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Calendar Year 2003

Annual Site Environmental Report for Sandia National Laboratories, New Mexico

Katrina Wagner, Susan Koss, Stephanie Salinas, Rebecca Sanchez, and Lucie Mayeux

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-AC04-94AL85000.

Sandia National Laboratories

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Calendar Year 2003
Annual Site
Environmental Report

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ABSTRACT

Sandia National Laboratories, New Mexico (SNL/NM) is a government-owned, contractor-operated facility owned by the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) and managed by the Sandia Site Office (SSO), Albuquerque, New Mexico. Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, operates SNL/NM. This annual report summarizes data and the compliance status of Sandia Corporation's environmental protection and monitoring programs through December 31, 2003. 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 the National Environmental Policy Act (NEPA). Environmental monitoring and surveillance programs are required by DOE Order 450.1, *Environmental Protection Program* (DOE 2003a) and DOE Order 231.1 Chg.2, *Environment, Safety, and Health Reporting* (DOE 1996).

Calendar Year 2003 Annual Site Environmental Report
Sandia National Laboratories, Albuquerque, New Mexico
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NOTE TO THE READER

The goals for the Annual Site Environmental Report are to present summary environmental data regarding environmental performance, compliance with environmental standards and requirements, and to highlight significant facility programs. 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 you are interested in reading chapter highlights, a one-page summary is provided at the beginning of each chapter. All of the chapter summaries are placed in Chapter 10.

We are striving to improve the quality of the contents as well as include information that is important to you. Please fill out the questionnaire located at the end of this document or provide feedback, comments, or questions to:

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NOTE: Appendices are either located after Chapter 10 or on a CD that is affixed to the back cover of this document.

FIGURES

TABLES

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ACRONYMS AND ABBREVIATIONS

A	ABC/AQCB	Albuquerque-Bernalillo County/Air Quality Control Board
	ACRR	Annular Core Research Reactor
	ACE	Army Corps of Engineers
	AEA	Atomic Energy Act
	AF	Air Force
	AFV	alternative fuel vehicles
	AHCF	Auxiliary Hot Cell Facility
	AIRFA	American Indian Religious Freedom Act
	ALARA	as low as reasonably achievable
	AMP	Analytical Management Program
	AMPF	Advanced Manufacturing Prototype Facility
	AMPL	Advanced Manufacturing Process Laboratory
	ANOVA	Analysis of Variance
	AOC	area of concern
	APPDL	Advanced Pulse Power Development
	AQC	Air Quality Compliance
	AR	annual review
	ARCOC	Analysis Request and Chain-of-Custody
	ARPA	Archaeological Resources Protection Act
	ASER	Annual Site Environmental Report
	AST	above-ground storage tank
	AT&T	American Telephone and Telegraph Company
	AWN	Acid Waste Neutralization
B	BAGI	Backscatter Absorption Gas Imaging
	BMP	Best Management Practice
	BTU	British Thermal Units
	BV	Background Volume
C	CAA	Clean Air Act
	CAAA	Clean Air Act Amendments
	CAMU	Corrective Action Management Unit
	CAN	Clean Air Network
	CAP	Consolidated Audit Program
	CAP88	Clean Air Act Assessment Package-1988
	CCCL	Cleaning and Contamination Control Laboratory
	CEARP	Comprehensive Environmental Assessment and Response Program
	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
	CFR	Code of Federal Regulations
	CINT	Center for Integrated Nanotechnologies
	COA	City of Albuquerque
	CPG	Comprehensive Procurement Guidelines
	CPMS	Criteria Pollutant Monitoring Station
	CPV	Compliance Plan Volume
	CRIO	Community Resources Information Office
	CSRL	Compound Semi-Conductor Research Laboratory
	CSS	Sanitary Sewer Line
	CTF	Coyote Test Field
	CUB	Central Utility Building
	CV	Coefficient of Variation
	CWA	Clean Water Act
	CWL	Chemical Waste Landfill
	CY	Calendar Year

D	D&D	decontamination and demolition
	DCG	derived concentration guide
	DLA	Defense Logistics Agency
	DoD	U.S. Department of Defense
	DOE	U.S. Department of Energy
	DOE/AL	U.S. Department of Energy/ Albuquerque Operations Office
	DQO	data quality objective
	DSS	Drain and Septic Systems
	DSSI	Diversified Scientific Services, Inc.
E	EA	Environmental Assessment
	ECF	Explosive Components Facility
	EDE	effective dose equivalent
	EDP	Experiment Development Plan
	EHS	Extremely Hazardous Substance
	EID	Environmental Information Document
	EIS	Environmental Impact Statement
	EM	Environmental Management
	EMS	Environmental Management System
	EMSL	Environmental Monitoring Systems Laboratory
	EO	Executive Order
	EOC	Emergency Operations Center
	EPA	U.S. Environmental Protection Agency
	EPCRA	Emergency Planning and Community Right-to-Know Act
	EPP	Environmentally Preferable Purchasing
	ER	Environmental Restoration
	ERT	Electrical Resistivity Tomography
	ES&H	Environment, Safety, and Health
	ESA	Endangered Species Act
F	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
	FSID	Facilities and Safety Information Document
	FY	Fiscal Year
G	GEL	General Engineering Laboratories
	GIF	Gamma Irradiation Facility
	GSA	General Services Administration
	GWPP	Groundwater Protection Program
H	HAP	hazardous air pollutant
	HAZWOPER	Hazardous Waste Operations and Emergency Response
	HBWSF	High-Bay Waste Storage Facility
	HCF	Hot Cell Facility
	HCl	hydrochloric acid
	HDRV	Historical Disposal Requests Validation
	HE	high explosives
	HERMES-III	High Energy Radiation Megavolt Electron Source-III
	HLW	high-level radioactive waste
	HQ	head quarters
	HSWA	Hazardous and Solid Waste Amendments
	HVAC	heating and air conditioning
	HWB	Hazardous Waste Bureau
	HWMF	Hazardous Waste Management Facility

I	ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectrum
	IE	De-Ionized Water
	ILMS	Integrated Laboratory Management System
	IM	Information Management
	IR	Infrared
	IRP	Installation Restoration Program
	ISMS	Integrated Safety Management System
	ISS	Interim Status Storage
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
	LECS	Liquid Effluent Control System
	LEED	Leadership in Energy and Environmental Design
	LIWG	Line Implementation Working Group
	LLT	Laboratory Leadership Team
	LLW	low-level waste
	LMC	Lockheed Martin Corporation
	LMF	Large-scale Melt Facility
	LTES	Long-Term Environmental Stewardship
	LTTD	Low-Temperature Thermal Desorption
	LWDS	Liquid Waste Disposal System
M	M&O	Maintenance and Operation
	MAC	maximum allowable concentration
	MAPEP	Mixed Analyte Performance Evaluation Program
	MBTA	Migratory Bird Treaty Act
	MCL	maximum contaminant level
	MDA	minimum detectable activity
	MDL	minimum detection limit
	MDL	Microelectronics Development Laboratory
	MEI	maximally exposed individual
	MESA	Microsystems and Engineering Sciences Application
	MLLW	mixed low-level waste
	MOC	Management and Operating Contract
	MP	monitoring point
	MSB	Manzano storage bunkers
	MSDS	Material Safety Data Sheet
	MSL	Melting and Solidification Laboratory
	MVF	Model Validation Facility
	MW	mixed waste
	MWL	Mixed Waste Landfill
N	N/A	not available or not applicable
	NAAQS	National Ambient Air Quality Standards
	NAICS	North American Industry Classification System
	NCP	National Oil and Hazardous Substances Pollution Contingency Plan
	ND	not detected
	NE	Not Established
	NELAP	National Environmental Laboratory Accreditation Program
	NEPA	National Environmental Policy Act
	NESHAP	National Emission Standards for Hazardous Air Pollutants

