 mg/L	TA2-SW1-320	22.2 mg/L	October 2007
	TA2-SW1-320 (dup)	22.2 mg/L	October 2007
	TA2-SW1-320	21.9 mg/L	April 2008
	TA2-SW1-320	23.4 mg/L	August 2008
	TA2-SW1-320	24.0 mg/L	November 2008
	TA2-W-19	10.4 mg/L	November 2008
	TJA-2	10.3 mg/L	April 2008
	TJA-2	10.9 mg/L	November 2008
	TJA-2 (dup)	10.6 mg/L	November 2008
	TJA-4	27.5 mg/L	October 2007
	TJA-4	27.8 mg/L	April 2008
	TJA-4	27.4 mg/L	August 2008
	TJA-4	29.8 mg/L	November 2008
	TJA-4 (dup)	29.6 mg/L	November 2008
	TJA-7	24.3 mg/L	October 2007
	TJA-7	24.4 mg/L	May 2008
	TJA-7	23.7 mg/L	August 2008
	TJA-7	25.6 mg/L	November 2008
	LWDS-MW1	12.6 mg/L	December 2007
	LWDS-MW1	11.9 mg/L	February 2008
	LWDS-MW1	11.6 mg/L	May 2008
	LWDS-MW1	11.5 mg/L	September 2008
	LWDS-MW1	11.7 mg/L	December 2008
	LWDS-MW1 (dup)	11.6 mg/L	December 2008
	TAV-MW10	10.3 mg/L	September 2008
	TAV-MW10	10.1 mg/L	December 2008
	TAV-MW10 (dup)	10.1 mg/L	December 2008
	CYN-MW1D	21.3 mg/L	March 2008
	CYN-MW1D (reanalysis)	15.5 mg/L	March 2008
	CYN-MW1D (dup)	15.1 mg/L	March 2008
	CYN-MW1D (dup reanalysis)	15.6 mg/L	March 2008
	CYN-MW1D	10.9 mg/L	September 2008
	CYN-MW1D (dup)	11.3 mg/L	September 2008
	CYN-MW3	10.9 mg/L	March 2008
	CYN-MW3	13.8 mg/L	September 2008
	CYN-MW3 (dup)	12.9 mg/L	September 2008
	CYN-MW6	27.7 mg/L	December 2007
	CYN-MW6 (dup)	29.3 mg/L	December 2007
	CYN-MW6	27.0 mg/L	March 2008
	CYN-MW6	27.9 mg/L	June 2008
	CYN-MW6	33.0 mg/L	September 2008

NOTE: See footnotes at end of table.

TABLE 7-4. Summary of Exceedences at Sampling Wells - October 2007 through December 2008 (Concluded)

Analyte	Well	Exceedance	Date
TRICHLOROETHENE MCL = 5.0 µg/L	TA2-W-19	6.23 µg/L	October 2007
	TA2-W-19	5.79 µg/L	January 2008
	TA2-W-19 (dup)	5.16 µg/L	May 2008
	WYO-4	6.94 µg/L	October 2007
	WYO-4	9.15 µg/L	January 2008
	WYO-4	6.69 µg/L	August 2008
	WYO-4 (dup)	6.44 µg/L	August 2008
	WYO-4	6.87 µg/L	November 2008
	LWDS-MW1	12.8 µg/L	December 2007
	LWDS-MW1	12.4 µg/L	February 2008
	LWDS-MW1	13.8 µg/L	May 2008
	LWDS-MW1	12.7 µg/L	September 2008
	LWDS-MW1	15.9 µg/L	December 2008
	LWDS-MW1 (dup)	16.2 µg/L	December 2008
	TAV-MW6	7.39 µg/L	November 2007
	TAV-MW6	10.2 µg/L	February 2008
	TAV-MW6	8.71 µg/L	May 2008
	TAV-MW6 (dup)	8.13 µg/L	May 2008
	TAV-MW6	9.81 µg/L	September 2008
	TAV-MW6	9.97 µg/L	December 2008
	TAV-MW10	9.80 µg/L	April 2008
	TAV-MW10	12.6 µg/L	December 2008
	TAV-MW10 (dup)	14.1 µg/L	December 2008
GROSS ALPHA (corrected) MCL = 15.0 pCi/L	CTF-MW1	26.45 pCi/L	March 2008
	CTF-MW2	58.86 pCi/L	March 2008
	CTF-MW2 (unpreserved)	82.12 pCi/L	March 2008
	CTF-MW2 (dup)	88.39 pCi/L	March 2008
	CTF-MW2 (dup unpreserved)	73.44 pCi/L	March 2008
	SFR-2S	19.14 pCi/L	March 2008
	TRE-1	22.43 pCi/L	March 2008
	CYN-MW4	31.66 pCi/L	September 2008
RADIUM-226/228 MCL = 5.0 pCi/L	CTF-MW2	14.07 pCi/L	March 2008
	CTF-MW2 (unpreserved)	13.00 pCi/L	March 2008
	CTF-MW2 (dup)	12.79 pCi/L	March 2008
	CTF-MW2 (dup unpreserved)	14.29 pCi/L	March 2008

NOTES: dup = duplicate
mg/L = milligrams per liter
µg/L = micrograms per liter
pCi/L = picocuries per liter
MCL = maximum contaminant level
*Gross alpha results reported as corrected values (by subtracting the uranium activity).

several hundred feet above the regional water table that have insufficient yield to be developed for domestic use. TCE and nitrate are the COCs for TAG.

BSG – The BSG area is located around the active Lurance Canyon Burn Site (LCBS) facility. Groundwater investigations were initiated in 1997 at the request of New Mexico Environmental Department (NMED) after elevated nitrate levels were discovered in the LCBS water well. In 1997, one groundwater monitoring well was installed. In 1999, two additional wells were installed, including two piezometers to detect and monitor groundwater flow at the interface of the arroyo sediments and bedrock. To date, both piezometers have remained dry. Three wells were installed in 2005 and 2006. All six monitoring wells were sampled from October 2007 through December 2008.

7.2 GROUNDWATER QUALITY ANALYSIS RESULTS

Analytical results for groundwater quality monitoring conducted by the GWPP and the ER Project are compared to state, federal, and DOE guidelines shown in Table 7-1. The frequency of groundwater quality monitoring and sample collection performed at SNL/NM is shown in Table 7-2. All groundwater samples are collected and analyzed in accordance with EPA protocols.

Water quality results for both the GWPP and the ER Project are summarized in the following pages and in Table 7-3. Exceedances of regulatory criteria for samples collected by SNL/NM monitoring activities are listed in Table 7-4.

7.2.1 GWPP Surveillance Results

Annual sampling of groundwater was conducted during the period of March 11, 2008 to April 21, 2008. Samples were collected from 14 wells and one spring. Groundwater surveillance samples for the GWPP were analyzed for the following parameters:

- VOCs
- dissolved metals (except for mercury),
- major ions (including nitrate),
- alkalinity/total phenols,
- total halogenated organics (TOX),
- High explosive (HE) (at selected wells),
- gamma spectroscopy,
- selected radionuclides, and
- gross alpha/beta activity.

Metals, excluding mercury, were analyzed from filtered groundwater samples to conform to New Mexico Water Quality Control Commission (NMWQCC) Standards for dissolved concentration limits. An unfiltered groundwater sample from each well was analyzed for total mercury.

Groundwater samples in seven wells (CTF-MW2 & 3, SFR-2S, SWTA3-MW3 & 4, and TRE-1) were analyzed for HE. The designated wells are used to establish background concentrations of HE at the Dynamic Explosives Test Site east and south of TA-III and to monitor potential groundwater impacts from explosive testing.

Field measurements taken at each well included alkalinity, turbidity, dissolved oxygen, potential of hydrogen (pH), specific conductivity, oxidation reduction potential (or redox [Eh]), and temperature.

VOCs

VOCs were not detected at concentrations above established MCLs or MACs from any groundwater sample. Chloroform and dibromomethane were the only VOCs detected. Chloroform was detected at a concentration of 0.693 micrograms per liter (µg/L) in the sample from CTF-MW3 and 0.867 µg/L in TRE-1. Dibromochloromethane was detected in the sample from CTF-MW3 at a concentration of 0.363 µg/L. Methylene chloride and toluene initially reported in the sample from NWTA3-MW3D but the results were rejected during data validation because the same chemicals were found in the trip blanks. The HE compound Cyclotrimethylenetrinitamine also known as Research Department compound X (RDX) was detected in the sample from CTF-MW2 at a concentration of 0.183 µg/L. The analysis of a duplicate sample from the same well yielded a concentration of 0.226 µg/L. A verification sample was collected on July 18, 2008. The results indicated a RDX concentration of 0.187 µg/L. All the RDX concentration values are qualified as "J" which means the values are above the method detection limit (MDL) but below the quantitation limit which means the numerical value is estimated.

Non-metal Inorganic Compounds and Phenolics

Non-metallic inorganic constituents analyzed in groundwater samples included phenolics and TOX, total cyanide, alkalinity, and ions (including bromide, chloride, fluoride, sulfate, and Nitrate Plus Nitrite (NPN) [reported as nitrogen]). Analytical results are given in Appendix A, Tables GWPP-A3 and GWPP-A4, with MCLs and MACs included for comparison.

No analytes exceeded the MCL associated with drinking water standards at any of the wells sampled. Fluoride concentrations in five wells and Coyote Springs exceeded the MAC of 1.6 milligrams per liter (mg/L) as established by the NMWQCC as the human health standard for groundwater. Fluoride was detected in monitor wells CTF-MW2, CTF-MW2 (duplicate), CTF-MW3, and SWTA3-MW4 at concentrations of 1.73 mg/L, 2.26 mg/L, 2.27 mg/L, 2.36 mg/L, 2.53 mg/L, and 1.65 mg/L, respectively. None of the groundwater samples exceeded the NMED Drinking MCL of 4 mg/L. The historic trend of fluoride concentrations in Coyote Springs, CTF-MW2, CTF-MW3, and SWTA3-MW4 is shown in Figures B-1 through B-4 respectively (see Appendix B of attached CD).

Metals

The analyses were conducted for dissolved metals on filtered groundwater samples, except for mercury. The total concentration of mercury was determined in an unfiltered aliquot of sampled groundwater. The groundwater standards of the NMWQCC are based on dissolved concentrations. Dissolved metals usually occur as natural trace concentrations and are generally below regulatory limits.

No metals parameters were detected above established regulatory limits in any groundwater sample, except beryllium and arsenic. Beryllium was detected above the MCL of 0.004 mg/L in Coyote Springs at a concentration of 0.00721 mg/L. Elevated beryllium has been consistently detected in the water from Coyote Springs (Figure B-5) and is deemed to be of natural origin as a consequence of groundwater in contact with the bedrock in this highly faulted location. Arsenic concentrations from multiple water samples from CTF-MW2 were in a range from 0.0483 to 0.0507 mg/L. All values exceeded the MCL for arsenic of 0.010 mg/L (see Figure B-6).

Total mercury was not detected above laboratory MDL for any groundwater sample.

Radionuclide Activity

Analyses for radioisotopes were conducted on all samples. Specific analyses included gamma spectroscopy, gross alpha/beta, radium-226 and -228, uranium-233/234, and uranium-235 and -238.

Gamma spectroscopic analysis was limited to the following key radioisotopes: americium-241, cesium-137, cobalt-60, and potassium-40. Only potassium-40 was reported above the associated minimum detectable activity (MDA) in samples from Coyote Springs, CTF-MW2, Greystone MW2, and SWTA3-MW3 at activities 47.6 +/- 32.9 pCi/L, 59.7 +/- 45.8 pCi/L, 71.9 +/- 43.2 pCi/L, and 50.4 +/- 41.5 pCi/L. No specific MCLs or MACs are established for these isotopes; however, U.S. Environmental Protection Agency (EPA) drinking water standards limit the effective dose for drinking water to 4 millirems per year (mrem/yr). The calculated maximum activity level using this standard is 1.2 picocuries per liter (pCi/L) for americium-241, 120 pCi/L for cesium-137, 200 pCi/L for cobalt-60, and 280 pCi/L for potassium-40. None of the activity levels from the groundwater samples exceed these values within the uncertainty level reported.

Uncorrected gross alpha activities for samples from CTF-MW1, CTF-MW2, CTF-MW3, SFR-2S, and TRE-1 exceeded the MCL of 15 pCi/L. In this region, groundwater contacts bedrock, which contains minerals that are high in naturally occurring uranium. After applying a correction for uranium the alpha results for CTF-MW3 dropped below the MCL. The nominal (without uncertainty range) corrected gross alpha for the other wells, CTF-MW1, CTF-MW2, SFR-2S, and TRE-1 were 24.1 pC/L, 88.5 pCi/L, 15.4 pCi/L, and 18.3 pCi/L, respectively. Trend plots for gross alpha for SFR-2S and TRE-1 are presented in Figures B-7 and B-8 respectively. No trend is presented for gross alpha from the CTF wells because data for only one sampling event exits.

7.2.2 ER Project Water Quality Results

CWL Results

Groundwater monitoring at CWL was performed during October and November 2007, and in June, October, and December 2008. Groundwater samples were collected from nine monitoring wells, and submitted for 40 Code of Federal Regulations (CFR) 264 (Appendix IX) VOCs, SemVolatile Organic Compounds (SVOCs), chlorinated herbicides, Polychlorinated Biphenyls (PCBs,) total cyanide, sulfides, total metals plus iron, and dissolved chromium analyses. Sample results were compared with MCLs, where established. Water quality parameters for specific conductivity, oxidation-reduction, pH, turbidity, and dissolved oxygen were measured prior to sampling each well.

VOCs, SVOCs, Chlorinated Herbicides, and PCBs

No VOCs, SVOCs, chlorinated herbicides, or PCBs were detected above established MCLs during period from October 2007 through December 2008. The VOC, TCE was detected below the MCL of 5.0 µg/L at concentrations ranging from 0.258 µg/L to 2.39 µg/L. No SVOCs were detected above laboratory MDLs, except bis(2-Ethylhexyl) phthalate. This

compound was detected below the MCL of 6.0 µg/L. No herbicides or PCBs were detected above laboratory MDLs.

Total Cyanide and Sulfide

Total cyanide was not detected above the laboratory MDL in any groundwater sample. Sulfides were detected in four samples at concentrations ranging from 0.810 mg/L to 1.87 mg/L.

Total Metals

As required by the NMED Hazardous Waste Bureau (HWB), all metal samples were analyzed for total metals. No metals parameters were detected above established MCLs, except for chromium. Chromium was detected above the MCL of 0.10 mg/L in the November 2007 sample from monitoring well CWL-MW2BU. Groundwater samples collected from CWL-MW2BU in June and October 2008 reported chromium at concentrations of 0.0178 mg/L and 0.0127 mg/L, respectively. The trend for total chromium concentration in CWL-MW2BU is shown in Appendix B, Figure B-9 (see attached CD).

Dissolved Chromium

Dissolved chromium was detected below the MCL of 0.10 mg/L in three CWL groundwater samples. Dissolved chromium was reported concentrations ranging from 0.00190 mg/L to 0.00302 mg/L.

MWL Results

Groundwater sampling of seven monitoring wells at the MWL was conducted in April, July and October 2008. Background well MWL-BW2 was also sampled in April 2008. Groundwater samples were analyzed for the standards analytes — VOCs, Target Analyte List (TAL) metals and total uranium, NPN (reported as nitrogen), major anions, tritium, gross alpha/beta radioactivity, and gamma-emitting radionuclides. In addition, analyses for total organic carbon (TOC), carbon dioxide, total dissolved solids (TDS), ferrous iron, and biological oxygen demand (BOD) were requested.

The COOC (NMED 2004) requires that new wells be sampled for perchlorate for a minimum of four quarters. During 2008, the recently installed groundwater monitoring wells MWL-MW7, MWL-MW8, and MWL-MW9, and background monitoring well MWL-BW2, were added to the perchlorate screening monitoring well network. If perchlorate is detected above the screening level in a specific well, monitoring will continue at that well at a frequency negotiated with the NMED.