	New Mexico Tech	New Mexico Institute of Mining and Technology
	NFA	No Further Action
	NGF	Neutron Generator Facility
	NGIF	New Gamma Irradiation
	NGPF	Neutron Generator Production Facility
	NHPA	National Historic Preservation Act
	NMAC	New Mexico Administrative Code
	NMAAQS	New Mexico Ambient Air Quality Standards
	NMED	New Mexico Environment Department
	NMHWA	New Mexico Hazardous Waste Act
	NMSBA	New Mexico Small Business Assistance Program
	NMWQCC	New Mexico Water Quality Control Commission
	NNSA	National Nuclear Security Administration
	NOD	Notice of Deficiency
	NON	Notice of Noncompliance
	NOV	Notice of Violation
	NPDES	National Pollutant Discharge Elimination System
	NPL	National Priorities List
	NPN	nitrate plus nitrite
	NR	non-regulated
	NRC	U.S. National Response Center
	NRC	U.S. Nuclear Regulatory Commission
	NSO	Nevada Site Office
	NSPS	New Source Performance Standards
	NTS	Nevada Test Site
O	OA	Office of Independent Oversight and Performance Assurance
	ODS	Ozone-depleting substance
	ORPS	Occurrence Reporting Processing System
P	P2	Pollution Prevention
	PA/SI	Preliminary Assessment/Site Inspection
	PCB	polychlorinated biphenyl
	PCE	tetrachloroethylene
	PEP	Performance Evaluation Plan
	PER	Performance Evaluation Report
	PETL	Processing and Environmental Technology Laboratory
	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
	PPE	Personnel Protection Equipment
	PPOA	Pollution Prevention Opportunity Assessment
	PQL	Practical quantitation limit
	PSL	Primary Subliner
Q	QA	quality assurance
	QAP	Quality Assurance Program
	QAP(j)P	Quality Assurance Project Plan
	QC	quality control
	QNR	Qualified NEPA Reviewers
	QSAS	Quality Systems Analytical Services
R	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 Area
	RMP	Risk Management Plan
	RMWMF	Radioactive and Mixed Waste Management Facility
	ROD	Record of Decision
	RPSD	Radiation Protection Sample Diagnostics
	RQ	reportable quantity
	RWNMDD	Radioactive Waste/Nuclear Materials Disposition Department
S	SAP	Sampling and Analysis Plan
	SARA	Superfund Amendments and Reauthorization Act
	SC	Significant Categories
	SCA/CUB	Scientific Computing Annex/Central Utility Building
	SCF	Scientific Computing Facility
	SD	sustainable design
	SDWA	Safe Drinking Water Act
	SGWS	shallow groundwater system
	SHPO	State Historic Preservation Officer
	SIC	Standard Industrial Classification
	SME	Subject matter experts
	SMERF	SMoke Emission Reduction Facility
	SMO	Sample Management Office
	SNL/CA	Sandia National Laboratories, California
	SNL/NM	Sandia National Laboratories, New Mexico
	SOW	statement of work
	SPCC	Spill Prevention Control and Countermeasures (plan)
	SPHINX	Short Pulse High Intensity Nanosecond X-Radiator (an accelerator facility)
	SPR	Sandia Pulsed Reactor
	SSL	soil screening level
	SSO	Sandia Site Operations
	SSWM	Storm Drain, Sanitary Sewer, and Domestic Water System Modernization
	ST	stabilization treatment
	STAR	Shock Thermodynamic Applied Research Facility
	START	Sandia Tomography and Radionuclide Transport Laboratory
	STEL	short-term exposure limit
	STP	Site Treatment Plan
	STVZ	Sandia Corporation/New Mexico Tech Vadose Zone
	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
	TCR	Test Capabilities Revitalization
	TESLA	Tera-Electron Volt Energy Superconducting Linear Accelerator
	TLD	thermoluminescent dosimeter
	TLV	threshold limit value
	TNMHC	total non-methane hydrocarbon
	TOC	Total Organic Carbon

	TOMP	Toxic Organic Management Plans
	TOX	total halogenated organics
	TPH	Total extractable petroleum hydrocarbons
	TQ	threshold quantity
	TRI	Toxic Release Inventory
	TRU	transuranic (radioactive waste)
	TSCA	Toxic Substances Control Act
	TSD	treatment, storage, and disposal
	TTF	Thermal Treatment Facility
	TTR	Tonopah Test Range
	TU	Temporary Unit
	TWA	time-weighted average
U	UNM	University of New Mexico
	USAF	U.S. Air Force
	USC	United States Code
	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
	VEP	Vapor Extraction Project
	VOC	volatile organic compound
	VSA	Vertical Sensor Array
	VZMS	Vadose Zone Monitoring System
W	WA	Weapons Assembly
	WIPP	Waste Isolation Pilot Plant
	WQG	Water Quality Group
X	XBGPR	Cross Borehole Ground Penetrative Radar

UNITS OF MEASURE

°C	degree centigrade
cm	centimeter
°F	degrees Fahrenheit
fast	feet above sea level
ft	feet
ft^3	cubic feet
g	gram
gal	gallon
hr	hour
in.	inch
kg	kilogram
km	kilometer
Km^3	cubic kilometer
kW	kilowatt
L	liter
lb	pound
m	meter
mb	millibar
m/s	miles per second
m^3	cubic meter
MFL	Micro-fibers per liter
mg	milligram
mi	mile
mL	milliliter
mph	miles per hour
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
scf	standard cubic feet
sq ft	square feet
sq km	square kilometer
sq mi	square mile
tpy	tons per year
yd^3	cubic yard
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

CHEMICAL ABBREVIATIONS

Ag	Silver	Mn	Manganese
Al	Aluminum	NaCl	sodium chloride
As	Arsenic	Ni	Nickel
Ba	Barium	NO_2	nitrogen dioxide
Be	Beryllium	NO_x	nitrogen oxides
Cd	Cadmium	O_3	ozone
Cr	Chromium	Pb	Lead
Co	Cobalt	Sb	Antimony
Cu	Copper	Se	Selenium
Fe	Iron	SO_2	sulfur dioxide
CO	carbon monoxide	TCA	trichloroethane
Eh	redox	TCE	trichloroethylene
H^3	tritium	Tl	Thallium
Hg	Mercury	U_{tot}	total uranium
${}_1H^1$	hydrogen	V	Vanadium
HCl	hydrochloric acid	Zn	Zinc
K	Potassium	1,1,1,-TCA	1,1,1,-trichloroethane
Mg	Magnesium		

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)	°F = 9/5 °C+ 32	Fahrenheit (°F)
Sievert (Sv)	100	roentgen equivalent man (rem)

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Executive Summary

In this Chapter ...

Summaries of the following Environmental Programs:

Waste Management and Pollution Prevention (P2)
Environmental Restoration (ER) Project
Terrestrial Surveillance
Water Quality
Groundwater Protection
Air Quality
National Environmental Policy Act (NEPA) Activities

Plants at the Albuquerque Botanical Gardens

In 2003, SNL/NM received the following P2 awards:

Green Zia, EPA WasteWise, White House Closing the Circle, and other DOE Awards for P2 Accomplishments.

Sandia Corporation received five "Gold Pretreatment Awards" from the City of Albuquerque for 100 percent compliance.

Sandia National Laboratories, New Mexico (SNL/NM) is one of the nation's premier multi-program security laboratories within the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). SNL/NM is operated by Sandia Corporation, owned by the DOE/NNSA, and managed by the Sandia Site Office (SSO). This Annual Site Environmental Report (ASER) was prepared in accordance with and as required by DOE Order 450.1, *Environmental Protection Program* (DOE 2003a) and DOE Order 231.1 Chg 2, *Environment, Safety, and Health Reporting* (DOE 1996).

This ASER summarizes environmental protection, restoration, and monitoring programs in place at SNL/NM for Calendar Year (CY) 2003. It also discusses Sandia Corporation's compliance with environmental statutes, regulations, DOE Orders, permit provisions, and highlights significant environmental program efforts and accomplishments. This ASER is a key component of the DOE's effort to keep the public informed about environmental conditions throughout the DOE/NNSA's Nuclear Weapons Complex.

Environmental Programs

Sandia Corporation's strategy for managing and implementing its Environment, Safety, and Health (ES&H) Program is described in the Integrated Safety Managment System (ISMS). The ISMS program is structured around five safety management functions and provides the processes to assist line management in identifying and controlling hazards. Further information about ISMS can be found in Chapter 8.

All 2003 program activities are performed continuously, but reported in this ASER on a CY basis, unless otherwise noted (programs based on the Fiscal Year (FY) run from October 1st through September 30th annually). The primary environmental programs in place at SNL/NM are summarized below.

Waste Management and Pollution Prevention (P2)

With hundreds of individual research laboratories, SNL/NM generates over 15,000 different waste streams. Waste at SNL/NM is processed at three facilities: the Hazardous Waste Management Facility (HWMF), the Radioactive and Mixed Waste Management Facility (RMWMF), and the Solid Waste Transfer Facility (SWTF). The focus of the P2 Program is to reduce resource use, generated waste, and enhance the overall efficiency of processes and organizations within SNL/NM. In 2003, SNL/NM received several awards for P2 accomplishments (see shaded box).

Environmental Restoration (ER) Project

The goal of finishing the ER Project by the end of FY 2006 continues, with a strong expectation of success. After over a year of negotiations, the New Mexico Environment Department (NMED), DOE and Sandia Corporation have agreed on the content of a Compliance Order on Consent. In addition to specifying milestones, schedules and explicit fines for non-compliance, the existence of the Order enhances the likelihood that funding for the project will be stable. During FY 2003, five sites were remediated and 15 sites were proposed for No Further Action (NFA). At the end of FY 2003, there were 125 sites remaining to be addressed at SNL/NM.

Terrestrial Surveillance

Soil, sediment, and vegetation are collected from on-site, perimeter, and off-site (community locations outside Kirtland Air Force Base [KAFB] boundaries) locations. The terrestrial surveillance sampling objectives are to detect any potential releases or migration of contaminated material to off-site locations. In 2003, there were no terrestrial sample results that indicated a significant level of concern that would trigger actions at locations that are not already being addressed by the ER Project.

Water Quality

- **Wastewater** – Wastewater from SNL/NM is discharged from five on-site outfalls permitted by the City of Albuquerque. Wastewater monitoring is conducted to ensure that all discharges meet the standards set by the City of Albuquerque's publicly-owned treatment works (POTW). All SNL/NM effluent discharge standards were within the City of Albuquerque's established limits except for one fluoride excursion in August of 2003. Equipment problems at one of the City of Albuquerque permitted stations resulted in data loss and a subsequent reportable occurrence for pH monitoring.

- **Surface Discharge** – All water to be discharged to the ground surface, either directly or to lined containments, must meet State of New Mexico surface discharge standards. There were eight requests made for individual discharges to the ground surface in 2003. In 2003, all requests met NMED New Mexico Water Quality Control Commission (NMWQCC) standards and were approved. Additionally, routine surface discharges are made to two evaporation lagoons servicing the Pulsed Power Facility under an existing discharge permit. All permit requirements for both lagoons were met in 2003. In 2003, there were six surface releases reported to NMED. There was no discernible impact to the environment due to any of these surface discharges.

- **Storm Water Runoff** – In FY 2003 analytical monitoring was not required under the National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit for Storm Water discharges. The NPDES permit requires quarterly analytical sampling to be conducted in the second and fourth year of the five year permit, weather permitting. FY 2003 is the third year of the permit. Visual sampling is required every year. No visual samples were collected for the 3rd and 4th quarter of FY 2003 due to the drought. For the samples collected during the 1st and 2nd quarter of FY 2003, no unusual characteristics were noted. The permit is due for renewal again in FY 2005.

Groundwater Protection

- **GWPP** – The GWPP conducts general surveillance of water quality from a network of wells not associated with the ER Project. Annual sampling was conducted in a total of 11 wells and one spring in FY 2003. Analysis was 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. All of the exceedences are attributed to naturally occurring sources.

- **ER** – The ER Project collects groundwater samples at six general project areas: the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), Technical Area V (TA-V), Tijeras Arroyo Groundwater (TAG), Canyons Area, and Drain and Septic Systems (DSS). Water quality results reported by the ER Project were consistent with past years' results.

Air Quality

- **Ambient Air Monitoring –** Sandia Corporation measures ambient air quality at five stations throughout SNL/NM and compares results with National Ambient Air Quality Standards (NAAQS) and local ambient air standards. The network monitors criteria pollutants and VOCs. There were no gaseous pollutant exceedances in 2003. Particulate matter (PM_{10}) short term exceedances were found during dust storms.

- **Air Quality Compliance –** The City of Albuquerque has yet to issue DOE a Title V Operating Permit for SNL/NM as required under the Clean Air Act Amendments (CAAA) of 1990; however, a synthetic minor permit application was submitted in 2003.

- **National Emission Standards for 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 2003, there were 18 SNL/NM facilities reporting NESHAP-regulated emissions. Of these 18 sources, 17 were point sources and one was a diffuse source. In 2003, the primary radionuclides released were tritium and argon-41. The results of the dose assessment showed that the on-site maximally exposed individual (MEI) received an effective dose equivalent (EDE) of 0.00219 millirem per year (mrem/yr). The off-site MEI received an EDE of 0.000872 mrem/yr. Both doses are well below the U.S. Environmental Protection Agency (EPA) standard of 10 mrem/yr.

National Environmental Policy Act (NEPA) Activities

During 2003, NEPA compliance activities at SNL/NM included support to DOE/NNSA/SSO for the completion of two environmental assessments (EAs); one for the Test Capabilities Revitalization (TCR) Program and one for the proposed Center for Integrated Nanotechnologies (CINT) to be built along Eubank Blvd, north of KAFB.

If you are interested in reading chapter highlights, a one-page summary is provided at the beginning of each chapter. All of the chapter summaries are placed in Chapter 10.

Employees conducting project review.

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In this Chapter ...
Sandia Corporation's History and Mission
Site Operations
Site Setting
Geology
Hydrological Setting
Regional Climate
Regional Ecology

Pinon Jay

Environmental Snapshot

- *The strongest winds occur in the spring when monthly wind speeds average 10.3 miles per hour (mph). Wind gusts can commonly reach up to 50 mph.*
- *The maximum elevation on KAFB is 7,986 feet.*

Chapter One

Introduction

Chapter Summary

This Annual Site Environmental Report (ASER) describes environmental protection programs currently in place at Sandia National Laboratories, New Mexico (SNL/NM). This report was prepared in accordance with the requirements set forth for all large U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) facilities and represents a key component of DOE's effort to keep the public informed about environmental conditions at DOE/NNSA sites.