Sampling results were compared with MCLs, where established. Water quality parameters were measured at the time of sample collection at each well.

VOCs

Groundwater samples from the MWL monitoring wells revealed detections of acetone and toluene. The MCL for toluene is 1,000 µg/L. No MCL exists for acetone. Neither compound is a contaminant of concern at the MWL, though historically, toluene has been detected in MWL groundwater samples. Acetone concentrations in samples from MWL-MW4 and MWL-MW6 were qualified as estimated values, during data validation, since calibration verification samples did not meet acceptance criteria. Toluene was detected well below the MCL of 1,000 µg/L in MWL-MW9. The laboratory qualified toluene as an estimated value since the concentration was detected below the effective laboratory practical quantitation limit (PQL).

Metals

Groundwater samples collected during the groundwater sampling at the MWL were analyzed for TAL filtered and unfiltered metals according to EPA Method SW846 (EPA 1986). Results indicate no detections of any metals from the filtered or unfiltered samples exceeded the respective MCLs.

Total uranium was analyzed for MWL-MW7, MWL-MW8, and MWL-MW9 from July and October quarterly sampling events. The results (see table A-5) were all less than the MCL of 0.03 mg/L. The data are consistent with other sampling events and are well within the range of total uranium concentrations historically seen at the MWL.

Uranium isotopes uranium-235 and uranium-238 were determined as mass concentrations during metals analysis. All uranium isotope values are consistent with past results. Uranium-235 values ranged from 0.000047 mg/L in MWL-BW2 to 0.000069 mg/L in MWL-MW5. Uranium-238 values ranged from 0.0061 mg/L MWL-BW2 to 0.009 mg/L in MWL-MW5.

Radionuclide Activity

Groundwater samples from the MWL monitoring wells were analyzed for gamma-emitting radionuclides, gross alpha/beta activity, and tritium and compared with the established EPA MCLs (no MCLs have been established for tritium).

Gross alpha/beta activity levels were detected above laboratory reporting limits in all environmental samples. Gross alpha activity levels range from 4.06 ±

2.08 pCi/L in the MWL-MW7 sample to 17.9± 10.5 pCi/L in the MWL-MW6 sample. Gross beta activity levels range from 3.25 ± 1.84 pCi/L in the MWL-BW2 sample to 12.1 ± 4.75 pCi/L in the MWL- MW5 sample. When the gross alpha data is corrected for the uranium activity contribution, none of the samples analyzed exceed the MCL of 15 pCi/L.

Neither tritium, nor gamma-emitting isotopes were detected above the MDA in any of the groundwater samples.

Perchlorate

During 2008, recently installed groundwater monitoring wells MWL-MW7, MWL-MW8, and MWL-MW9, and background monitoring well MWL-BW2, were added to the perchlorate screening monitoring well network. No perchlorate was detected in the environmental samples from the new groundwater monitoring wells MWL-MW7, MWL-MW8, MWL-MW9, and MWL-BW2 at a screening level of 4 µg/L.

TA-V Results

Quarterly groundwater sampling at TA-V was performed in November/December 2007, January/February 2008, April/May 2008, August/September 2008, and November/December 2008.

Analytes Sampled

Quarterly groundwater samples were analyzed for VOCs and NPN (reported as nitrogen). In addition to the quarterly analytes, analyses for TAL metals, total uranium, tritium, gross alpha/beta, and selected radionuclides by gamma spectroscopy were conducted on samples during the August/September 2008 sampling event. Also, anions (bromide, chloride, fluoride, and sulfate), total cyanide, and total phenol were analyzed for samples collected from TAV-MW10 during the April/May 2008 sampling event. Field water quality measurements were taken at each well prior to sample collection.

VOC Analyses

TCE concentrations in excess of the MCL of 5 µg/L were detected in samples from TA-V monitoring wells LWDS-MW1, TAV-MW6, and TAV-MW10 (see Table 7-4). The maximum concentration detected was 16.2 µg/L in LWDS-MW1 in December 2008. The maximum concentration detected in TAV-MW6 was 10.2 µg/L in February 2008, and the maximum concentration detected in TAV-MW10 was 14.1 µg/L in December 2008. The TCE concentration trends for LWDS-MW1 and TAV-MW6 are shown in Figures B-10 and B-11. TAV-MW10 was installed to replace TAV-MW1 and the TCE concentrations for these two wells appear to be increasing over time (see Figure B-12). No other VOCs were detected above MCLs in any other monitoring well.

Anion Analyses

Among the anion analytes NPN (reported as nitrogen), bromide, chloride, fluoride, and sulfate, only fluoride and NPN have an MCL or MAC. Fluoride concentrations did not exceed the MAC of 1.6 mg/L, which is the lower of the two regulatory limits. NPN (reported as nitrogen) concentrations exceeded the MCL of 10 mg/L in LWDS-MW1 during all sampling events from October 2007 through December 2008, with a maximum concentration of 12.6 mg/L in December 2007 (Table 7-4). The nitrate in LWDS-MW1 has consistently exceeded the MCL over the past six years, however, the concentrations appear to be constant to slightly decreasing over time (Figure B-13). The nitrate concentrations in TAV-MW10 exceeded the MCL during two sampling events. TAV-MW10 was installed to replace TAV-MW1 and the nitrate concentrations for these two wells appear to be increasing over time (Figure B-14).

Metals

Total metal analyses were conducted on the groundwater samples collected from TAV-MW10 during the April/May 2008 sampling event and from the remainder of the wells during August/September 2008 sampling event. No metal concentrations exceeded established MCLs.

Radionuclide Activity

Gamma spectroscopy, gross alpha/beta, and tritium analyses were conducted on all wells during the August/September 2008 sampling event. All radionuclide activities were below MCLs, where established. Tritium, analyzed by EPA Method 906.0M, was not detected above the MDA in any of the 12 samples.

TAG Results

Groundwater sampling at TAG was performed in October 2007, January 2008, April/May 2008, July/August 2008, and November 2008. Samples were collected from 21 wells — ten perched groundwater system wells, and 11 regional aquifer wells. Samples collected quarterly, semiannually, and annually were analyzed for NPN (reported as nitrogen) and VOCs. Additional analyses including TAL metals, tritium, gross alpha/beta, and selected radionuclides by gamma spectroscopy were conducted during the July/August 2008 sampling event. Field water quality measurements were taken at each well prior to sample collection.

VOC Analyses

TCE concentrations above the MCL of 5 µg/L were detected in groundwater samples from two perched groundwater system wells, WYO-4 and TA2-W-19 (Table 7-4). WYO-4 had concentrations of TCE exceeding the MCL in all sampling events, with a maximum TCE concentration of 9.15 µg/L in January 2008 (see Figure B-15). TA2-W-19 had a maximum concentration of 5.79 µg/L in January 2008 (see Figure B-16).

Inorganic Chemical Analyses

Inorganic chemical analyses of quarterly groundwater samples consisted of NPN (reported as nitrogen). Nitrate exceeded the MCL in three wells during all sampling events: TA2-SW1-320, TJA-4, and TJA-7 (Table 7-4). Nitrate concentrations exceeded the MCL in TJA-2 during two sampling events (April/May 2008 and November 2008), and in TA2-W-19 during one sampling event (November 2008) (Table 7-4). The maximum concentration in the study area was reported for TJA-4 at 29.8 mg/L in November 2008. Figures B-17 through B-21 show that nitrate concentrations in these five wells range from slightly increasing to slightly decreasing over time.

Metals

Total metals analyses were performed on the samples collected during the July/August 2008 sampling event. The results were all below the respective MCLs, where established.

Radionuclide Activity

Gamma spectroscopy, gross alpha/beta, and tritium analyses were conducted on 21 wells during the July/August 2008 sampling event. All radionuclide activities were below MCLs, where established. Tritium, analyzed by EPA Method 906.0M, was not detected above the MDA in any of the 21 samples.

Burn Site Groundwater Results

Groundwater sampling at BSG was performed in December 2007, March 2008, June 2008, and September 2008 on six wells located in Lurance Canyon near the SNL/NM Burn Site Facility. The samples were analyzed for VOCs, SVOCs, diesel-range organics, gasoline-range organics, major ions, NPN (reported as nitrogen), TAL metals (plus uranium), gross alpha/beta, tritium, and radionuclides by gamma spectroscopy. Per the requirements of the COOC, quarterly sampling for perchlorate was conducted at CYN-MW6. Field water quality measurements were taken at each well prior to sample collection.

VOCs and Other Organic Compounds

No VOCs or SVOCs were detected above MCLs. Other organics found in groundwater samples included low levels of diesel-range organics in CYN-MW7 at 50.8 µg/L in March 2008, and gasoline-range organics in CYN-MW6 at 37.6 µg/L in December 2007.

Major and Minor Anions

NPN results exceeded the MCL of 10 mg/L in samples from CYN-MW6 during all sampling events, with a maximum 33.0 mg/L during the September 2008 sampling event (see Table 7-4). Nitrate concentrations in this well have consistently exceeded the MCL (see Figure B-22). NPN concentrations in CYN-MW3 exceeded the MCL in two sampling events, with a maximum concentration of 13.8 mg/L during the September 2008 sampling event (Table 7-4). Nitrate concentrations are relatively stable over time in CYN-MW3 (Figure B-23). NPN results from CYN-MW1D exceeded the MCL in two sampling events with a maximum concentration of 21.3 mg/L during the March 2008 sampling event (Table 7-4; Figure B-24).

Perchlorate concentrations in CYN-MW6 exceeded the 0.004 mg/L screening level established in the COOC. The maximum concentration of 0.00725 mg/L was detected during the March 2008 sampling event. No MCL or MAC currently exists for perchlorate, although the NMED identifies perchlorate as a potential toxic pollutant. All other major ion results were below established MCLs.

Metals

No metal concentrations above MCLs were detected in any of the wells sampled during the September 2008 sampling event.

Radionuclide Activity

Groundwater samples were analyzed for gross alpha/beta, tritium, and gamma spectroscopy. All radionuclide activities were below MCLs, except for gross alpha in CYN-MW4, CYN-MW6, CYN-MW7, and CYN-MW8. Uncorrected gross alpha values from CYN-MW4, CYN-MW6, CYN-MW7, and CYN-MW8 exceeded the MCL of 15 pCi/L at activities ranging from 18.2 ± 4.16 pCi/L to 40.5 ± 8.22 pCi/L. Gross alpha trend data for these wells is shown in Figures B-25 through B-28 respectively. In this region, groundwater contacts bedrock which contains minerals that are high in naturally occurring uranium. Gross alpha results are consistent with historical results in Burn Site monitoring wells and are reported as uncorrected gross alpha activities (not

corrected by subtracting naturally occurring uranium or radium activities). Gamma spectroscopy analysis did not detect any isotopes above associated MDAs. Tritium, analyzed by EPA Method 906.0M, was not detected above the MDA in any of the six samples.

7.3 WATER LEVELS

Water levels are a means to assess the physical changes of the groundwater system over time. This includes changes in the local water table, the quantity of water available, as well as the direction and speed of groundwater movement. The GWPP gathers groundwater level measurements from a large network of wells on and around KAFB. In addition to wells owned by the DOE National Nuclear Security Administration (NNSA), Sandia Site Office (SSO), data is solicited for U.S. Air Force (USAF) IRP, COA, and USGS wells. In 2008, data from 164 wells were incorporated into the monitor well water level database. Water levels were measured monthly or quarterly.

7.3.1 Regional Hydrology

Groundwater Conceptual Model

A brief overview of the regional hydrology is given in Chapter 1, Section 1.5 of this report. Although water levels may fluctuate locally over the course of the year in response to seasonal recharge and groundwater withdrawal, the overall level of the regional aquifer within the basin continues to decline. The regional aquifer which underlies the western part of KAFB is comprised of the saturated coarse-to-fine grained strata of the upper and middle units of the Santa Fe Group. Most of the COA and KAFB water supply wells are completed in this aquifer. Groundwater withdrawl at these wells is manifested as declining water levels throughout the region.

The regional water table in the KAFB area can be subdivided into three general areas:

Groundwater levels east of the Tijeras Fault Complex are approximately 100 to 150 feet below the surface.

Groundwater levels west of the Tijeras Fault Complex and the Sandia Fault are approximately 500 feet or more below ground surface (bgs). This area is part of the regional Albuquerque Basin aquifer system.

Between the east and west areas is a transition zone comprised of the fault complex. The aquifer system within the fault complex is not well documented. This is due to the complex geology of the area and the limited number of wells available to characterize the system.

Regional Groundwater Table

The 2008 Regional Groundwater Elevation Contour map for SNL/KAFB is presented in Figure 7-3. The extent of the contoured map area was constructed using static water level data from 36 wells west of the Tijeras Fault Complex. This map represents the water table in the time period spanning August through October 2008. The three month window is necessary because some wells are only monitored quarterly. Generally, these monitor wells are screened across the regional water table in the upper unit of the Santa Fe Group. They penetrate different depths into the aquifer and have various lengths of screened intervals. Although most of the water level data represent an unconfined water table, some water levels may represent semi-confined conditions.

The contour lines shown in Figure 7-3 represent lines of equal elevation of the groundwater table. Groundwater withdrawal as a consequence of pumping by KAFB production wells at the northern part of the KAFB and nearby COA production wells has created a depression in the regional water table. This "U" shaped depression, with the top of the "U" pointing north, extends south to Isleta Pueblo, and is a result of preferential flow through highly conductive ancestral Rio Grande fluvial deposits, which are the primary aquifer material in this area. Groundwater flow is perpendicular to the contour lines in the direction of decreasing elevation. The direction of groundwater flow within the region is toward the production wells. This pumping- induced flow to the north is in contrast with the southwesterly flow direction reported in 1961 at a time of significantly lower groundwater withdrawal (Bjorklund and Maxwell 1961).

Perched Groundwater System (PGS)

A subset of monitor wells are completed in a PGS between ground level and the regional water table. This PGS is limited to the northern part of KAFB in the vicinity of SNL/NM TA -I, -II, and -III, extending southwest to the location of the former KAFB sewage lagoons. The eastward extent of the PGS wells extends to under the KAFB Landfill and southeast to the KAFB Golf Course. The elevation data of the first saturated water interval in the PGS wells are illustrated in Figure 7-4. The figure was constructed from water level elevation data for 14 wells completed in the PGS. The contours indicate a gradient to the east-southeast. The highest elevation contour, near the western edge of the PGS, near the former KAFB sewage lagoons is at 5,155 feet above sea level (fasl) (KAFB-2622). This elevation corresponds to a depth to water from the surface of approximately 207 feet. At the same location the regional water table

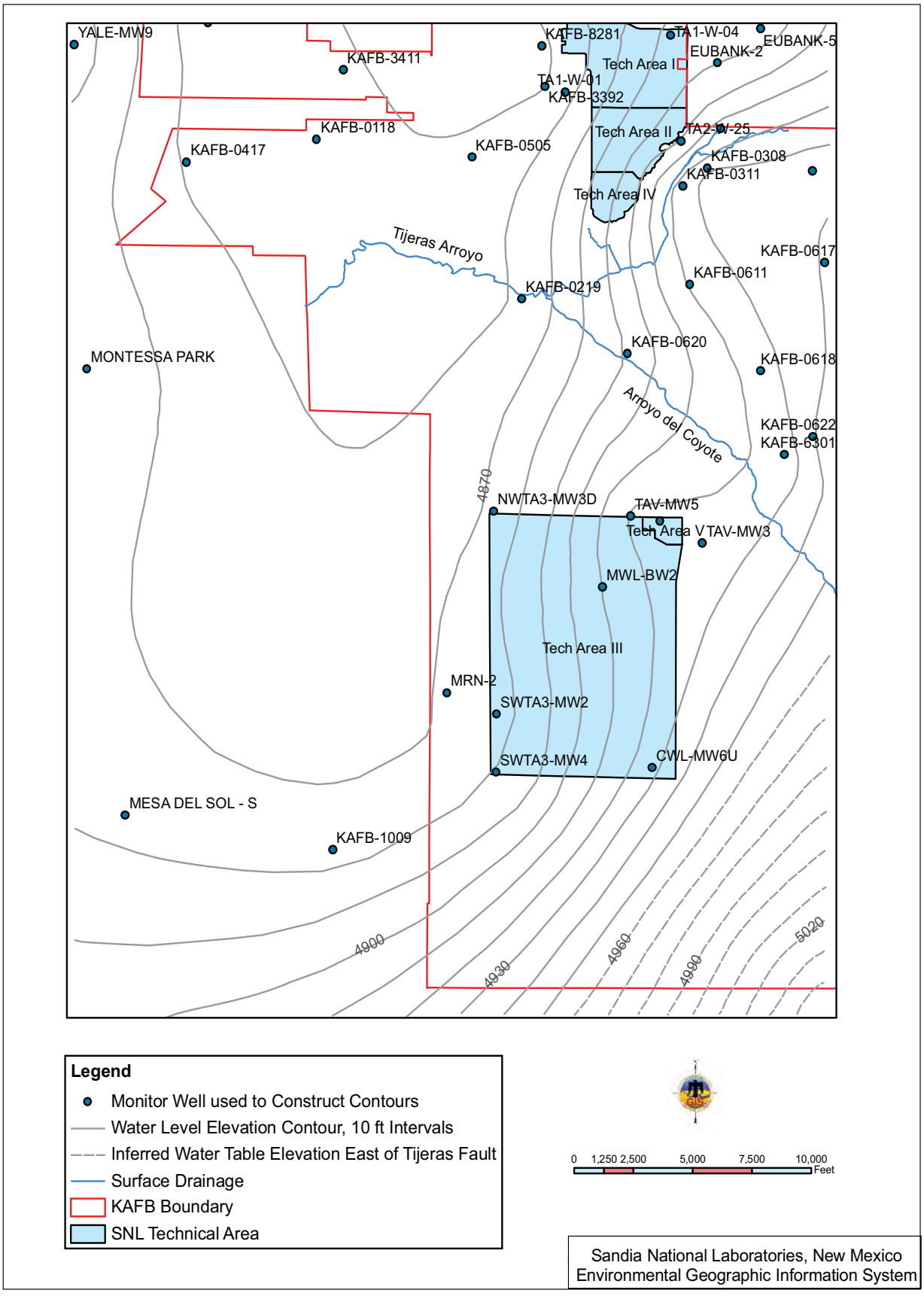

FIGURE 7-3. 2008 Regional Groundwater System Water Table Elevation

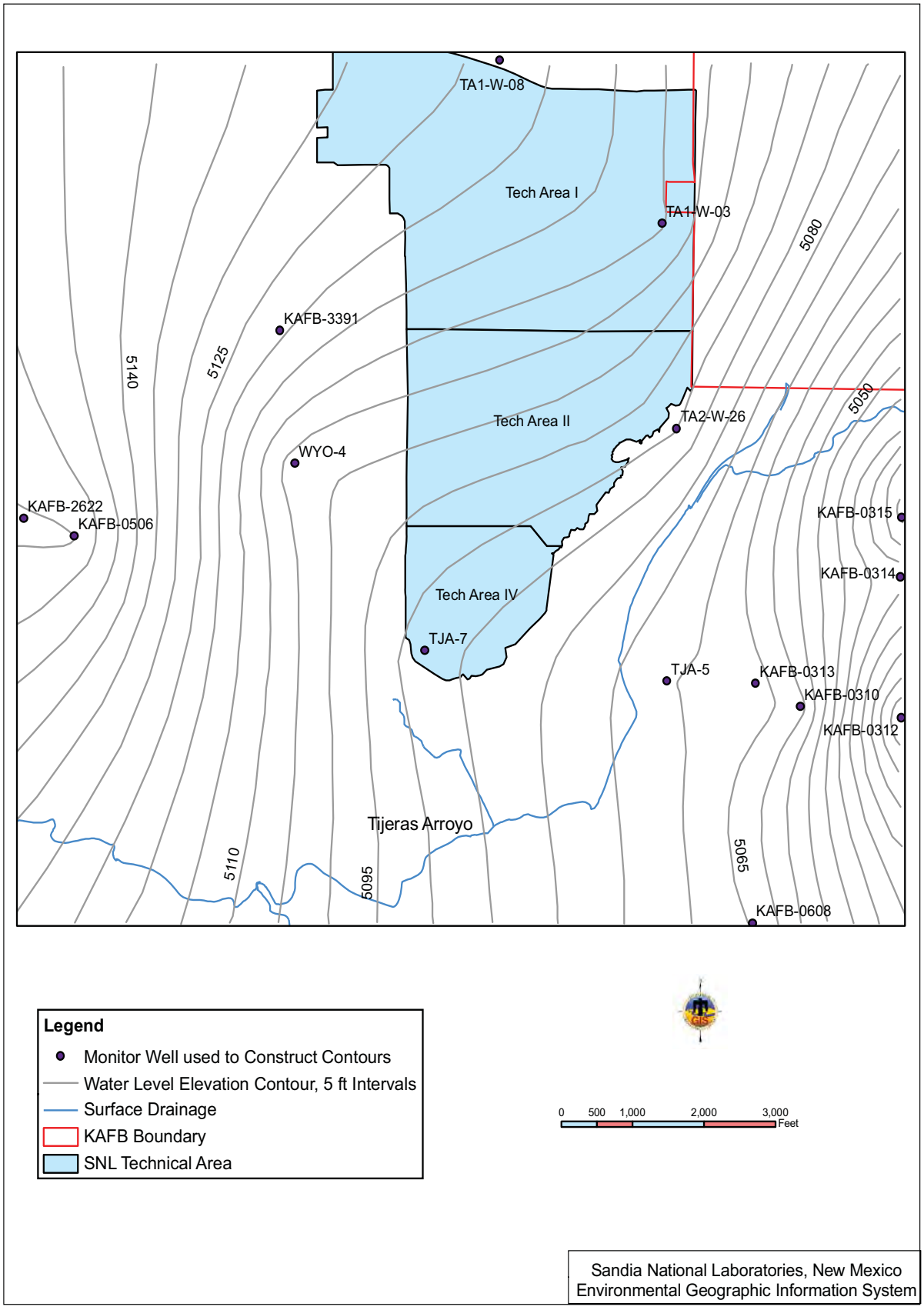

FIGURE 7-4. 2008 Perched Groundwater System Water Table Elevation

is 495 feet bgs. Along the eastern boundary of the PGS, the elevation of first water is at 5,037 fasl (KAFB-0314). This elevation is close to the elevation of the regional water table, which is 4,929 fasl (KAFB-0308) at this location. Because of the eastern dip of the PGS wells and the western dip of the regional system, the two systems appear to merge near this location.

Groundwater Recharge and Loss

The dynamics of water table fluctuations, as reflected by water levels in individual wells, are a balance between groundwater inflow to the basin, recharge, water withdrawal, and basin outflow. Recharge to the groundwater in the Middle Rio Grande Basin occurs primarily through mountain front recharge and infiltration from active arroyos, washes, and rivers within the basin.

Recharge potential for groundwater is directly related to the amount of precipitation. The regional climate for the Albuquerque Basin area is semi-arid, as described in Section 1.6. KAFB water production wells supply most of the water used by SNL/NM and KAFB. KAFB production wells extract groundwater from the upper and middle units of the Santa Fe Group at a depth of up to 1,600 feet. These units constitute the primary aquifer for the Albuquerque metropolitan area. In (FY) 2008, KAFB pumped approximately 896 million gallons (gal) of groundwater from seven water wells. This represents a decrease of 74.7 million gal from the previous year.

7.3.2 Groundwater Level Trends

In 1993, the USGS conducted a study on the Santa Fe Group and the Albuquerque area and found that the quantity of water in the aquifer was significantly less than previously estimated (Thorn et al. 1993). The imbalance between recharge and groundwater withdrawal has resulted in a general decline in water levels. Figure 7-5 shows the contour map of the regional water table elevation changes recorded for the western area of KAFB over the one year period between 2007 and 2008.

The largest amount of decline over the period is approximately 1.0 feet per year, similar to the rate of decline reported for the previous year. The largest is in the vicinity of the southwestern boundary of TA-III. In the eastern portion of the mapped area, including TA-III, water levels show moderate declines. In contrast to the trend of water level declines throughout most of the region, the water levels in the northeast portion of the mapped area are increasing slightly. This area coincides with a potential recharge area associated with Tijeras Arroyo.

The water level trends for PGS wells indicate a decrease in water level elevations in the western portion of the zone (Figure 7-6). There is a pronounced decrease of 1.78 feet in water level elevation measured at the WYO-4 location over the recent year. This accelerated localized decreasing trend has persisted at this location for the last four years. The water levels in the eastern part appear to be increasing, which is consistent with the notion that the PGS is draining to the east and merging with the regional system.

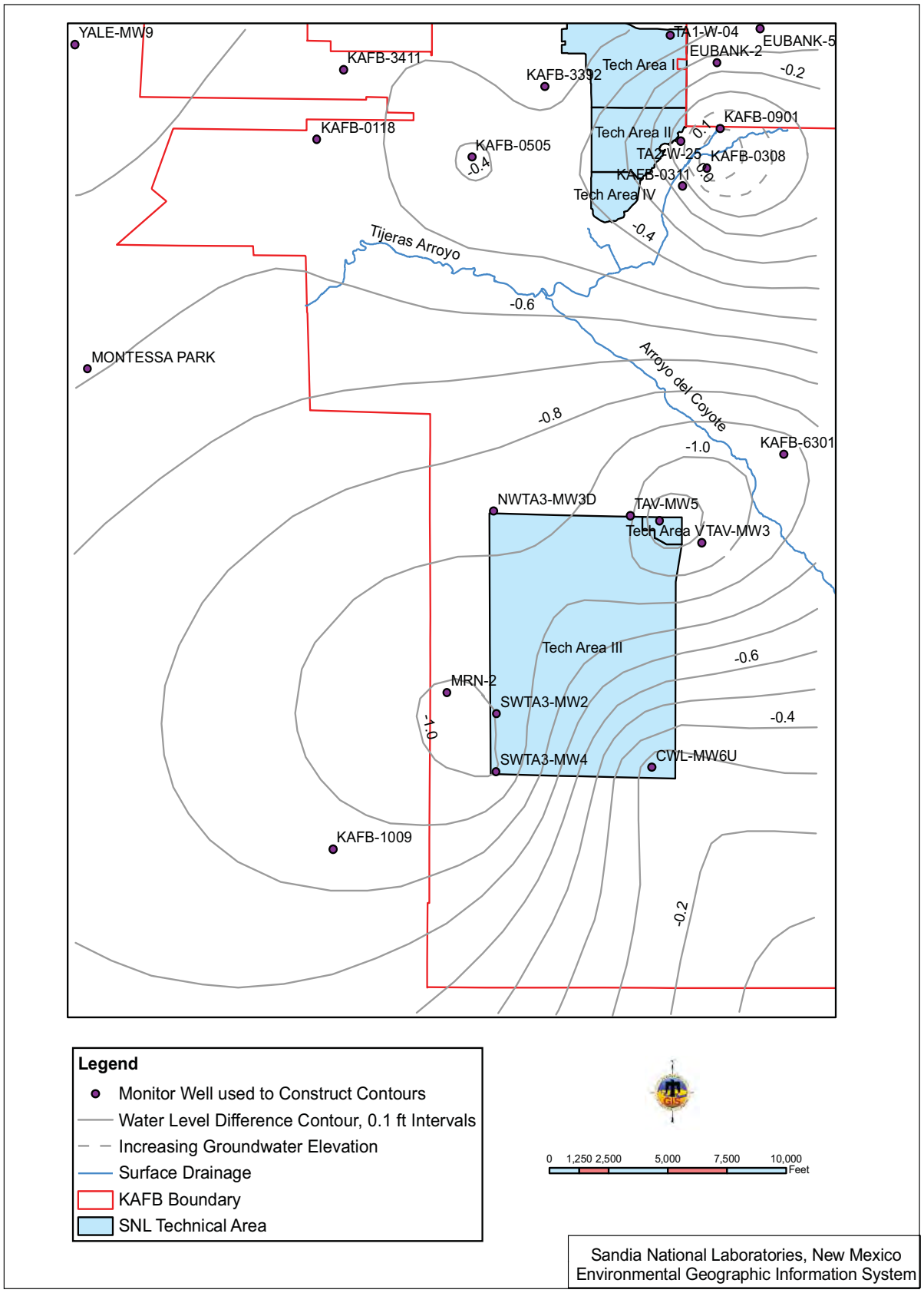

FIGURE 7-5. Change in Regional Groundwater System Table Elevation 2007 to 2008

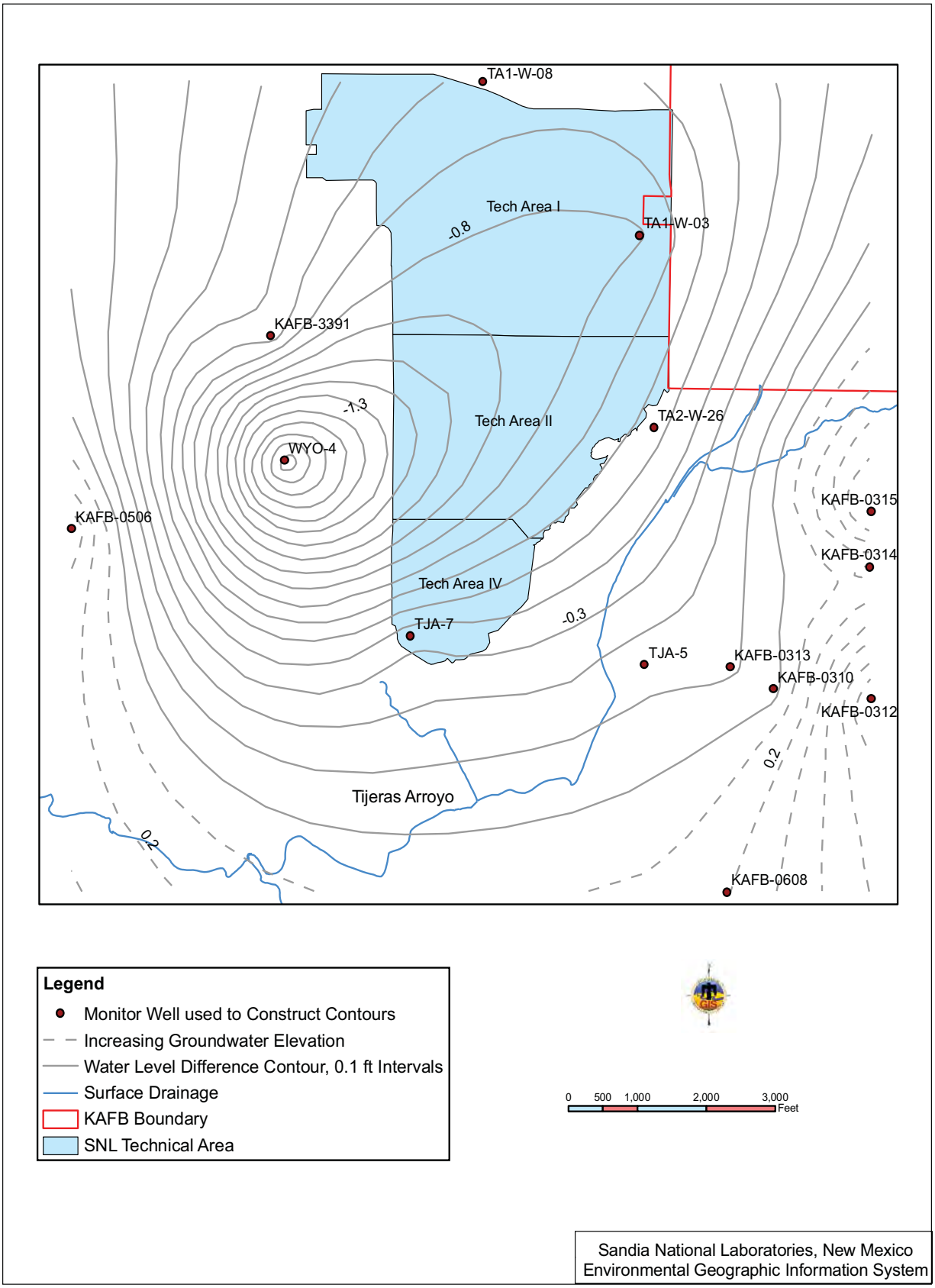

FIGURE 7-6. Change in Perched Groundwater System Water Table Elevation 2007 to 2008

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8.0 Quality Assurance

This chapter provides a summary of the following:

- Corporate Level Quality Assurance (QA)
- Environmental Program QA
- Environmental Sampling and Analysis
- 2008 Sample Management Office (SMO) Activities

8.1 CORPORATE LEVEL QA

Sandia Corporation's (Sandia) Integrated Laboratories Management System (ILMS) is the framework for all management requirements at Sandia. It represents the complete set of policies, business rules, practices and information which are the foundation of Sandia's business expectations and intent. Sandia management is responsible for ensuring the quality of its products and assessing its operations, programs, projects, and business systems, identifying deficiencies, and effecting continuous improvements. Through the ILMS, Sandia will insure consistent application of quality management principles to:

- Enable Sandia's Vision and Strategy,
- Achieve Mission Performance, Operational Excellence, and Stewardship, and
- Satisfy requirements for Contractor Assurance.