SNL/NM is located on Kirtland Air Force Base (KAFB) in Albuquerque, New Mexico. The regional setting of SNL/NM provides a diverse range of geological, hydrological, climatic, and ecological settings. The Sandia Mountains, named for the watermelon color seen on the mountains at sunset, and the Manzanita Mountains both provide a beautiful setting at SNL/NM.

Sandia Corporation (a wholly-owned subsidiary of Lockheed Martin Corporation) continues to provide technological innovations since its inception in 1945. The mission of Sandia Corporation is to provide science and engineering support for the nuclear weapons stockpile and stewardship. Most of SNL/NM's activities are conducted within five technical areas (TAs) and several remote locations.

In support of Sandia Corporation's mission, Environment, Safety, and Health (ES&H) issues are addressed through environmental management (EM) programs. These programs include effluent monitoring, environmental surveillance, environmental restoration (ER), pollution prevention (P2), chemical inventory management, oil spill prevention, and quality assurance (QA).

View of the Sandia Mountains from SNL/NM

SNL/NM is one of the nation's premier multi-program security laboratories within the DOE/NNSA. SNL/NM is a government-owned, contractor-operated facility owned by the DOE/NNSA and managed by the Sandia Site Office (SSO).

General Site Location and Characteristics

KAFB is a 51,559-acre military installation, including 20,486 acres withdrawn from the Cibola National Forest through an agreement with the U.S. Forest Service (USFS) (Figure 1-1) located at the foot of the Manzanita Mountains, with a mean elevation of 5,384 ft and a maximum of 7,986 ft. KAFB and SNL/NM are located adjacent to the City of Albuquerque, which surrounds KAFB on the north, northeast, west, and southwest boundaries.

KAFB is host to over 150 tenant groups at this site. SNL/NM is located on the east side of KAFB. The total area of DOE/NNSA-owned property that is dedicated to SNL/NM facilities and operations is approximately 8,784 acres. Of these, Sandia Corporation conducts its operations within 2,841 acres (five TAs and several remote test areas). An additional 8,397 acres in remote areas are provided to DOE through land-use agreements with the U.S. Air Force (USAF) and Isleta Pueblo. There are an additional 9,000 acres of buffer zone near the southwest boundary of KAFB. The buffer zone, leased from the State of New Mexico and Isleta Pueblo, provides margins of safety and sound buffers for SNL/NM testing activities. The ownership of the land is divided between the Isleta Pueblo and the State of New Mexico. Additional information on local geology, hydrology, and ecology is presented at the end of this chapter.

Operations Contract

Sandia Corporation, like all regulated industries, complies with specific environmental regulations promulgated by local, state, and federal agencies. The Management and Operating Contract (MOC) between Sandia Corporation and DOE defines the primary contractual obligations for operating SNL/NM. This contract also drives Sandia Corporation's ES&H standards and requirements. Additionally, as stated in the MOC, Sandia Corporation must comply with DOE directives that establish specific requirements for environmental programs. There are six primary DOE directives currently on the contract baseline that pertain to the environmental protection and management:

- DOE Order 231.1 Chg 2, *Environment, Safety, and Health Reporting* (DOE 1996);
- DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information* (DOE 1997) ;
- DOE Order 435.1, *Radioactive Waste Management* (DOE 2001b);
- DOE Order 450.1, *Environmental Protection Program* (DOE 2004);
- DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1993); and
- SEN-22-90, *DOE Policy on Signatures of RCRA Permit Applications* (DOE 1990).

1.1 Sandia Corporation's History and Mission

History

SNL/NM got its start in 1945 as part of the Manhattan Project, which produced the first nuclear weapon. In 1949, President Harry Truman wrote American Telephone & Telegraph (AT&T) Corporation offering the company *"an opportunity to render an exceptional service in the national interest"* by managing Sandia Corporation. AT&T managed Sandia Corporation for 44 years. Today, Sandia Corporation is managed by Lockheed Martin Corporation for the DOE/NNSA.

Mission

Sandia Corporation's enduring mission is to provide science and engineering support for the nuclear weapons stockpile. Today, the mission includes other 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 preventing disruption of critical infrastructures such as energy supply and financial networks. Sandia Corporation collaborates with industry, universities, and other government agencies to commercialize new technologies. Recent technologies developed at SNL/NM can be found at the following website:

http://www.sandia.gov/LabNews

Managing a Legacy of Contamination

In a ranking of DOE sites SNL/NM was one of the least contaminated facilities. The cleanup and remediation of all SNL/NM sites is expected to be complete by 2006. Some sites will require long-term monitoring to ensure that any remaining

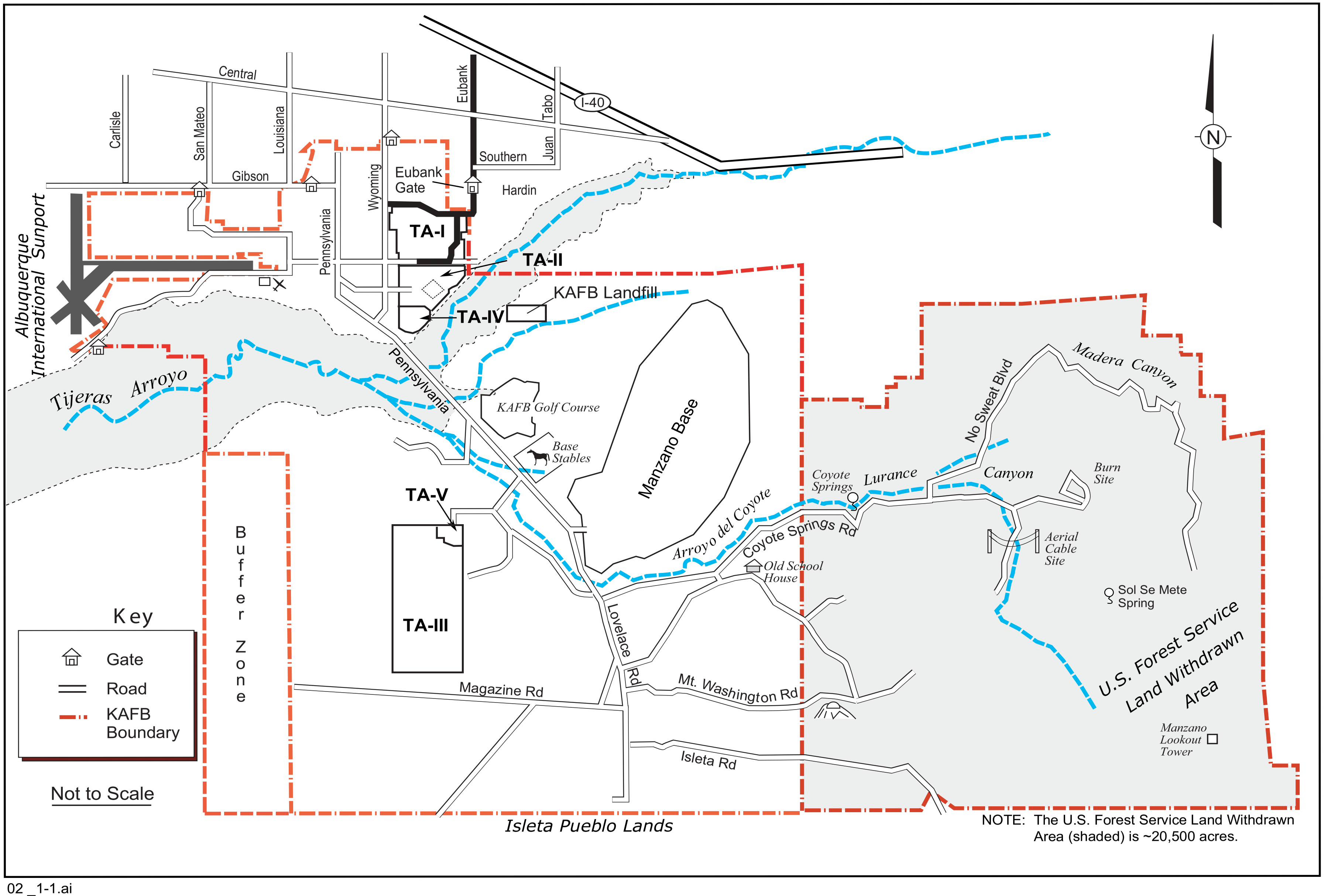


FIGURE 1-1. SNL/NM Technical Areas and the U.S. Forest Service Land Withdrawn Area