Corporate Work Process

The Corporate Work Process (CWP) is central to Sandia's ILMS for conducting work activities. All members of the workforce are required to utilize the CWP to safely manage and conduct all work for Sandia. The CWP is illustrated in Figure 8-1.

8.1.1 Environment, Safety & Health (ES&H) Policy Statement Requirement

The ES&H Policy of Sandia is to protect and preserve the environment and to ensure the safety and health of its Members of the Workforce by providing a place of employment that is, to the greatest extent possible, free from recognized hazards that have the potential to cause physical harm to Members of the Workforce. The ES&H Policy will allow Sandia to successfully contribute to the overall protection of worker health, public health, and the environment.

FIGURE 8-1. Sandia's Integrated Laboratories Management System (ILMS)
The Corporate Work Process is illustrated in the five points of the star.

As part of its mission, Sandia has adopted three key ES&H principles:

1. All Members of the Workforce take responsibility and are accountable for ES&H performance at Sandia National Laboratories, New Mexico (SNL/NM).
2. All Members of the Workforce operate from an unwavering belief that job-related injuries, illnesses, and environmental incidents are preventable and unacceptable.
3. Working safely is a condition of employment.

8.1.2 Integrated Safety Management System (ISMS)

Sandia's corporate ES&H program mandates compliance with all applicable laws, regulations and U.S. Department of Energy (DOE) directives that are included in the Prime Contract between DOE and Sandia. As appropriate, internal corporate policy and permit requirements are included. Sandia is committed to performing work safely and ensuring protection of the Members of the Workforce, the public, and the environment.

ES&H performance at Sandia is based upon the Five Safety Management Core Functions and the Seven Guiding Principles of ISMS.

Sandia is committed to environmental protection for current and future generations. This commitment includes identifying and mitigating potential risks to the environment, and incorporating environmental management as an integrated element of all work.

Environmental Management System (EMS)
Sandia has implemented an EMS as an integral part of its ISMS. The EMS addresses the environmental consequences of Sandia's activities, products, and services. The ISMS includes environmental management aspects in all five of the core management functions that support work planning, hazard analysis, hazard control, work performance and feedback and improvement.

Five Core Safety Management Functions of ISMS
There are five core safety management functions which provide the necessary work control structures, planning and execution at the activity level to ensure the safety of the Members of the Workforce, the public, and the environment:

1. ***Define the Scope of Work*** – Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.
2. ***Analyze the Hazards*** – Hazards and environmental impacts associated with the work are identified, analyzed, categorized, and communicated.
3. ***Develop and Implement Hazard Controls*** – Applicable standards and requirements are identified and agreed upon. Controls to prevent/mitigate hazards and environmental impacts are identified, the safety envelope is established, and controls are implemented.
4. ***Perform Work Within Controls*** – Readiness is confirmed and work is performed safely, and in an environmentally responsible manner.
5. ***Provide Feedback and Continuous Improvement*** – Information and feedback on the adequacy of controls is gathered, opportunities for improving the definition and planning of work are identified and implemented, and line and independent oversight is conducted.

Seven Guiding Principles of ISMS
Sandia shall, in the performance of work, ensure implementation of the following Seven Guiding Principles:

1. ***Line Management is Responsible for Safety*** – Line management is responsible for the protection of employees, the public, and the environment. Line management includes those contractor and subcontractor employees managing or supervising employees performing work.

FIGURE 8-2. ISMS Star.

2. ***Clear Roles and Responsibilities are Defined*** – Clear and unambiguous line of authority and responsibility for ensuring ES&H is established and maintained at all organizational levels.
3. ***Worker Competence Is Commensurate with Responsibilities*** – Personnel possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.
4. ***Priorities are Balanced*** – Resources are effectively allocated to address ES&H, programmatic, and operational considerations. Protecting employees, the public, and the environment is a priority whenever activities are planned and performed.
5. ***Safety Standards and Requirements are Identified*** – Before work is performed, the associated hazards are evaluated and an agreed-upon set of ES&H standards and requirements are established which, if properly implemented, provide adequate assurance that employees, the public, and the environment are protected from adverse consequences.
6. ***Hazard Controls are Tailored to Work Being Performed*** – Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards. Emphasis should be on designing the work and/or controls to reduce or eliminate the hazards and prevent accidents and unplanned releases and exposures.
7. ***Operations Authorization Exists*** – The conditions and requirements to be satisfied for operations to be initiated and conducted are established and agreed-upon by DOE and the contractor. These agreed-upon conditions and requirements are requirements of the contract and binding upon the contractor. The extent of documentation and level of authority for agreement shall be tailored to the complexity and hazards associated with the work and shall be established in a Safety Management System.

8.2 ENVIRONMENTAL PROGRAM QA

Environmental samples are collected by personnel in various programs and analyzed for radiological and non-radiological contaminants. Some sampling is specifically mandated by regulations to meet compliance, while other sampling activities that are not are carried out in accordance with DOE Orders.

8.2.1 Environmental Sampling and Analysis

Environmental Sampling

Environmental sampling is conducted in accordance with program-specific Sampling and Analysis Plans (SAPs) or Work Plans which contain applicable QA elements. These documents meet appropriate federal, state, and local regulatory guidelines for conducting sampling and analysis activities.

Program-Specific SAPs

Each program involved in environmental monitoring and sampling develops and follows a relevant SAP. Most project SAPs include critical elements, such as procedures for sample collection, sample preservation and handling, sample control, references to analytical methods, laboratory Quality Control (QC) and procedures, field QC, health and safety, schedules and frequency of sampling and reporting.

Sample Management Office (SMO)

Environmental samples are packaged, shipped, and tracked to off-site (contracted) laboratories by the SMO. The SMO is responsible for QA and QC once the samples are relinquished to the SMO by field team members.

Some samples are processed and analyzed for radiological constituents by the SNL/NM Radiation Protection Sample Diagnostics (RPSD) laboratory, in accordance with RPSD procedures.

The SMO's roles and responsibilities include providing guidance and sample management support for field activities. However, each distinct program is responsible for its overall adherence and compliance regarding any sampling and analysis activity performed.

Selection of a Contract Laboratory

All off-site contract laboratories are selected based on performance objectives, licenses and accreditations, and appraisal (pre-award assessment) as described in the Quality Assurance Project Plan (QAPP) for the SMO (SNL 2007e). All laboratories must employ U.S. Environmental Protection Agency (EPA) test procedures wherever possible; when these are not available, other suitable and validated test procedures are applied. Laboratory instruments must be calibrated in accordance with established procedures, methods, and the SMO Statement of Work (SOW). All calibrations and detection limits must be verified before sample analysis and data reporting. Once a laboratory has passed the initial appraisal and has been awarded a contract, the SMO is responsible for continuously monitoring laboratory performance to ensure that the laboratories are audited annually and meet their contractual requirements.

Contract laboratories are required to participate in applicable DOE and EPA programs for blind audit check sampling to monitor the overall accuracy of analyses routinely performed on SNL/NM samples.

Project QC Samples
Project-specified QC samples are submitted to contract laboratories in order to meet project Data Quality Objectives (DQOs) and SAP requirements. Various field QC samples are collected to assess the quality and final usability of the data. Errors that can be introduced into the sampling process include potential sample contamination in the field or during the transportation of samples, some of which are unavoidable. Additionally, the variability present at each sample location can also affect sample results.

Laboratory QC
With each SNL/NM sample batch, laboratory QC samples are concurrently prepared at defined frequencies and analyzed in accordance with established methods. Analytical accuracy, precision, contamination, and matrix effects associated with each analytical measurement are determined.

QC sample results are compared either to statistically established control criteria or prescribed acceptance control limits. Analytical results generated concurrently with QC sample results within established limits are considered acceptable. If QC analytical results exceed control limits, the results are qualified, and corrective action is initiated if warranted. Reanalysis is then performed for samples in the analytical batch as specified in the SOW and laboratory procedures. QC sample summaries are included in analytical reports prepared by contract laboratories for SNL/NM.

8.3 2008 SMO ACTIVITIES

In 2008, the SMO processed a total of 4,307 samples in support of Sandia projects, including:

- Environmental Monitoring (air and water),
- Terrestrial Surveillance,
- Long-Term Stewardship (LTS),
- Waste characterization,
- Decontamination and Demolition (D&D), and
- Environmental Restoration (ER).

Of these, 3,519 were for environmental monitoring and surveillance projects. A total of 623 samples were submitted as field and analytical QC samples to assist with data validation and decision making. Approximately 595 of the 623 QC samples were taken for environmental monitoring and surveillance projects.

SMO Sample Processing

The SMO processed the following types of samples in 2008 in support of SNL/NM projects:

- *Radioactive waste*
- *Mixed waste*
- *Hazardous waste*
- *Decontamination & Demolition (D&D)*
- *D&D swipes*
- *D&D materials*
- *Sludges and liquids*
- *Soil*
- *Groundwater*
- *Decon water*
- *Solid waste*
- *Air*
- *Wastewater effluent*
- *Surface water*
- *Storm water*
- *Soil gas*
- *Air filters*

SMO contract laboratories perform work in compliance with the Sandia SOW for analytical laboratories (Puissant 2009).

Inter-Laboratory Comparisons
SMO contract laboratories are required to participate in the DOE Mixed Analyte Performance Evaluation Program (MAPEP). They also participate in commercial vendor programs designed to meet the requirements given in the proficiency testing section (Chapter II) of the National Environmental Laboratory Accreditation Conference (NELAC) Standard. SMO contract laboratories have a history of achieving a 90 percent or greater success rate during these comparisons. Acceptable results are based either on established control limits (as stated in the applicable methods) or statistically applied acceptance windows as determined by the performance evaluation provider. Windows are typically two or three standard deviations around the true value.

Laboratory QA
In 2008, the SMO continued on-site data package assessments and validation at the NELAC approved laboratories used by Sandia. Data packages (including a wide array of analysis methods) are requested at the time of the on-site visit. The laboratories are not notified in advance and do not know which data packages will be assessed. The handling history of the data package is carefully reviewed from sample

receipt to data completion by retracing each step through documentation files. Specific checks for documentation completeness, proper equipment calibration, and batch QC data are made. These assessments focus on data defensibility and regulatory compliance.

During 2008, Sandia employed the following contract laboratories to perform analysis of SNL/NM samples:

- **GEL Laboratories** in Charleston, South Carolina.
- **Test America Inc.** (formerly Severn Trent) in St. Louis, Missouri; Costa Mesa, California; Austin, Texas; and Arvada, Colorado.
- **Assaigai Laboratory** in Albuquerque, New Mexico.
- **BWXT Services** in Lynchburg, Virginia

QA Audits

The DOE Consolidated Audit Program (DOECAP) conducted audits in 2008 at the primary SMO contract laboratories using DOECAP Quality Systems Analytical Services (QSAS) requirements. The audit reports, responses from the labs, and closure letters are all posted and tracked through the DOECAP website. The SMO works closely with the contract laboratories to expeditiously resolve audit findings. Decisions regarding sample distribution to contract laboratories are based on audit information, including outstanding corrective actions. In 2008, no Priority-1 findings that impacted SMO work were documented during laboratory audits. All corrective actions were expeditiously resolved.

Data Validation and Records Management

Sample collection, Analysis Request and Chain of Custody (ARCOC) documentation and measurement data were reviewed and validated for each sample collected. Analytical data reported by the laboratories were reviewed to assess laboratory and field precision, accuracy, completeness, representativeness, and comparability with respect to method compliance and the DQOs of the particular program.

The following sources reviewed and validated data at a minimum of three levels:

1. The analytical laboratory, where data was validated according to the laboratory's QA plan, Standard Operating Procedures (SOPs), and client-specific requirements,

2. A qualified member of Sandia's SMO staff, who reviews the analytical reports and corresponding sample collection and ARCOC documentation for completeness and laboratory contract compliance, and

3. A Sandia project leader, who is responsible for program objectives, regulatory compliance, and project-specific data quality requirements. The project leader makes the final decision regarding the usability of the data.

Additionally, all groundwater monitoring data and a specified percentage of other program data are validated to detailed method-specified requirements and qualified in accordance with the Data Validation Procedure for Chemical and Radiochemical Data (SNL 2007a).

9.0 REFERENCES, PERMITS, REGULATIONS, & STANDARDS FOR ENVIRONMENTAL PROGRAMS

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40 CFR 68 "Chemical Accident Prevention Provisions"

40 CFR 82 "Protection of Stratospheric Ozone"

40 CFR 112 "Oil Pollution Prevention"

40 CFR 122 "EPA Administered Permit Programs: The National Pollutant Discharge Elimination System" (NPDES)

40 CFR 141 "National Primary Drinking Water Regulations"

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40 CFR 265 "Interim Status Standards for Owners and Operators of Hazardoud Waste Treatment, Storage, and Disposal Facilities."

40 CFR 280 "Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks"

40 CFR 302 "Designation, Reportable Quantities, and Notification" (CERCLA Implementing Regulation)

40 CFR 355 "Emergency Planning and Notification"

40 CFR 372 "Toxic Chemical Release Reporting: Community Right-to-Know" (EPCRA Implementing Regulation)

ACTS AND STATUTES

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- Archaeological Resources Protection Act (ARPA) of 1979 (16 U.S.C. §470aa)
- Atomic Energy Act (AEA) of 1954 (42 U.S.C. §2011 et seq.)
- Clean Air Act (CAA) and CAA Amendments (CAAA) of 1990 (42 U.S.C. §7401)
- Clean Water Act (CWA) of 1977 (the Federal Water Pollution Control Act) (33 U.S.C. §1251)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. §9601) Amended by the Superfund Amendments and Reauthorization Act (SARA)
- Emergency Planning and Community Right to Know Act (EPCRA) of 1986 (42 U.S.C. §11001 et seq.) (Also known as SARA Title III.)
- Endangered Species Act (ESA) (16 U.S.C.§1531 et seq.)
- Federal Facility Compliance Act (FFCA) of 1992 (42 U.S.C. §6961)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. §136)
- Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. §703 et seq.)
- National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. §4321)
- National Historic Preservation Act of 1966, as amended (16 U.S.C. §470 et seq.)
- Pollution Prevention Act of 1990 (42 U.S.C. §13101 et seq.)
- Quiet Communities Act of 1978 (42 U.S.C. §4901 et seq.)
- Resource Conservation and Recovery Act (RCRA) of 1976 (42 U.S.C. §6901 et seq.)
- Safe Drinking Water Act (SDWA) (42 U.S.C §300f)
- Superfund Amendments and Reauthorization Act (SARA) of 1986 (see CERCLA)
- Toxic Substances Control Act (TSCA) of 1976 (15 U.S.C. §2601 et seq.)

Note: U.S.C. = United States Code

APPLICABLE LOCAL AND STATE LAWS AND REGULATIONS FOR ENVIRONMENTAL PROGRAMS

Water Quality

20.6.2 NMAC, "Ground and Surface Water Protection"
20.6.4 NMAC, "Standards for Interstate and Intrastate Surface Waters"
20.7.10 NMAC, "Drinking Water" Albuquerque/Bernalillo County Water Utility Authority, "Sewer Use and Wastewater Control Ordinance."

Air Quality

20.2.3 NMAC, "New Mexico Ambient Air Quality Standards"
20.11.02 NMAC, "Permit Fees"
20.11.08 NMAC, "New Mexico Ambient Air Quality Standards"
20.11.20 NMAC, "Fugitive Dust Control"
20.11.21 NMAC, "Open Burning"
20.11.100 NMAC, "Motor Vehicle Inspection"

Miscellaneous

NMSA 76-4-1 et seq.,"New Mexico Pesticide Control Act"
21.17.50 NMAC, "Pesticides"

Oil Storage and Spill Containment

Oil Storage Programs

20.5 NMAC, "Petroleum Storage Tanks"

Waste Management

Hazardous Waste Management Program

20.4.1 NMAC, "Hazardous Waste Management"
20 NMAC 4.1, "Hazardous Waste Management"

Solid Waste Program

20.9 NMAC, "Solid Waste Management"

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2008

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
SEWER WASTEWATER					
General	WW001 Station Manhole, south of TA-IV at Tijeras Arroyo	2069 A	7/17/08	2/28/13	ABCWUA
General	WW006 Station Manhole, at Pennsylvania Ave.	2069 F	Submitted to ABCWUA	Pending	ABCWUA
Microelectronics Development Laboratory (MDL)	WW007 Station Manhole, TA-I	2069 G	Submitted to ABCWUA	Pending	ABCWUA
General	WW008 Station Manhole, south of TA-II at Tijeras Arroyo	2069 I	Submitted to ABCWUA	Pending	ABCWUA
General	WW011 Station Manhole, north of TA-III (includes TAs-III and V, and Coyote Test Field sewer lines)	2069 K-5	Submitted to ABCWUA	Pending	ABCWUA
Center for Inteegrated Nano-Technologies (CINT)	CINT	2238A	1/5/07	4/30/11	ABCWUA
SURFACE DISCHARGE					
Pulsed Power Development Facilities (Discharge Plan)	TA-IV, Lagoons I and II	DP-530	9/21/07	9/21/12	NMED
UNDERGROUND STORAGE TANKS (UST)					
UST (20,000 gallons)	TA-I	1368	6/1/08	6/01/09	NMED
UST (20,000 gallons)	TA-I	1369	6/1/08	6/01/09	NMED
ABOVE GROUND STORAGE TANKS (AST)					
AST / 10,000	TA-I	1370	6/1/08	6/01/09	NMED
AST / 10,000	TA-I	1370	6/1/08	6/01/09	NMED
AST / 10,000	TA-I	1370	6/1/08	6/01/09	NMED
AST / 2,000	TA-I	1370	6/1/08	6/01/09	NMED
AST / 5,000	TA-III	1370	6/1/08	6/01/09	NMED
AST / 25,000	CTF	1370	6/1/08	6/01/09	NMED
STORM WATER					
National Pollution Discharge Elimination System (NPDES) "Multi-sector General" Permit	Storm water discharges from Points (MP) 01 through MP 10	NMR05A961	2/01	9/30/05 EPA has extended this Permit	EPA

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2008 (Continued)

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
NPDES CONSTRUCTION PERMITS					
Microsystems and Engineering Science Applications (MESA) Facility	TA-I	NMR15DQ19	03/19/02	7/31/09	EPA
20th Street Stockpile Area	TA-I	NMR15E764	04/29/05	Active until terminated	EPA
Mixed Waste Landfill Cover	TA-III	NMR15EZ15	05/18/06	Active until terminated	EPA
Technical Area III Concrete Recycle/Borrow	TA-III	NMR15F015	5/31/06	Active until terminated	EPA
Technical Area III Cable Debris	TA-III	NMR15G396	8/7/08	Active until terminated	EPA
Building 807	TA-I	NMR15W46	5/29/08	Active until terminated	EPA
Technical Area II Fence Removal	TA-II	NMR15F099	8/17/07	Active until terminated	EPA
DS&A Modular Office Installation	TA-I	NMR15G277	8/7/08	Active until terminated	EPA
Heating Systems Modernization (HSM)	TA-I	NMR15FK02	5/11/07	Active until terminated	EPA
G, H, 11th Street	TA-I	NMR15FV53	1/31/08	12/31/08	EPA
Liquid Natural Gas	TA-III	NMR10G703	10/31/08	Active until terminated	EPA
Thunder Range	Range 6 Site 91 Breaching Site Site 9965	NMR15G365	6/03/08	Active until terminated	EPA
TA II Escarpment	TA-II	NMR10G475	08/12/08	Active until terminated	EPA
18th Street and K Ave Detention Facility	TA-I	NMR10G684	10/31/08	Active until terminated	EPA
Ion Beam Laboratory	TA-I	NMR10G588	10/01/08	Active until terminated	EPA

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2008 (Continued)

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
ECOLOGICAL					
U.S. Fish and Wildlife Service Special Purpose Salvage Permit	Site-Wide Ecological Monitoring	MB040780-0	5/30/01	12/31/05	U.S. Fish and Wildlife Service
U.S. Fish and Wildlife Service Special Purpose Relocate Permit	Site-Wide Ecological Monitoring Activity	MB105852-0	5/26/05	6/30/05	U.S Fish and Wildlife Service
RCRA					
Hazardous Waste Facility Permit Module I - General Permit Conditions Module II - General Facility Conditions Module III - Containers	Hazardous Waste Management Facility (HWMF), TA-II (storage)	NM5890110518-1	8/6/92	08/06/02, modified 2008** (renewal application submitted 2/6/02, draft permit issued 8/20/07)	NMED
Hazardous Waste Facility Permit Module IV - Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units (SWMUs)	Environmental Restoration (ER) Sites	NM5890110518-1	8/26/93	9/20/02, modified 2008** (renewal application submitted 2/6/02, draft permit issued 8/20/07)	EPA/NMED
Hazardous Waste Treatment Facility Permit Module I - General Permit Conditions Module II - General Facility Conditions Module III - Containers	Thermal Treatment Facility (TTF), TA-III (Treatment of explosive waste)	NM5890110518-2	12/4/94	12/4/04, modified 2005 ** (renewal application submitted 2/6/02, draft permit issued 8/20/07)	NMED

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2008 (Continued)

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
RCRA (continued)					
Class III Permit Modification for the Management of Hazardous Remediation Waste in the Corrective Action Management Unit (CAMU), Tech Area III Modification to Part B Operating Permit	CAMU, TA-III	NM5890110518	9/25/97	9/20/02** (renewal application submitted 2/6/02, draft permit issued 8/20/07)	NMED
RCRA Part A Permit Application for Hazardous Waste Management Units for the hazardous component in mixed waste stored and/or treated at ten waste management areas.	RMWMF (storage and treatment); 7 Manzano Bunkers (storage only); Auxiliary Hot Cell Facility (storage and treatment)	NM5890110518	Application for interim status first submitted 8/90; most recent revision 3/22/2007	Under Review (No expiration date), draft permit issued 8/20/07	NMED
RCRA Post-Closure Care Permit for the Chemical Waste Landfill	CWL, TA-III	N/A	N/A	Draft permit issued 5/21/07	NMED
TSCA					
Risk-Based Approval Request under 40 CFR 761.61(c); Risk-Based Method for Management of PCB Materials; Chemical Waste Landfill and Corrective Action Management Unit (CAMU)	Chemical Waste Landfill and CAMU, co-located in TA-III	N/A	6/26/02	CAMU Closure Report submitted 4/19/04. CWL permit continues until closure. CWL closure delayed pending NMED remedy selection process; closure expected late 2007.	EPA, Region 6

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2008 (Continued)

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
OPEN BURN PERMITS*					
Explosive Firing Site—Panel Box Tests	TA-III	08-0003	1/1/2008	12/31/2008	COA
Thermal Treatment Facility	TA-III	07-0120	1/1/2008	12/31/2008	COA
Lurance Burn Site—Large 250-gal Pool Fire	Remote	07-0118	1/1/2008	12/31/2008	COA
Lurance Burn Site—Igloo Building 9830	Remote	07-0119	1/1/2008	12/31/2008	COA
Lurance Burn Site/10K-ft Sled Track—Wood Crib Fire Tests	Remote/TA-III	07-0117	1/1/2008	12/31/2008	COA
Impact Test Facility—Explosive	TA-III	08-0004	1/1/2008	12/31/2008	COA
Impact Test Facility—Propellant	TA-III	08-0005	1/1/2008	12/31/2008	COA
Impact Test Facility—Thermite	TA-III	08-0006	1/1/2008	12/31/2008	COA
9940 (DETS) Site—Explosive Tests	Remote	07-0113	1/1/2008	12/31/2008	COA
Thunder Range—Explosive Tests	Remote	07-0112	1/1/2008	12/31/2008	COA
9920 – Explosive Tests	Remote	08-0007	1/1/2008	12/31/2008	COA
Nuclear and Energy Work Complex – Sodium Metal Tests	TA-III	08-0021	3/24/2008	12/31/2008	COA
Thunder Range – Thermal Cook-Off Test #1	Remote	08-0036	6/23/2008	7/23/2008	COA
9920 – Explosive R&D Tests	Remote	08-0038	6/27/2008	12/31/2008	COA
9930 – Explosive R&D Tests	Remote	08-0037	6/27/2008	12/31/2008	COA
Thunder Range – Thermal Cook-Off Test #2	Remote	08-0044	7/10/2008	8/10/2008	COA
Thunder Range – Thermal Cook-Off Test #3	Remote	08-0045	7/10/2008	8/10/2008	COA
Thunder Range – Thermal Cook-Off Test #4****	Remote	08-0046	7/10/2008	8/10/2008	COA
Thunder Range – Thermal Cook-Off Test #5****	Remote	08-0047	8/1/2008	8/31/2008	COA
Sled Track Complex – Blast-Induced Fragment Characterization Test #1****	TA-III	08-0049	9/1/2008	9/30/2008	COA
Sled Track Complex – Blast-Induced Fragment Characterization Test #2****	TA-III	08-0050	9/1/2008	9/30/2008	COA
Sled Track Complex – Blast-Induced Fragment Characterization Test #3****	TA-III	08-0051	10/1/2008	10/31/2008	COA
LNG Test Site Firebreak	TA-III	08-0059	10/1/2008	10/31/2008	COA
LNG Test Site – 51,000-gal Test****	TA-III	07-0064	5/1/2008	5/31/2008	COA
LNG Test Site – 154,000-gal Test****	TA-III	07-0065	6/1/2008	6/30/2008	COA
LNG Test Site – 310,000-gal Test****	TA-III	07-0066	7/1/2008	7/31/2008	COA
LNG Test Site – 10,000-gal Test****	TA-III	08-0060	10/13/2008	11/13/2008	COA
AIR (Permits & Registrations)					
Document Disintegrator	TA-III	Permit #144-M1	09/28/2006		COA
Fire Laboratory used for the Authentication of Modeling and Experiments (FLAME)	Burn Site	Registration #196	5/19/1988		COA
Neutron Generator Facility (NGF)	TA-I	Permit #374-M1	7/17/1998		COA
Standby diesel generators at Bldg 862	TA-I	Permit #402	5/07/1996		COA
Radioactive and Mixed Waste Management Facility (RMWMF)	TA-III	Permit #415-M1	5/10/1997		COA

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2008 (Continued)

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
AIR (Permits & Registrations) (concluded)					
Title V Operating Permit	Site-Wide	515 (pending)	Submitted 3/1/1996		COA
Emergency Generator at Building 702	TA-I	Permit #924	5/5/1998		COA
Processing and Environmental Technology Laboratory (PETL) Emergency Generator	TA-I	Permit #925-M1	3/5/2001		COA
PETL Boilers and HAP Chemicals	TA-I	Registration #936	5/5/2004		COA
Advanced Manufacturing Prototype Facility (AMPF)	TA-I	Registration #1406	11/6/2000		COA
Microelectronics Development Laboratory (MDL)	TA-I	Permit #1678-M1	12/14/2004		COA
Steam Plant	TA-I	Permit #1705-M1	11/10/2004		COA
Thermal Test Complex	TA-III	Permit #1712	4/9/2004		COA
Center for Integrated Nanotechnology (CINT)	Sandia Science & Technology Park	Permit #1725	10/11/2004		COA
MESA Facility Central Utility Building 858J	TA-I	Permit #1820	9/28/2006		COA
Building 899A Boilers	TA-!	Registration #1823	4/1/2008		COA
South East Tech Area I	TA-I	Permit #1828	9/28/2006		COA
Heating System Modernization Boilers	TA-I	Permit #1830	3/23/2007		COA
Building 878 HAP Chemical Registration	TA-I	Registration #1888	5/28/2008		COA
Strategic Defense Facility, Building 963	TA-4	Permit#1900	1/11/2008		COA
Miscellaneous HAP Registration	Sitewide Permit	Registration #1901	5/28/2008		COA
Building 865 HAP Registration	TA-I	Registration #1902	5/28/2008		COA
Solar Tower HAP Registration	Remote	Registration #1903	5/28/2008		COA
Building 869 HAP Registration	TA-I	Registration #1905	5/28/2008		COA
Advanced Materials Laboratory (AML) HAP Registration	Offsite	Registration #1906	5/28/2008		COA

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2008 (Concluded)

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
FUGITIVE DUST CONTROL AND DEMOLITION PERMIT FILE* (Permits & Registrations)**					
Borrow Site – Cell 1 Programmatic	TA-III	P08-0005	12/10/2007	12/10/2012	COA
Moving Vehicle Test Track Programmatic	TA-III	P08-0004	12/11/2007	12/11/2012	COA
Building 9940 Programmatic	Remote	P08-0006	12/10/2007	12/10/2012	COA
Thunder Range Programmatic	Remote	P06-0004	05/2/2006	5/2/2011	COA
Thunder Range – Range 6 programmatic	Remote	P08-0061	7/18/2008	7/18/2013	COA
Thunder Range – Range 1 Programmatic	Remote	P08-0062	8/7/2008	8/7/2013	COA
Thunder Range – Range 2 Programmatic	Remote	P08-0064	8/7/2008	8/7/2013	COA
Thunder Range – Range 5 Programmatic	Remote	P08-0063	7/2/2008	7/2/2013	COA
TA-I Infrastructure	TA-I	10-344-3663	2/6/2007	12/31/2009	COA
Large Scale LNG Test Site	TA-III	1009-626-3732	5/5/2007	12/31/2009	COA
S. End Long Sled Track	TA-III	10-624-3730	5/14/2007	5/14/2008	COA
HSM Project	TA-I	10-10-3726	5/14/2007	12/31/2009	COA
TA-II Fence Removal	TA-II	10-210-3779	7/26/2007	7/26/2008	COA
TA-II East Escarpment Repair	TA-II	10-626-3817	9/14/2007	9/14/2008	COA
TA-I Utility Improvements	TA-I	10-204-3817	9/19/2007	9/18/2008	COA
Building 956 Parking Lot	TA-II	10-564-3773	7/25/2007	7/24/2008	COA
WIF/MESA Storm Water Ponds	TA-I	10-308-3839	10/18/2007	10/18/2008	COA
Building 893 Demolition	TA-I	10-210-3893	1/15/2008	1/15/2009	COA
Ion Beam Lab Construction	TA-I	10-204-4014	6/30/2008	6/30/2013	COA
Cable Debris Removal	TA-III	10-683-3968	4/30/2008	4/30/2009	COA
Building 857 Renovations	TA-I	1009-264-3978	5/12/2008	5/12/2009	COA
Building 807 Demolition	TA-I	10-204-4013	6/30/2008	6/30/2009	COA
Detention Basin Facility	TA-I	10-2004-4088	11-19/2008	11/19/2009	COA

NOTES: †Registration = Certificate - no permit required
PCB = polychlorinated biphenyl
*Open Burn Permits are issued by the City of Albuquerque
for no more than a year at any one time.
**Sandia submitted a timely application for permit renewal. The expired permit remains in force until the new one is issued.
***Permits are obtained by general contractors directly from City of Albuquerque
COA= City of Albuquerque
TA= technical area
EPA = U.S. Environmental Protection Agency
N/A = not applicable
NMED = New Mexico Environment Department
RCRA = Resource Conservation and Recovery Act
N/A = not applicable
@ =DOE/SSO Permits
****No tests were conducted in association with this Permit in CY2008.