contamination does not migrate from the site. Detailed information about EM cleanup efforts throughout DOE can be found at DOE's website:

http://www.em.doe.gov/index4.html

A History of Progress

Over the past 12 years, Sandia Corporation has made tremendous progress in building a comprehensive ES&H Program. The ES&H Manual (SNL 2004), a dynamic online resource available to all personnel at SNL/NM, clearly describes ES&H requirements for all levels of work conducted. 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. Recycling programs, P2, and other waste minimization practices have been very successful at SNL/NM. Several audits have been conducted in recent years by the U.S. Environmental Protection Agency (EPA), various DOE/NNSA offices, the City of Albuquerque, and the State of New Mexico. The results of these audits, as well as SNL/NM internal audits support the commitment of SNL/NM in the area of ES&H.

Sandia Corporation's strategy for managing and implementing its ES&H Program is described in the Integrated Safety Management System (ISMS). The ISMS Program is structured around five safety management functions: (1) plan work, (2) analyze hazards, (3) control hazards, (4) perform work, and (5) feedback and improvement. ISMS provides the processes to assist line management in identifying and controlling hazards.

Environmental Management System (EMS)

Sandia Corporation is working to define and implement an EMS as an improvement of the environmental elements of ISMS. It will serve as the basis to manage environmental compliance, controls, and improvements. Additionally, P2 goals will be incorporated into the EMS. This strategy ensures that ES&H considerations are incorporated into each element of all work processes being conducted at Sandia Corporation.

1.2 Site Operations

Technical Area I (TA-I)

TA-I is the focus of SNL/NM's operations housing the main administrative center and a close grouping of laboratories and offices. A majority of activities performed in TA-I are dedicated to the design and research and development (R&D) of weapon systems; limited production of weapon system components; and energy research programs. Facilities in TA-I include the main technical library, several assembly/manufacturing areas, the Steam Plant, the Advanced Manufacturing Process Laboratory (AMPL), the Microelectronics Development Laboratory (MDL), and the Neutron Generator Facility (NGF).

Technical Area II (TA-II)

TA-II includes the diamond-shaped compound south of TA-I and several facilities south of Hardin Road. TA-II is home of the Explosive Components Facility (ECF) and the Classified Waste Landfill. Other TA-II facilities include the Facilities Command Center, the Solid Waste Transfer Facility (SWTF), and the Hazardous Waste Management Facility (HWMF).

Sandia Vision

Helping our nation secure a peaceful and free world through technology.

Sandia Mission

The primary mission of Sandia Corporation is to ensure the safety, security, and reliability of the nation's nuclear weapons.

Technical Area III (TA-III)

TA-III is the largest and most remote area of all TAs. It contains facilities separated by large, undeveloped areas. TA-III is used to accommodate large-scale engineering test activities that require large safety and/or security area buffers, such as sled tracks used for collision testing, centrifuges, and a radiant heat facility. Other facilities include the Radioactive and Mixed Waste Management Facility (RMWMF), the Mixed Waste Landfill (MWL), the Chemical Waste Landfill (CWL), the Large-Scale Melt Facility (LMF), and the Melting and Solidification Laboratory (MSL).

Technical Area IV (TA-IV)

TA-IV is located just south of TA-I and TA-II. This area is used to conduct R&D activities in inertial-confinement fusion, pulsed power, and nuclear particle acceleration. Active and inactive accelerators in TA-IV are the Z- Accelerator, the Advanced Pulse Power Development (APPDL), 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 (RHEPP-I and RHEPP-II) accelerators, the High Power Microwave Laboratory, and the Short Pulse High Intensity Nanosecond X-Radiator (SPHINX).

Lab Accomplishments

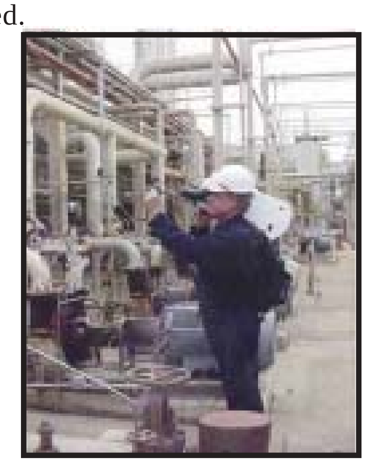
Green Zia Environmental Excellence Recognition: New Mexico Governor Bill Richardson notified Sandia Corporation that it has won a Green Zia Environmental Excellence Recognition for 2003. Sandia was recognized for its Site-Wide Program and for its commitment to environmental excellence across all of its organizations. The Green Zia program encourages companies, government agencies, and other organizations to consider environmental performance as a core business practice. The EPA and other state environmental agencies use the Green Zia Program as a benchmark. Governor Richardson said in a letter, "The approach emphasizes prevention of waste and pollution and relies on cost-effective solutions to assure a clean environment and healthy economy for New Mexico."

Green Zia Environmental Excellence Recognition.

White House Closing the Circle Award: The 2003 winners of the White House Closing the Circle Award heeded President Bush's call for the federal government to demonstrate that the federal workforce is committed to improving environmental performance and protection of resources. Sandia Corporation's Model Validation Design Team was nominated and won the Prestigious Award by incorporating sustainability into the design and construction of new facilities at SNL/NM. Out of 200 entries from many government agencies, only 26 individuals and teams won awards. The Model Validation Team was the only DOE nomination selected.

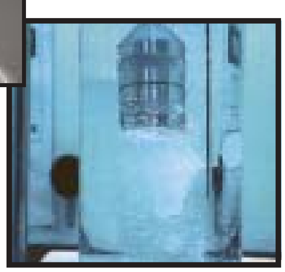
Model Validation Design Team receiving the White House Closing the Circle Award.

Sensors for The Environment: Sandia Corporation developed sensors to help the environment, such as the laser-based, gas leak detection system. This system, called Backscatter Absorption Gas Imaging (BAGI), uses infrared (IR) laser radiation to illuminate an area as it is viewed by an infrared video camera. If there is a hydrocarbon gas leak present, the plumes will absorb the laser light and appear as dark clouds in the video picture.



Sandia's Portable gas-leak imager undergoing major field test in early 2003.

In-situ chemiresistor sensor housing.



Chemiresistors operate underwater to detect and measure VOCs.

Sandia Corporation developed a unique electronic "sniffer" that can provide real-time in situ monitoring of volatile organic compounds (VOCs) in air, soil and water. These sensors are micro-chemical sensors called Chemiresistor. They can instantaneously detect a large variety of VOCs by being deployed directly in underground wells or water resources, and data is transmitted to a computer for remote monitoring.

Technical Area V (TA-V)
TA-V is located adjacent to the northeast end of TA-III. Facilities in TA-V routinely handle radioactive materials used in experimental research for nuclear fuel. TA-V houses the Sandia Pulsed Reactor (SPR), the New Gamma Irradiation Facility (NGIF), the Annular Core Research Reactor (ACRR), and the currently inactive Hot Cell Facility (HCF).

Remote Test Areas
Several remote test areas are located east and southeast of TA-III and within the canyons and foothills of the USFS withdrawn area (e.g., Lurance Canyon and Coyote Canyon). These areas are used for explosive ordnance testing, rocket firing experiments, and open burn thermal tests.

1.3 SITE SETTING

Regional Topography and Layout
KAFB has widely varied topography from rugged mountains on the east to nearly flat plains on the west. As shown in Figure 1-1, the land withdrawn area backs up to and encompasses a portion of the Manzanita Mountains within the Cibola National Forest. The remainder of KAFB, with the exception of Manzano Base, is situated on gently west-sloping foothill terrain that grades to widespread flat areas where the majority of USAF and SNL/NM facilities are located.

Sandia Corporation's Science and Technology Capabilities

- *Advanced Manufacturing*
- *Biotechnology*
- *Computational and Information Sciences*
- *Electronics*
- *Engineering Sciences*
- *Materials and Process Sciences*
- *Microelectronics and Photonics*
- *Modeling and Simulation*
- *Nanotechnology*
- *Pulsed Power Sciences*
- *Surety Sciences*

The Mountains
The most prominent topographic feature in the Albuquerque area is the impressive west face of the Sandia Mountains. The Sandia Mountains form a 13-mi long escarpment distinguished by steep cliffs, pinnacles, and narrow canyons. Sandia Crest at 10,678 ft is the highest point in the region. Tijeras Canyon divides the Sandia Mountains to the north from the Manzanita and Manzano Mountains to the south. Sediments transported from the canyons and draws of these mountains have formed coalescing alluvial fans called bajadas. These broad alluvial plains slope west across KAFB and are dissected by the Tijeras Arroyo, smaller arroyos, and washes.

Tijeras Arroyo
Tijeras Arroyo is 4,265 ft wide and 108 ft deep forming a significant topographic feature 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 dry except during heavy downpours, which can cause significant flash floods. The arroyo originates out of 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 KAFB west boundary.

Today, water from the Rio Grande is primarily used for agricultural irrigation; however, plans are underway to build a water treatment plant by 2005 that will use water from the river to supplement Albuquerque's drinking water supply.

Counties and Population
New Mexico is the fifth largest state in the U.S. with 121,666 sq mi in area and a total population of approximately 1.5 million. A recent count of the population within an 80-km (50-mi) radius of SNL/NM was 854,211 residents (DOC 2004). The Albuquerque metropolitan area alone has approximately 723,296 residents (DOC 2004). There are nine counties contained in all or part of this radius (Figure 1-2).

1.4 GEOLOGY

1.4.1 Regional 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 in which vast amounts of sediments have been deposited. The Rio Grande rift extends for about 450 mi from Leadville, Colorado to northern New Mexico.

1.4.2 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 mi wide and 100 mi long and 3,000 sq mi 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,

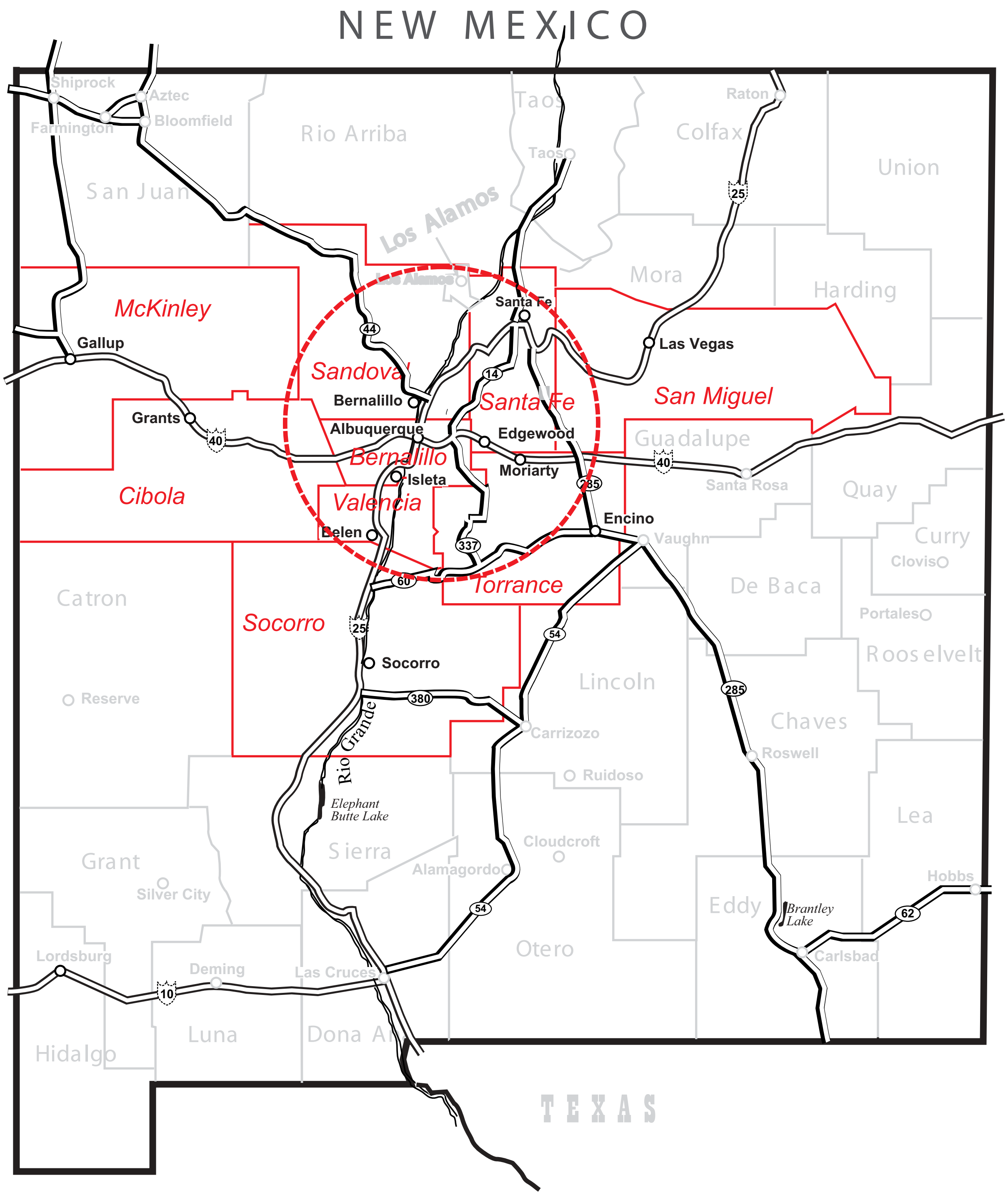


FIGURE 1-2. State of New Mexico Map

The overlay shows major roads, cities, county lines, and the 50-mi radius from SNL/NM facilities (dashed circle).

and the Nacimiento uplift at the northern end. There is relatively little topographic relief along the Rio Puerco fault belt on the northwestern side of the basin. Two south-flowing rivers drain the basin: the Rio Puerco to the west and the Rio Grande to the east.

Regional Fault Systems
As shown in Figure 1-3, several major faults are located on KAFB. The Tijeras fault, which has been traced as far north as Madrid, New Mexico, trends southwesterly through Tijeras Canyon and across KAFB. The 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.