TABLE 9-2. Federal and State Air Regulations Applicable to SNL/NM

CAA Title	CAA Section	Federal Regulation	Local Regulation	Subject
I	176(c)	40 CFR 51 40 CFR 93	20 NMAC 11.0420 NMAC 11.03	Conformity of Federal Actions (State and Federal Plans) General and Transportation
	110	40 CFR 58	N/A	Ambient Air Quality Surveillance
	109	40 CFR 50	20 NMAC 11.08	National Primary and Secondary Ambient Air Quality Standards (NAAQS)
	165-166	40 CFR 52	20 NMAC 11.02	Permit Fees
		40 CFR 52	20 NMAC 11.05	Visible Air Contaminants
		40 CFR 52	20 NMAC 11.06	Emergency Action Plan
		40 CFR 52	20 NMAC 11.07	Variance Procedure
		40 CFR 52	20 NMAC 11.20	Fugitive Dust Control
		40 CFR 52	20 NMAC 11.21	Open Burning
		40 CFR 51–52	20 NMAC 11.40	Source Registration
		40 CFR 51–52	20 NMAC 11.41	Authority-to-Construct
		40 CFR 51.100	20 NMAC 11.43	Stack Height Requirements
		40 CFR 51	20 NMAC 11.44	Emissions Trading
	171-193	40 CFR 51–52	20 NMAC 11.60	Permitting in Nonattainment Areas
	160-169	40 CFR 52	20 NMAC 11.61	Prevention of Significant Deterioration
	165-166	40 CFR 60 40 CFR 63	20 NMAC 11.65	Volatile Organic Compounds (VOC)
		40 CFR 60	20 NMAC 11.66	Process Equipment
		40 CFR 60	20 NMAC 11.22	Wood Burning
		40 CFR 60	20 NMAC 11.63	New Source Performance Standards (NSPS)
		40 CFR 60	20 NMAC 11.67	Equipment, Emissions and Limitations(stationary combustion sources)
		40 CFR 60	20 NMAC 11.68	Incinerators
		40 CFR 60	20 NMAC 11.69	Pathological Waste Destructors
II	202-210213-219211	40 CFR 85-86	20 NMAC 11.100	Motor Vehicle Inspection: Decentralized
			20 NMAC 11.101	Motor Vehicle Inspection: Centralized
		40 CFR 80	20 NMAC 11.102	Oxygenated Fuels
			20 NMAC 11.103	Motor Vehicle Visible Emissions
III	112	40 CFR 61 40 CFR 63	20 NMAC 11.64	National Emission Standards for Hazardous Air Pollutants (NESHAP)Subpart H – Radionuclides Subpart M – Asbestos
IV	401-416	40 CFR 72-78	20 NMAC 11.62	Acid Rain
V	501-507	40 CFR 70-71	20 NMAC 11.42	Operating Permits
VI	601-618	40 CFR 82	20 NMAC 11.23	Stratospheric Ozone Protection
VII	113-114	40 CFR 64	20 NMAC 11.90	Administration, Enforcement, Inspection

NOTES: CAA = Clean Air Act NMAC = New Mexico Administrative Code
CFR = Code of Federal Regulations

TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM

Date	Milestone	Comment
1984	Amendments to Resource Conservation and Recovery Act (RCRA) and Hazardous and Solid Waste Amendments (HSWA) in 1984	MW became an issue after amendments to RCRA and HSWA enforced Land Disposal Restrictions (LDRs), including prohibition on storage of wastes for more than one year.
Aug 1990	RCRA Part A Interim Status Permit Application	Submitted RCRA Part A Interim Status Permit application for MW storage. Later revisions to the interim status permit added proposed MW treatment processes.
Oct 1992	Federal Facilities Compliance Act (FFCA) Passed	The FFCA allows storage of MW over one-year RCRA time limit. Requires U.S. Department of Energy (DOE) to submit a site treatment plan for MW.
Dec 1992	Notice of Noncompliance (NON) Issued	U.S. Environmental Protection Agency (EPA) issued a NON for storage of RCRA-regulated MW over the one-year maximum period.
Oct 1993	Conceptual Site Treatment Plan Submitted	DOE submitted *Conceptual Site Treatment Plan for Mixed Waste* to NMED; other drafts followed.
Mar 1995	Final Site Treatment Plan Submitted	DOE submitted final *Site Treatment Plan for Mixed Waste* to NMED.
Jun 1995	Historical Disposal Requests Validation (HDRV) Project Initiated	The HDRV Project was initiated to characterize and sort legacy MW. Project continued into 1997, when it was replaced with new sorting procedures.
Oct 1995	Federal Facility Compliance Order (FFCO) Signed	The FFCO, an agreement between State, DOE, and Sandia Corporation, details specific actions required with regard to MW management, including the requirement to develop of a Site Treatment Plan (STP), to be updated annually.
March 1996	STP Milestones Met	Updated STP to reflect FY 1995 activities.
Sep 1996	First MW Shipment FFCO Amendment No. 1	First MW shipment made, MW sent to Perma-Fix/DSSI for treatment. FFCO amended.
Dec 1996	Revisions to Proposed Treatment Methods	DOE and Sandia re-submitted Part A and B permit application, to reflect revisions to proposed on-site treatment methods.
May 1997	FFCO Amendment No. 2	FFCO amended.
Dec 1997	On-site MW Treatment	Onsite treatment of MW began at the RMWMF in Bldg. 6920. Additionally, Bldg. 6921 was converted to a laboratory for the treatment of certain types of MW.
1997	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1996 activities and changes to proposed treatment technologies. NMED approved Revision 1 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
1998	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1997 activities and changes to proposed treatment technologies. NMED approved Revision 2 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.

TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM (Continued)

Date	Milestone	Comment
1999	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1998 activities and changes to proposed treatment technologies. NMED approved Revision 3 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
2000	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 1999 activities and changes to proposed treatment technologies. NMED approved Revision 4 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
2001	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2000 activities and changes to proposed treatment technologies. NMED approved Revision 5 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
May 2001	FFCO Amendment No. 3	FFCO amended.
2002	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2001 activities and changes to proposed treatment technologies. NMED approved Revision 6 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
Feb 2002	Revisions to Permit Application	DOE and Sandia submitted updated Part A and B permit application to NMED to reflect revisions to on-site waste management operations. Permit application for mixed waste management units is combined with permit renewal request for hazardous waste management units at SNL/NM.
2003	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2002 activities and changes to proposed treatment technologies. NMED approved Revision 7 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
April 2003 **November 2003**	Revisions to Permit Application	DOE and Sandia revised Part A and Part B permit application in response to NMED comments.
2004	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2003 activities and changes to proposed treatment technologies. NMED approved Revision 8 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
April 2004	FFCO Amendment No. 4	FFCO amended

TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM (Concluded)

Date	Milestone	Comment
November 2004	Revisions to Permit Application	DOE and Sandia revised Part A and Part B permit application in response to NMED comments.
2005	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2004 activities and changes to proposed treatment technologies. NMED approved Revision 9 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
June 2005 **October 2005**	Revisions to Permit Application	DOE and Sandia revised Part A and Part B permit application to reflect changes in waste management operations.
May 2006	Revisions to Permit Application	DOE and Sandia revised Part B permit application to reflect changes in waste management operations.
2006	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2005 activities and changes to proposed treatment technologies. NMED approved Revision 10 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
March 2007	Revisions to Permit Application	DOE and Sandia revised Part A and Part B permit application to reflect changes in waste management operations.
August 2007	Draft Permit Issued	NMED issued draft permit to DOE and Sandia, and made it available for public comment.
2007	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2006 activities and changes to proposed treatment technologies. NMED approved Revision 11 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.
January 2008	Comments on Draft Permit Submitted	DOE and Sandia submit extensive comments on draft permit to NMED and request resolution of comments.
2008	STP Milestones Met	Treated wastes on site and shipped mixed wastes to off-site treatment and disposal facilities, meeting all treatment and disposal milestones. Updated STP to reflect FY 2007 activities and changes to proposed treatment technologies. NMED approved Revision 12 to STP, revising waste volumes and treatment/disposal technologies, and establishing new deadlines.

NOTES: NON = Notification of Non-compliance
RCRA = Resource Conservation and Recovery Act
HSWA = Hazardous and Solid Waste Amendments
FFCA = Federal Facility Compliance Act
NMED = New Mexico Environment Department
DSSI = Diversified Scientific Services, Inc.
FY = fiscal year
DOE = Department of Energy
HDRV = Historical Disposal Requests Validation
STP = Site Treatment Plan
FFCO = Federal Facility Compliance Order
MW = Mixed Waste

TABLE 9-4. Mixed Waste Treatment and Disposal Status (End of FY 2008)

Waste Category	Volume (m^3)	Description	Status and Plans
TG 1	0	Inorganic Debris with Explosive Component	No waste currently in inventory
TG 2	0.01	Inorganic Debris with a Water Reactive Component	Utilizing on-site treatment or shipping to off-site treatment and disposal facilities.
TG 3	0	Reactive Metals	No waste currently in inventory.
TG 4	0	Elemental Lead	No waste currently in inventory.[a]
TG 5	0	Aqueous Liquids (Corrosive)	No waste currently in inventory.
TG 6	0	Elemental Mercury	No waste currently in inventory.
TG 7	0	Organic Liquids I	No waste currently in inventory.
TG 8	0	Organic Debris with Organic Contaminants	No waste currently in inventory.*
TG 9	0.25	Inorganic Debris with TCLP Metals	Utilizing on-site treatment or shipping to off-site treatment and disposal facilities.[a]
TG 10	0.1	Heterogeneous Debris	Sort waste as needed to determine more suitable treatability groups.
TG 11	0	Organic Liquids II	No waste currently in inventory.
TG 12	0.4	Organic Debris with TCLP Metals	Utilizing off-site treatment and disposal options.[a]
TG 13	0	Oxidizers	No waste currently in inventory.
TG 14	0	Aqueous Liquids with Organic Contaminants	No waste currently in inventory.
TG 15	0.35	Soils <50 percent Debris & Particulates with TCLP Metals	Utilizing on-site treatment and off-site treatment and disposal options.[a]
TG 16	0	Cyanide Waste	No waste currently in inventory.
TG 17	0	Liquid/Solid with Organic and/or Metal Contaminants	No waste currently in inventory.*
TG 18	0	Particulates with Organic Contaminants	No waste currently in inventory.
TG 19	0	Liquids with Metals	No waste currently in inventory.
TG 20	0	Propellant with TCLP Metals	No waste currently in inventory.*
TG 21	0	Sealed Sources with TCLP Metals	No waste currently in inventory.*
TG 22	0	Reserved	Not Applicable
TG 23	0	Thermal Batteries	No waste currently in inventory.
TG 24	0.03	Spark Gap Tubes with TCLP Metals	Utilizing on-site treatment and off-site disposal options.[a]
TG 25	23.0	Classified Items with TCLP Metals	Utilizing on-site treatment and off-site treatment options, and investigating off-site disposal options.
TG 26	0	Debris Items with Reactive Compounds & TCLP Metals	No waste currently in inventory.
TG 27	0	High Mercury Solids & Liquids	No waste currently in inventory
TRU/MW	1.33	TRU/MW	Investigating off-site treatment and disposal options.

NOTES: [a] Treatment and/or disposal at one or more permitted off-site mixed waste management facilities.
Treatments are detailed in the *Site Treatment Plan for Mixed Waste, Sandia National Laboratories, New Mexico* (SNL 2007d) and the *Site Treatment Plan for MW, FY07 Update* (SNL 2007c).
TCLP = toxicity characteristic leaching procedure m^3 = cubic meters
TRU/MW = transuranic/mixed waste

RADIOLOGICAL DOSE

Radiation Protection

The U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) has established radiation protection standards for the public to control and limit radiation doses resulting from activities at DOE facilities. Sandia National Laboratories, New Mexico (SNL/NM) is the DOE facility specific to this discussion. Public areas are defined as any location that is accessible to non-DOE facility employees (e.g., excluding Sandia Corporation employees and contractors), such as Kirtland Air Force Base (KAFB) personnel and the surrounding community. Radiation protection standards are provided in DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1993). Environmental monitoring requirements for DOE operations are given in DOE Order 450.1, *Environmental Protection Program* (DOE 2008). In addition to these quantitative standards, the overriding DOE policy is that exposures to the public shall be maintained "as low as reasonably achievable" (ALARA).

DOE Order 5400.5 limits the total annual effective dose equivalent (EDE) of all potential exposure pathways to the public (including air, water, and the food chain) to 100 millirem per year (mrem/yr). The Order lists the Derived Concentration Guides (DCGs) for radionuclides in water and air that could be continuously consumed or inhaled (365 days/year). This is a conservative approach that assumes that a member of the public resides at the location continuously. Table 9-5 lists the DCGs pertinent to activities at SNL/NM and to this report.

TABLE 9-5. Derived Concentration Guides (DCGs) for Selected Radionuclides*

	Ingested Water		Inhaled Air†	
Radionuclide	**DCG (µCi/ml)**	**f_1 Value****	**DCG (µCi/ml)**	**Solubility Class**
Tritium (water)	2×10^{-3}	--	1×10^{-7}	W
Cesium-137	3×10^{-6}	1	4×10^{-10}	D
Uranium, total (U_{tot})	6×10^{-6}	--	1×10^{-13}	Y

NOTES: μCi/ml = microcuries per milliliter
*From Figure III-1, DOE Order 5400.5, Change 2, January 7, 1993 (DOE 1993).
DCG for tritium in air is adjusted for skin absorption.
** F_1 value is the gastrointestinal absorption factor
Listed DCG's for U_{tot} are based on U_{nat} listing in 5400.5 (DOE 1993).

- *Water Pathways* - DOE drinking water guidelines are based on an annual EDE not to exceed 4 mrem/yr. Guideline values for drinking water are calculated at 4 percent of ingested water using DCG values for specific nuclides.

- *Air Pathways* - DOE facilities are required to comply with U.S. Environmental Protection Agency (EPA) standards for radiation protection as given in National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart H, specific to radionuclides emitted from DOE facilities (with the exception of radon). This rule mandates that air emissions from DOE facilities shall not cause any individual of the public to receive an EDE of greater than 10 mrem/yr from air pathways. Table 9-6 summarizes the public radiation protection standards that are applicable to DOE facilities.

WATER QUALITY MONITORING PARAMETERS

Resource Conservation and Recovery Act (RCRA)

Table 9-7 lists the 40 CFR 265, Subpart F, parameters required for groundwater monitoring analysis, implemented under RCRA. Table 9-8 gives the EPA interim primary drinking water standards (40 CFR 265, Appendix III) for the groundwater monitoring parameters. Table 9-9 gives EPA secondary drinking water standards. At SNL/NM, this regulation applies to Environmental Restoration (ER) sites. Table 9-10 gives New Mexico Water Quality Control Commission (NMWQCC) Standards for groundwater.