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, en-echelon normal faults, which are Tertiary in age (Lozinsky et al. 1991; Woodward 1982; Kelley 1977).

1.5 Hydrological Setting

The hydrogeological system is divided into two areas separated by the Tijeras fault complex, which marks a distinct geological boundary. 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 49 to 98 ft deep. On the west side of the Tijeras fault complex within the basin, groundwater levels occur from 295 to 492 ft below the surface.

A shallow groundwater system (SGWS) overlies the regional system in the north portion of KAFB. The SGWS extends southward from TA-1 to the KAFB Golf Course. The western extent of the SGWS is somewhere midway between Wyoming Boulevard and the Albuquerque Sunport 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 SGWS is to the southeast with the depth to water approximately 270 ft below ground level in the western part and 420 ft to groundwater in the east.

Natural Springs
There are two perennial springs present 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.

Groundwater Production
The primary regional aquifer in the basin is within the upper unit and, to a lesser degree, the middle unit of the Santa Fe Group. Most of the City of Albuquerque's water supply wells are located on the east side of the Rio Grande. 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 was primarily to the southwest. As a result of groundwater withdrawal, the water table has dropped by as much as 141 ft (Thorn et al. 1993). Groundwater withdrawal from KAFB and City of Albuquerque wells at the north end of KAFB has created a trough-like depression in the water table causing flow to be diverted northeast in the direction of the well fields.

1.6 Regional Climate

Wide diurnal temperature extremes, monsoons, and frequent drying winds are characteristic of the Albuquerque Basin climate.

Air temperatures are characteristic of high-altitude and dry continental climates. Temperature averages are as follows: the monthly average relative humidity varies from a low of 30 percent in early summer to 56 percent in early winter.

Annual precipitation, most of which occurs between July and October, averages approximately 8.3 in. on KAFB. In the higher elevations of the Sandia and Manzano Mountains, annual precipitation is between 12 to 35 in. The winter season is typically dry with less than 1.6 in. of precipitation recorded.

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 upslope-downslope diurnal/nocturnal (day/night) wind flows. Diurnal winds tend to blow toward the mountains during the day and nocturnal winds tend to blow down the mountain towards

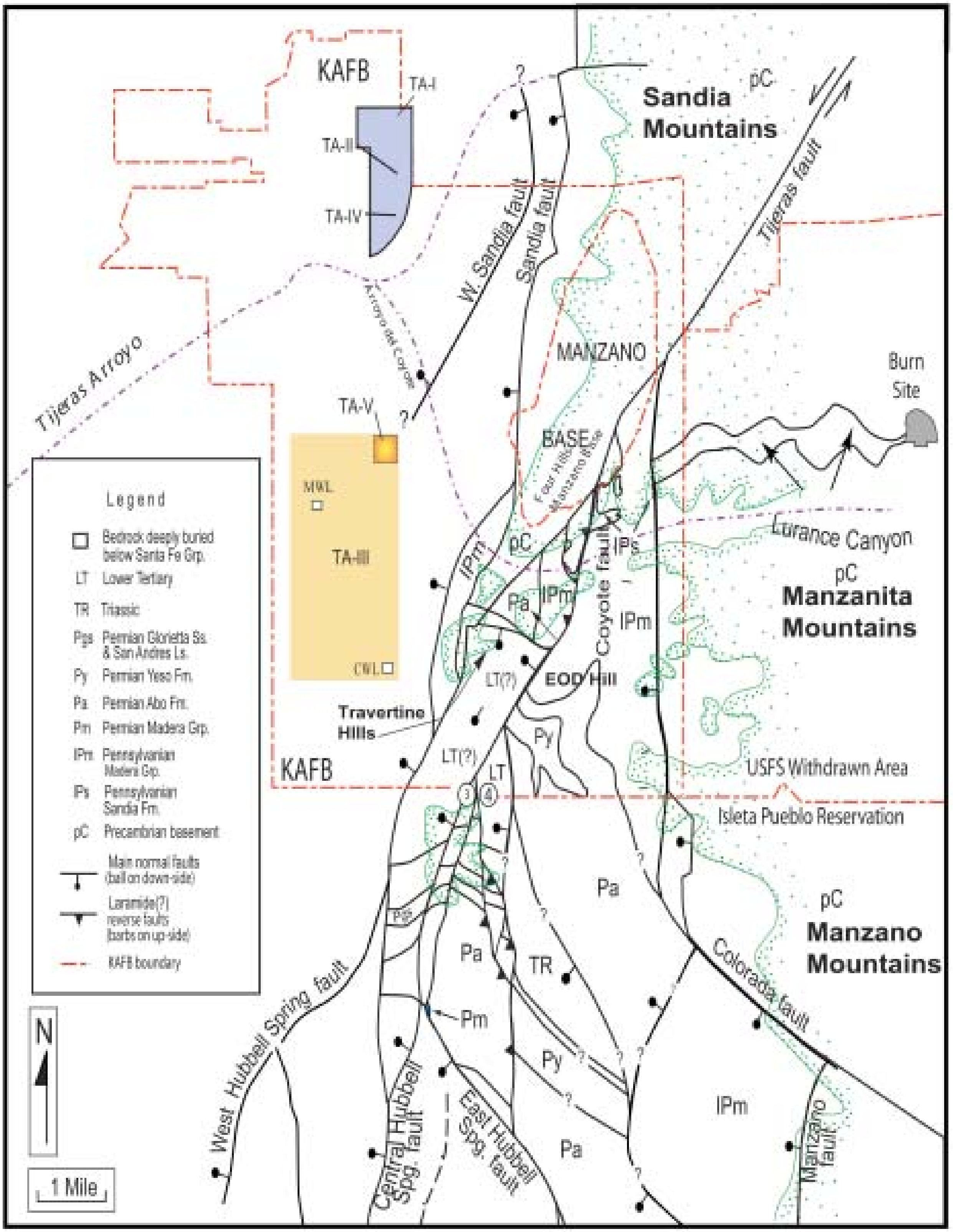


FIGURE 1-3. Generalized Geology in the Vicinity of SNL/KAFB

the Rio Grande Valley. These topographically induced wind flows can be enhanced or negated by weather systems that move across the southwest part of the U.S. The strongest winds occur in the spring when monthly wind speeds average 10.3 mph. Wind gusts can commonly reach up to 50 mph.

1.7 Regional Ecology

The SNL/NM facilities area is influenced by two major physiographic provinces:

Mesa and Plains – much of central New Mexico, including the middle Rio Grande and much of SNL/NM, is comprised of this physiography. Major landforms are valleys, lowlands, outwash plains, and alluvial fans and terraces. Grama and galleta grasses and four-wing saltbush occur along with sand sage at lower elevations, pinon-juniper at higher elevations, and conifers are in the scattered mountain ranges. Riparian strips along water courses have cottonwood-willow and non-native salt cedar.

Southern Rocky Mountains – the Sandia and Manzano Mountains form the southern extension of the Rocky Mountains. The eastern portion of SNL/NM is located in, and bordered by the Manzanos. Vegetation in these steep, rugged mountains varies greatly on the basis of elevation and aspect. Due to topography, weather, fire, insect outbreaks, and disease, forests in the Southern Rocky Mountains tend to be patchy. The landscape is a complex mosaic of open meadows and forest stands of varying age and species composition.

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 occur 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.