TABLE 9-6. General Dose Limits to the Public from DOE Facilities

Pathway	Effective Dose Equivalent (EDE) Limit	Comments
All Pathways*	100 mrem/yr 1 mSv/yr	The EDE for any member of the public from all routine DOE operations (normal planned activities including remedial actions). Radiation dose occurring from natural background and medical exposures are not included in the total allowed dose from all pathways.
Air Pathway **	10 mrem/yr 0.10 mSv/yr	Sandia calculates doses resulting from all potential air depositions and direct inhalation (e.g., emissions, ground shine, food crops)

NOTES: *DOE Order 5400.5, Chapters I and II (DOE 1993)
**40 CFR 61, Subpart H for radionuclides, National Emission Standards for Hazardous Air Pollutants (NESHAP).
mrem/yr = millirem per year
mSv/yr = millisievert per year
DOE = Department of Energy

TABLE 9-7. Groundwater Monitoring Parameters Required by 40 CFR 265, Subpart F*

Contamination Indicator	Groundwater Quality	Appendix III† Drinking Water Supply
pH	Chloride	Arsenic
Specific Conductivity	Iron	Barium
Total Organic Halogen (TOX)	Manganese	Cadmium
Total Organic Carbon (TOC)	Phenol	Chromium
	Sodium	Fluoride
	Sulfate	Lead
		Mercury
		Nitrate (as N)
		Selenium
		Silver
		Endrin
		Lindane
		Methoxychlor
		Toxaphene
		2,4-D
		2,4,5-TP Silvex
		Radium
		Gross Alpha
		Gross Beta
		Coliform Bacteria
		Turbidity

NOTES: *Resource Conservation and Recovery Act (RCRA)
†40 CFR 265, Appendix III.
pH = potential of hydrogen (acidity)

TABLE 9-8. EPA Primary Drinking Water Supply Standards/New Mexico Drinking Water Standards

Inorganic Chemicals	MCL	Units
Antimony	0.006	mg/L
Arsenic	0.010	mg/L
Asbestos	7	MFL
Barium	2.0	mg/L
Beryllium	0.004	mg/L
Cadmium	0.005	mg/L
Chromium	0.1	mg/L
Copper	1.3*	mg/L
Cyanide (free cyanide)	0.2	mg/L
Fluoride	4.0	mg/L
Lead	0.015	mg/L
Mercury (inorganic)	0.002	mg/L
Nickel (New Mexico only)	0.2	mg/L
Nitrate (measured as N)	10	mg/L
Nitrite (measured as N)	1	mg/L
Selenium	0.05	mg/L
Thallium	0.002	mg/L
Organic Chemicals	**MCL**	**Units**
Alachlor	0.002	mg/L
Atrazine	0.003	mg/L
Benzene	0.005	mg/L
Benzo(a)pyrene	0.0002	mg/L
Carbofuran	0.04	mg/L
Carbon tetrachloride	0.005	mg/L
Chlordane	0.002	mg/L
Chlorobenzene	0.1	mg/L
2,4-D	0.07	mg/L
Dalapon	0.2	mg/L
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	mg/L
o-Dichlorobenzene	0.6	mg/L
p-Dichlorobenzene	0.075	mg/L
1,2-Dichloroethane	0.005	mg/L
1,1-Dichloroethylene	0.007	mg/L
cis-1,2-Dichloroethylene	0.07	mg/L
trans-1,2-Dichloroethylene	0.1	mg/L
Dichloromethane	0.005	mg/L
1,2-Dichloropropane	0.005	mg/L
Di(2-ethylhexyl)adipate	0.4	mg/L
Di(2ethylhexyl)phthalate	0.006	mg/L
Dinoseb	0.007	mg/L
Dioxin (2,3,7,8-TCDD)	0.00000003	mg/L
Diquat	0.02	mg/L
Endothall	0.1	mg/L
Endrin	0.002	mg/L
Ethylbenzene	0.7	mg/L

TABLE 9-8. EPA Primary Drinking Water Supply Standards/New Mexico Drinking Water Standards (concluded)

Organic Chemicals (continued)	MCL	Units
Ethylene Dibromide	0.00005	mg/L
Glyphosate	0.7	mg/L
Heptachlor	0.0004	mg/L
Heptachlor epoxide	0.0002	mg/L
Hexachlorobenzene	0.001	mg/L
Hexachlorocyclopentadiene	0.05	mg/L
Lindane	0.0002	mg/L
Methoxychlor	0.04	mg/L
Oxamyl (Vydate)	0.2	mg/L
Polychlorinated biphenyls (PCBs)	0.0005	mg/L
Pentachlorophenol	0.001	mg/L
Picloram	0.5	mg/L
Simazine	0.004	mg/L
Styrene	0.1	mg/L
Tetrachloroethylene	0.005	mg/L
Toluene	1	mg/L
Total Trihalomethanes (TTHMs)	0.1	mg/L
Toxaphene	0.003	mg/L
2,4,5-TP (Silvex)	0.05	mg/L
1,2,4-Trichlorobenzene	0.07	mg/L
1,1,1-Trichloroethane	0.2	mg/L
1,1,2-Trichloroethane	0.005	mg/L
Trichloroethylene	0.005	mg/L
Vinyl chloride	0.002	mg/L
Xylenes (total)	10	mg/L
Radionuclides	**MCL**	**Units**
Beta particles and photon emitters	4	mrem/yr
Gross alpha particle activity	15	pCi/L
Radium 226 and Radium 228 (combined)	5	pCi/L
Uranium	0.030	mg/L

NOTES: EPA = Enviromental Protection Agency
*action level concentrations which trigger systems into taking treatment steps if 10 percent of tap water samples exceed the value
**New Mexico Drinking Water Standard only, EPA removed nickel in 1995
MCL = Maximum Contaminant Level
mg/L = milligram per liter
ml = milliliter
MFL= Micro-fibers per liter
mrem/yr = millirem per year
pCi/L = picocurie per liter

TABLE 9-9. EPA Secondary Drinking Water Supply Standards

Contaminant	Level
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 color units
Copper	1.0 mg/L
Corrosivity	Non-corrosive
Fluoride	2.0 mg/L
Foaming agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.1 mg/L
Sulfate	250 mg/L
Total dissolved solids (TDS)	500 mg/L
Zinc	5 mg/L

NOTES: EPA = Environmental Protection Agency
mg/L = milligram per liter
pH = potential of hydrogen (acidity)

TABLE 9-10. New Mexico Water Quality Control Commission (NMWQCC) Standards for Groundwater of 10,000 mg/L total dissolved solid (TDS) Concentration or Less

Contaminant	NMWQCC Standard	Units
A. Human Health Standards		
Arsenic	0.1	mg/L
Barium	1.0	mg/L
Cadmium	0.01	mg/L
Chromium	0.05	mg/L
Cyanide	0.2	mg/L
Fluoride	1.6	mg/L
Lead	0.05	mg/L
Total Mercury	0.002	mg/L
Nitrate (as N)	10.0	mg/L
Selenium	0.05	mg/L
Silver	0.05	mg/L
Uranium	5.0	mg/L
Radioactivity: Radium-226 & Radium 228	30.0	pCi/L
Benzene	0.01	mg/L
Polychlorinated biphenyls (PCB's)	0.001	mg/L
Toluene	0.75	mg/L
Carbon Tetrachloride	0.01	mg/L
1,2-dichloroethane (EDC)	0.01	mg/L
1,1-dichloroethylene (1,1-DCE)	0.005	mg/L
1,1,2,2-tetrachloroethylene (PCE)	0.02	mg/L
1,1,2- trichloroethylene (TCE)	0.1	mg/L
Ethylbenzene	0.75	mg/L
Total Xylene	0.62	mg/L
Methylene Chloride	0.1	mg/L
Chloroform	0.1	mg/L
1,1 –dichloroethane	0.025	mg/L
Ethylene dibromide (EDB)	0.0001	mg/L
1,1,1 –trichloroethane	0.06	mg/L
1,1,2 –trichloroethane	0.01	mg/L
1,2,2,2 –tetrachloroethane	0.01	mg/L
Vinyl Chloride	0.001	mg/L
PAHs: total naphtalene + monomethylnapthalenes	0.03	mg/L
Benzo(a)pyrene	0.0007	mg/L

TABLE 9-10. New Mexico Water Quality Control Commission (NMWQCC) Standards for Groundwater of 10,000 mg/L total dissolved solid (TDS) Concentration or Less (Concluded)

Contaminant	NMWQCC Standard	Units
B. Other Standards for Domestic Water Supply		
Chloride	250.0	mg/L
Copper	1.0	mg/L
Iron	1.0	mg/L
Manganese	0.2	mg/L
Phenols	0.005	mg/L
Sulfate	600.0	mg/L
Total Disolved Solids	1000.0	mg/L
Zinc	10.0	mg/L
pH	Between 6 and 9	
C. Standards for Irrigation Use – Groundwater shall meet the standards of Subsection A,B, and C unless other wise provided		
Aluminum	5.0	mg/L
Boron	0.75	mg/L
Cobalt	0.05	mg/L
Molybdenum	1.0	mg/L
Nickel	0.2	mg/L

NOTES: mg/L = milligram per liter
MAC = maximum allowable concentration
pCi/L = picocurie per liter
pH = potential of hydrogen (acidity)

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10.0 Glossary

A

Abatement – Reducing the degree or intensity of, or eliminating, pollution.

Absorbent material – a material having capacity or tendency to absorb another substance.

Absorption – The uptake of water, other fluids, or dissolved chemicals by a cell or an organism (as tree roots absorb dissolved nutrients in soil.)

Alluvial – Relating to and/or sand deposited by flowing water.

Ambient air – Any unconfined portion of the atmosphere: open air, surrounding air.

Analyte – A substance or chemical constituent that is undergoing analysis.

Antimony – A metallic element having four allotropic forms, the most common of which is a hard, extremely brittle, lustrous, silver-white, crystalline material. It is used in a wide variety of alloys, especially with lead in battery plates, and in the manufacture of flame-proofing compounds, paint, semiconductor devices, and ceramic products. Any of the above examples that have an investigative or research use are not waste until the owner determines that there is no further legitimate need or use for them.

Appraisal – A documented activity performed according to written procedures and specified criteria to evaluate the compliance and conformance of an organization with programs, standards, and other requirements contained in orders, laws, and regulations, or other requirements invoked by SNL.

Aquifer – An underground geological formation, or group of formations, containing water. A source of groundwater for wells and springs.

Arroyo – A deep gully cut by an intermittent stream; a dry gulch.

Asbestos – A mineral fiber that can pollute air or water and cause cancer or asbestosis when inhaled. Uses for asbestos-containing material include, but are not limited to, electrical and heat insulation, paint filler, reinforcing agents in rubber and plastics (e.g., tile mastic), and cement reinforcement.

Attenuation – The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and/or transformation. Can also be the decrease with distance of sight caused by attenuation of light by particulate pollution.

Audit – 1. An examination of records or financial accounts to check their accuracy. 2. An adjustment or correction of accounts. 3. An examined and verified account.

B

Background radiation – Relatively constant low-level radiation from environmental sources such as building materials, cosmic rays, and ingested radionuclides in the body.

Basin – 1. A low-lying area, wholly or largely surrounded by higher land, that varies from a small, nearly enclosed valley to an extensive, mountain-rimmed depression. 2. An entire area drained by a given stream and its tributaries. 3. An area in which the rock strata are inclined downward from all sides toward the center. 4. An area in which sediments accumulate.

Best Management Practice (BMP) – The preferred methods and practices for managing operations.

Biological niche – A role played by a species in the environment.

Biota – The animal and plant life of a given region.

Borehole – A hole created or enlarged by a drill or auger. Also known as drill hole.

C

Catchment basin – The geographical area draining into a river or reservoir.

Cesium-137 – A radioactive isotope of cesium used in radiation therapy and found in atmospheric fallout.

Commercial solid waste –Includes all types of solid waste generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential, household and industrial wastes. At SNL, such waste includes office trash, packaging material, empty containers, cardboard, newspaper, broken glass, and food debris.

Coniferous forest – A type of forest characterized by cone-bearing, needle-leaved trees.

Containment – An enclosed space or facility to contain and prevent the escape of hazardous material.

Containment cell – An engineered structure designed to contain and prevent the migration of hazardous waste.

Contamination – Introduction into water, air, and soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use. Also applies to surfaces of objects, buildings, and various household and agricultural use products.

Corporate Work Process (CWP) – A five-element process for managing and performing work that applies to all activities, facilities, organizations, and employees.

Corrective action – 1. EPA can require treatment, storage and disposal (TSDF) facilities handling hazardous waste to undertake corrective actions to clean up spills resulting from failure to follow hazardous waste management procedures or other mistakes. The process includes cleanup procedures designed to guide TSDFs toward in spills. 2. An action identified to correct a finding that, when completed, fixes the problem or prevents recurrence.

CSU-enabled Energy Star Operations - means the equipment (monitors) go into "sleep" (low energy) mode when inactive for a set period of time.

D

Data Quality Objectives (DQO) – Following a strategic, systematic process for planning scientific data collection efforts.

Decontamination – Removal of harmful substances such as noxious chemicals, harmful bacteria or other organisms, or radioactive material from exposed individuals, rooms and furnishings in buildings, or the exterior environment.

Demolition – The act or process of wrecking or destroying, especially destruction by explosives.

Discharge – Any liquid or solid that flows or is placed on or onto any land or into any water. This includes precipitation discharges to the storm drains, accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of any material or substance on or into any land or water.

Discharge limits – The maximum concentration of a specified pollutant allowed to be discharged in a volume of water or wastewater.

Discharge point – The site or location of a release, flow or runoff of any waste governed by regulation.

Diurnal – 1. Relating to or occurring in a 24-hour period; daily. 2. Occurring or active during the daytime rather than at night: diurnal animals.

Dosimeter – A device used to measure the dose of ionizing radiation received by an individual.

Drawdown – 1. The drop in the water table or level of water in the ground when water is being pumped from a well. 2. The amount of water used from a tank or reservoir. 3. The drop in the water level of a tank or reservoir.

E

Ecology – The relationship of living things to one another and their environment, or the study of such relationships.

Ecosystem – The interacting system of a biological community and its non-living environmental surroundings.

Effective Dose Equivalent (EDE) – The weighted average of dose equivalents in certain organs or tissues of the body; this can be used to estimate the health-effects risk of the exposed individual.

Effluent – Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

Electronic Product Environmental Assessment Tool (EPEAT) - Is a set of criteria in eight different electronic to determine the environmental attributes of a particular electronic office product. At this point, EPEAT is only targeting computer desktops/ towers, notebook computers (laptops) and monitors.

Electroplating – To coat or cover with a thin layer of metal by electrodeposition.

Energy Star Operations - means the equipment (monitors) go into "sleep" (low energy) mode when inactive for a set period of time. (CSU enabled)

Environment – The sum of all external conditions affecting the life, development and survival of an organism.

Environment, Safety and Health (ES&H) – A program designed to protect and preserve the environment and to ensure the safety and health of its employees, contractors, visitors, and the public.

Environmental Assessment (EA) – An environmental analysis prepared pursuant to the National Environmental Policy Act (NEPA) to determine whether a federal action would significantly affect the environment and thus require a more detailed environmental impact statement.

Environmental Impact Statement (EIS) – A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions.

Environmental Management – A program designed to maintain compliance with EPA, state, local and DOE requirements.

Environmental Management System (EMS) – A continuing cycle of planning, evaluating, implementing, and improving processes and actions undertaken to achieve environmental goals.

Environmental Monitoring – The collection and analysis of samples or direct measurements of environmental media such as air, water, and soil.

Environmental Restoration (ER) – A project chartered with the assessment and, if necessary, the remediation of inactive waste sites.

Environmental surveillance – A program including surveys of soil and vegetation, water sampling and analysis, in an attempt to identify and quantify long-term effects of pollutants resulting from SNL operations.

Ephemeral stream – A stream channel which carries water only during and immediately after periods of rainfall or snowmelt.

ER site – Any location listed on the environmental restoration ER site list that has been identified as an area that is (or may be) contaminated-either on or beneath the land surface-as a result of SNL operations. Contaminants may be chemicals, radioactive material, or both.

Exceedance – Violation of the pollutant levels permitted by environmental protection standards.

Explosive waste – Any explosive substance, article, or explosive-contaminated item that cannot be used for its intended purpose and does not have a legitimate investigative or research use.

F

Fault – A fracture in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are displaced relative to one another and parallel to the plane of fracture.

Fauna – 1. Animals, especially the animals of a particular region or period, considered as a group. 2. A catalog of the animals of a specific region or period.

Flora – 1. Plants. 2. The plant life characterizing a specific geographic region or environment.

Flow channel – the part of a stream bed that is occupied by water under normal flow conditions

G

Gamma Radiation – very high-energy/high-frequency electromagnetic radiation that is emitted by the nuclei of radioactive substances during decay, or by the interactions of high-energy electrons with matter. They are similar to, but have a shorter wavelength, than X-rays.

Geology – The scientific study of the origin, history, and structure of the earth.

Groundwater – The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supply wells and springs. Because ground water is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks.

H

Hazardous substance – 1. Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive. 2. Any substance designated by EPA to be reported if a designated quantity of the substance is spilled in the waters of the United States or is otherwise released into the environment.

Hazardous waste – Waste that meets any of the following conditions:

Hazardous waste landfill – An excavated or engineered site where hazardous waste is deposited and covered.

Hazardous waste site – Any facility or location at which hazardous waste operations take place.

Herbicides – A chemical pesticide designed to control or destroy plants, weeds, or grasses.

High-Level Radioactive Waste (HLW) – Waste generated in core fuel of a nuclear reactor, found at nuclear reactors or by nuclear fuel reprocessing; is a serious threat to anyone who comes near the waste without shielding.

Hydrology – The science dealing with the properties, distribution, and circulation of water.

I

Illicit discharges – The absolute prohibitions against the release of certain substances.

Implementation Plan (IP) – The plan developed by the Operational Readiness Review (ORR) or Readiness Assessment (RA) team that describes the specifics of approach, schedule, methodology, team members and their qualifications, and reporting requirements of the ORR or RA. The Implementation Plan (IP) is used by the team leader to execute the ORR or RA.

Industrial discharges – The absolute prohibitions against the release of certain substances.

Inertial-confinement fusion – A method of controlled fusion in which the rapid implosion of a fuel pellet, produced by laser, electron, or ion beams, raises the temperature and density of the pellet core to levels at which nuclear fusion can take place before the pellet flies apart.

Infiltration – 1. The penetration of water through the ground surface into sub-surface soil or the penetration of water from the soil into sewer or other pipes through defective joints, connections, or manhole walls. 2. The technique of applying large volumes of waste water to land to penetrate the surface and percolate through the underlying soil.

Inhalation hazard – Risk from materials or chemicals that present a hazard if respired (inhaled) into the lungs.

Insecticides – A pesticide compound specifically used to kill or prevent the growth of insects.

Integrated Laboratories Management System (ILMS) – Framework for all management requirements for Sandia. It represents the complete set of policy, business rules, practices, and information that establishes Sandia's business expectations and intent.

Integrated Safety Management System (ISMS) Systematically integrates safety into management and work practices at all levels so that missions are accomplished while protecting the worker, the public, and the environment.

L

Lagoons – 1. A shallow pond where sunlight, bacterial action, and oxygen work to purify wastewater; also used for storage of wastewater. 2. Shallow body of water, often separated from the sea by coral reefs or sandbars.

Landfill – 1. Sanitary landfills are disposal sites for non-hazardous solid wastes spread in layers, compacted to the smallest practical volume, and covered by material applied at the end of each operating day. 2. Secure chemical landfills are disposal sites for hazardous waste, selected and designed to minimize the chance of release of hazardous substances into the environment.

Leachate – Water that collects contaminants as it trickles through wastes, pesticides or fertilizers. Leaching may occur in farming areas, feedlots, and landfills, and may result in hazardous substances entering surface water, ground water, or soil.

Leached – The process by which soluble constituents are dissolved and filtered through the soil by a percolating fluid.

Legacy contamination – Contamination that remains after facilities, operations, or activities that created it have gone out of existence or ceased, often resulting in an orphan site in need of remediation or institutional control.

Line management – The process of managing workers through individual Integrated Job Structure assignments (i.e., work titles) and contractor positions that support SNL's mission core processes and enabling processes.

Long-Term Environmental Stewardship (LTS)– Activities necessary to maintain long-term protection of human health and the environment from hazards posed by residual radioactivity and chemically hazardous materials.

Low-Level Radioactive Waste (LLW) – Wastes less hazardous than most of those associated with a nuclear reactor; generated by hospitals, research laboratories, and certain industries. The Department of Energy, Nuclear Regulatory Commission, and EPA share responsibilities for managing them.

Low-Temperature Thermal Desorption (LTTD) – A process of removing organic compounds from soil by heating it and causing the organics to volatilize and/or decompose. The volatilized compounds may be further degraded by after burning or catalysis.

M

Maximally Exposed Individual (MEI) – The location of a member of the public which receives or has the potential to receive the maximum radiological dose from air emissions of a National Emissions Standards for Hazardous Air Pollutants (NESHAP) radionuclide source.

Migratory birds – All birds listed within the Migratory Bird Treaty Act, 50 CFR 10.13, or which are a mutation or hybrid of any such species, including any part, nest, or egg.

Mixed Analyte Performance Evaluation Program (MAPEP) – The MAPEP is used by the DOE as a quality assurance tool for environmental analytical services across the DOE Complex. It includes radiological, stable inorganic, and organic constituents (i.e., mixed analytes) in the same single-blind sample for analytical performance evaluation. The samples use various matrices including soils, water, vegetation, and air filters. MAPEP samples are not a mixed waste.

Mixed Low-Level Waste (MLLW) – Waste containing both hazardous and low-level radioactive components.

Mixed waste – Radioactive waste that contains both source material, special nuclear material, or by-product material subject to the Atomic Energy Act of 1954, as amended; and a hazardous component subject to the Resource Conservation and Recovery Act (RCRA), as amended.

Mixed waste generator – Any person or organization generating mixed waste or causing a material to be subject to mixed waste regulations. Generators are responsible for the generation and subsequent management of mixed waste as part of their occupation or position. Generators may include managers, their employees, and contractors.

N

National Emissions Standards for Hazardous Air Pollutants (NESHAP) – Emissions standards set by EPA for an air pollutant not covered by NAAQS that may cause an increase in fatalities or in serious, irreversible, or incapacitating illness. Primary standards are designed to protect human health, secondary standards to protect public welfare (e.g. building facades, visibility, crops, and domestic animals).

National Environmental Policy Act (NEPA) – The basic national charter for protection of the environment. It establishes policy, sets goals, and provides means for carrying out the policy.

National Pollutant Discharge Elimination System (NPDES) – A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation.

Natural resources – Resources (actual and potential) supplied by nature.

Nitrates – A compound containing nitrogen that can exist in the atmosphere or as a dissolved gas in water and which can have harmful effects on humans and animals. Nitrates in water can cause severe illness in infants and domestic animals. A plant nutrient and inorganic fertilizer, nitrate is found in septic systems, animal feed lots, agricultural fertilizers, manure, industrial waste waters, sanitary landfills, and garbage dumps.

Nitrites – 1. An intermediate in the process of nitrification. 2. Nitrous oxide salts used in food preservation.

Nitrogen Dioxide – A poisonous brown gas, NO2, often found in smog and automobile exhaust fumes and synthesized for use as a nitrating agent, a catalyst, and an oxidizing agent.

Non-Methane Hydrocarbon (NMHC) – The sum of all hydrocarbon air pollutants except methane; significant precursors to ozone formation.

Non-radiological contaminants – A source of contamination that has no radiological components.

Nuclear energy – The energy released by a nuclear reaction.

Nuclear particle acceleration – Imparting large kinetic energy to electrically charged sub-atomic nuclear particles (e.g., protons, deuterons, electrons) by applying electrical potential differences for the purpose of physics experiments.

O

Outfalls – The place where effluent is discharged into receiving waters.

Overland surface flow – A land application technique that cleanses waste water by allowing it to flow over a sloped surface. As the water flows over the surface, contaminants are absorbed and the water is collected at the bottom of the slope for reuse.

Ozone – A colorless gas (O3) soluble in alkalis and cold water; a strong oxidizing agent; can be produced by electric discharge in oxygen or by the action of ultraviolet radiation on oxygen in the stratosphere (where it acts as a screen for ultraviolet radiation).

P

Passive soil vapor – Used in the context of soil gas sampling by placing a porous material into contact with the soil. Gases present in the soil will adsorb to the material. The porous material is removed from the soil after a sufficient time of exposure and sent to a laboratory for analysis of the adsorbed gases.

Perched groundwater – Groundwater that is unconfined and separated from an underlying main body of groundwater by an unsaturated zone (also known as perched water).

Perennial spring – A spring that flows continuously, as opposed to an intermittent spring or periodic spring.

Physiography – The study of the natural features of the earth's surface, especially in its current aspects, including land formation, climate, currents, and distribution of flora and fauna (also called physical geography).

Piezometer – An instrument for measuring pressure, especially high pressure.

PM10 – Particulate matter (diameter equal to or less than 10 microns).

PM2.5 – Respirable particulate matter (diameter equal to or less than 2.5 microns)

Point source – A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack.

Point source discharges – Any discernible, confined, and discrete conveyance from which pollutants are or may be discharged.

Pollutant – Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Pollutant, water – Defined by the Environmental Protection Agency (EPA) as any physical, chemical, biological, or radiological substance that has an adverse affect on water.

Pollution Prevention (P2) – The use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and waste into land, water, and air. For DOE, this includes recycling.

Polychlorinated biphenyls – "PCB" and "PCBs" are chemical terms limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances that contains such substance. Because of their persistence, toxicity, and ecological damage via water pollution, their manufacture was discontinued in the U.S. in 1976.

Potable Water – Water free from impurities present in quantities sufficient to cause disease or harmful physiological effects.

Practical Quantitation Limit (PQL) – The lowest level of analytical determination that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

Pulsed power – Technology is used to generate and apply energetic beams and high-power energy pulses.

Q

Quality Assurance (QA) – A system of procedures, checks, audits, and corrective actions to ensure that all EPA research design and performance, environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

Quality Control (QC) – Used in determining analytical accuracy, precision, and contamination when samples are collected , and to assess the quality and usability of the data.

R

Radiation-generating device (RGD) – Collective term for devices which produce ionizing radiation, sealed sources which emit ionizing radiation, small particle accelerators used for single-purpose applications which produce ionizing radiation (e.g., radiography), and electron-generating devices that produce x-rays incidentally.

Radioactive waste – Any waste that emits energy as rays, waves, streams or energetic particles. Radioactive materials are often mixed with hazardous waste, from nuclear reactors, research institutions, or hospitals.

Radiological Contaminants – Radioactive material deposited in any place where it is not desired, particularly where its presence may be harmful.

Radionuclide – Radioactive particle, man-made (anthropogenic) or natural, with a distinct atomic weight number. Can have a long life as soil or water pollutant.

Radon – A colorless naturally occurring, radioactive, inert gas formed by radioactive decay of radium atoms in soil or rocks.

Reportable quantity (RQ) – Quantity of material or product compound or contaminant which when released to the environment is reportable to a regulatory agency.

Rodenticides – A chemical or agent used to destroy rats or other rodent pests, or to prevent them from damaging food, crops, etc.

S

Sample Management Office (SMO) – An SNL office that manages environmental analytical laboratory contracts and assists with the processing and tracking of samples undergoing chemical and radiochemical analyses performed at these laboratories.

Sampling and Analysis Plan (SAP) – A plan containing various criteria required for conducting sampling activities.

Sanitary discharges – The portion of liquid effluent exclusive of industrial wastewater and storm water. The liquid discharges from rest rooms and food preparation activities.

Screened intervals – The section of water well piping below ground that is perforated or in some manner made porous to allow water to enter the interior of the casing and prohibit the entry of sand and rocks.

Seasonal recharge – Recharge of groundwater during and after a wet season, with a rise in the level of the water table.

Secondary containment – Any structure or device that has been installed to prevent leaks, spills, or other discharges of stored chemicals, waste, oil, or fuel from storage, transfer, or end-use equipment from being released to the environment. Examples of secondary containment include pans, basins, sumps, dikes, berms, or curbs.

Semi-confined aquifer – An aquifer partially confined by soil layers of low permeability through which recharge and discharge can still occur.

Semi-volatile organic compounds – Organic compounds that volatilize slowly at standard temperature (20 degrees C and 1 atm pressure).

Site-Wide Environmental Impact Statement (SWEIS) – A detailed public document, for which a federal agency is responsible, that provides analysis of the expected impacts on the human environment of a proposed action and alternatives to the proposed action.

Solid waste – Any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities.

Statement Of Work (SOW) – A comprehensive description of the goods, services, or combination of goods and services for which SNL contracts.

Storm water – Water runoff from rainfall or snowmelt, including that discharged to the sanitary sewer system.

Sulfur Dioxide – A colorless, extremely irritating gas or liquid, SO2, used in many industrial processes, especially the manufacture of sulfuric acid.

Surface discharge – Spilling, leaking, pumping, pouring, emitting, emptying, or dumping into water or in a location and manner where there is a reasonable probability that the discharged substance will reach surface or subsurface water.

T

Thermoluminescent Dosimeters – A device that monitors both the whole body and skin radiation dose to which a person has been exposed during the course of work. These same devices can also be used to measure environmental exposure rates.

Threatened and endangered species – A species present in such small numbers that it is at risk of extinction.

Time-weighted composites – A sample consisting of several portions of the user's discharge collected during a 24-hour period in which each portion of the sample is collected with a specific time frame that is irrespective of flow.

Topography – The physical features of a surface area including relative elevations and the position of natural and man-made (anthropogenic) features.

Toxic (chemicals) – Any chemical listed in EPA rules as "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986."

Transuranic waste (TRU) – Radioactive waste containing alpha-emitting radionuclides having an atomic number greater than 92, and a half-life greater than 20 years, in concentrations greater than 100 nCi/g.

Trihalomethanes – A chemical compound containing three halogen atoms substituted for the three hydrogen atoms normally present in a methane molecule. It can occur in chlorinated water as a result of reaction between organic materials in the water and chlorine added as a disinfectant.

Tritium – A radioactive hydrogen isotope with atomic mass 3 and half-life 12.5 years, prepared artificially for use as a tracer and as a constituent of hydrogen bombs.

Turbidity – 1. Haziness in air caused by the presence of particles and pollutants. 2. A cloudy condition in water due to suspended silt or organic matter.

U

Unconsolidated basin sediment – 1. A sediment that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth. 2. Soil material that is in a loosely aggregated form.

Underground Storage Tank (UST) – A single tank or a combination of tanks, including underground pipes connected thereto, which are used to contain an accumulation of regulated substances, such as petroleum products, mineral oil, and chemicals, and the volume of which, including the volume of underground pipes connected thereto, is 10% or more beneath the surface of the ground.

Up-gradient – In the direction of higher water levels.

Upstream – In, at, or toward the source of a stream.

Uranium – A heavy silvery-white metallic element, radioactive and toxic, easily oxidized, and having 14 known isotopes of which U 238 is the most abundant in nature. The element occurs in several minerals, including uraninite and carnotite, from which it is extracted and processed for use in research, nuclear fuels, and nuclear weapons.

USFS (U.S. Forest Service) Withdrawn Area – A portion of Kirtland Air Force Base consisting of land within the Cibola National Forest, which has been withdrawn from public access for use by the US Air Force and the US Department of Energy.

V

Vadose zone – The zone between land surface and the water table within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. Soil pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone.

Vanadium – A bright white, soft, ductile metallic element found in several minerals, notably vanadinite and carnotite, having good structural strength and used in rust-resistant high-speed tools, as a carbon stabilizer in some steels, as a titanium-steel bonding agent, and as a catalyst.

Volatile Organic Compound (VOC) – Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity.

W

Waste characterization – Identification of chemical and microbiological constituents of a waste material.

Waste management – The processes involved in dealing with the waste of humans and organisms, including minimization, handling, processing, storage, recycling, transport, and final disposal.

Wastewater – The spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter.

Water Pollution - The presence in water of enough harmful or objectionable material to damage the water's quality.

Water table – The level of groundwater.

Water-bearing strata – Ground layers below the standing water level.

Watershed – The land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point.

Wetland – An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.

Wind rose – A wind rose is a graphical presentation of wind speed and direction frequency distribution.

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