1.7.1 Regional Life Zones Occurring on KAFB

Ponderosa Pine Forest or Transition Life Zone (7,000 – 8,000 feet) A closed canopy of ponderosa pines, pinon-pine,

TABLE 1-1. Most 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*	Desert cottontail	*Sylvilagus audubonii*
Bobcat	*Felis rufus*	Deer mouse	*Peromyscus maniculatus*
Big brown bat	*Eptesicus fuscus*	Gunnison's prairie dog	*Cynomys gunnisoni*
Banner-tailed kangaroo rat	*Dipodomys spectabilis*	Gray fox	*Urocyon cinereoargenteus*
Black-tailed jackrabbit	*Lepus californicus*	Mountain lion	*Felis concolor*
Common porcupine	*Erethizon dorsatum*	Mule deer	*Odocoileus hemionus*
REPTILES AND AMPHIBIANS			
Collared lizard	*Crotaphytus collaris*	Leopard lizard	*Gambelia wislizenii*
Chihuahuan spotted whiptail	*Cnemidophorus exsanguis*	Tiger salamander	*Ambystoma tigrinum*
Desert horned lizard	*Phrynosoma platyrhinos*	Western diamondback rattlesnake	*Crotalus atrox*
Eastern fence lizard	*Sceloporus undulatus*	Side-blotched lizard	*Uta stansburiana*
Gopher snake	*Pituophis melanoleucus*	Striped whip snake	*Masticophus taeniatus*
Great plains skink	*Eumeces obsoletus*	Short-horned lizard	*Phrynosoma douglassi*
Great plains toad	*Bufo cognatus*		
PLANTS			
Apache plume	*Fallugia paradoxa*	Goathead	*Tribulus terrestris*
One-seed juniper	*Juniperus monosperma*	India ricegrass	*Achnatherum hymenoides*
New Mexico porcupine grass	*Stipa 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*	Blue locoweed	*Astragalus lentiginosus*

juniper, scrub oak, grassy meadows, streams, marshes and canyons are typical of this zone. The Forest Service withdrawn area in the eastern portion of KAFB reaches an elevation of just over 7,900 feet.

Pinon Jay are found in the Pinon - Juniper Woodland Zone

Pinon-Juniper Woodland Zone (6,000 – 7,000 feet) A mostly open canopy of pinon-pine and juniper dot this zone of foothills and mesas. Animals typical of this woodland include the pinon mouse and pinon jay. Much of the rolling terrain in the withdrawn area is comprised of this zone.

Gunnison's Prairie Dog is found in the Upper Sonoran Life Zone

Upper Sonoran Life Zone (below 6,000 feet) This shortgrass 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 lands fall within this zone.

Pinon Pines found in the Pinon-Juniper Woodland Zone

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In this Chapter ...

Chapter Two
Compliance Summary

Chapter Summary

Sandia Corporation conducts operations based on environmental regulations, statutes, and U.S. Department of Energy (DOE) Orders. A variety of programs at Sandia National Laboratories, New Mexico (SNL/NM) work together to strive for 100 percent compliance with applicable regulations. As a part of these federal, state, and locally mandated regulations, SNL/NM adheres to strict reporting and permitting requirements. In 2003, there were no violations issued to SNL/NM.

External audits and appraisals are conducted at SNL/NM to identify issues that may arise from operations. SNL/NM also conducts internal audits and appraisals as a part of quality assurance (QA).

In 2003, there were six environmental releases reported to the New Mexico Environment Department (NMED). Two of these releases also met Occurrence Reporting and Processing System (ORPS) criteria as an occurrence. There were two City of Albuquerque wastewater reportable events. One of these met the ORPS criteria as an occurrence.

Electricity-powered trucks at SNL/NM

Environmental Snapshot

SNL/NM's Fleet Services recently purchased 10 new Ford Rangers that are powered by electricity in place of gasoline. These trucks will be used in normal daily routines much like their gasoline guzzling counterparts. Fleet Services plans to increase its number of electrically powered vehicles in the near future.

Snow Covered Sandia Mountains

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

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

2.1 Compliance Status With Federal Regulations

Most environmental regulations and statutes applicable to Sandia Corporation along with their websites are discussed on page 2-4.

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

CERCLA, commonly known as "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 (DOE 1995). This inspection confirmed that Sandia Corporation does not own any sites that would qualify for listing on the National Priorities List (NPL). The NPL lists the nation's high priority cleanup sites or "Superfund sites." Therefore, with respect to inactive hazardous waste sites, Sandia Corporation has no CERCLA reporting requirements. Other CERCLA reporting requirements may be invoked in the case of a reportable quantity (RQ) release. Sandia Corporation was in full compliance with CERCLA Superfund Amendments, and Reauthorization Act (SARA), and one RQ release was reported in 2003 (Table 2-4 and Section 6.2.2).

Additional CERCLA reporting requirements defined under SARA Title III are discussed in the following section.

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

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

EPCRA requires that the community be informed of potential hazards, such as the type and location of large quantities of toxic chemicals used and stored by facilities in 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 and all subsequent reports must be made accessible to the public. The four major reporting requirements designated by specific sections of SARA Title III (or EPCRA) are shown in Table 2-1.

There was one reportable release at SNL/NM under EPCRA in 2003. Information on EPCRA can be found at the following EPA website:

http://yosemite.epa.gov/oswer/CeppoWeb.nsf/content/epcra_law.htm

Toxic Release Inventory (TRI) Reporting

EPCRA regulations require that facilities with activities described in the Standard Industrial Classification (SIC) Code 20 through 39 that use toxic chemicals listed in SARA Title III over a threshold value must submit a TRI report. A TRI report is also required by EO 13148, *Greening the Government Through Leadership in Environmental Management*. The threshold value for listed chemicals for which a TRI report is required is 10,000 lb/yr, unless otherwise specified.

In 2003, the EPA proposed to include in the regulations the North American Industry Classification System (NAICS) codes that correspond to the SIC codes that are currently subject to the TRI reporting requirements. The EPA also proposed that facilities that are subject to TRI reporting requirements report both SIC and NAICS codes on EPCRA section 313 reporting forms for the first full reporting period after the effective date of the final rule (the proposed NAICS rule date was March 21, 2003, and has not yet been finalized). Thereafter, facilities that are subject to TRI reporting requirements would be

TABLE 2-1. 2003 SARA Title III (or EPCRA) Reporting Requirements Applicable to SNL/NM

Section	SARA Title III Section Title	Requires Reporting? Yes	No	Description
302 - 303	Notification/ Plans	✓		Sandia Corporation submits an annual report listing chemical inventories above the reportable Threshold Planning Quantities listed in 40 CFR Part 355 Appendix B, 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	✓		One RQ release of an EHS, or as defined under CERCLA, occurred in 2003.
311-312	MSDSs/ Chemical Purchase Inventory Report	✓		There are two "Community Right-to-Know" reporting requirements: (a) SNL/NM 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 lbs and for all EHSs present at the facility in an amount greater than or equal to 500 lbs or the Threshold Planning Quantity, whichever is lower; (b) SNL/NM 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		✓	Sandia Corporation is below the reporting threshold in 2003 for submitting a TRI Report for SNL/NM operations. SNL/NM has been below the reporting threshold for a TRI report since 1995.

NOTE: MSDS = Material Safety Data Sheets (gives relevant chemical information)
RQ = reportable quantity
TRI = Toxic Release Inventory
EPA = U.S. Environmental Protection Agency
SNL/NM = Sandia National Laboratories, New Mexico
lbs = pounds
EHS = extremely hazardous substance
DOE = U.S. Department of Energy
NNSA = National Nuclear Security Administration
SSO = Sandia Site Office
CFR = Code of Federal Regulations
SARA = Superfund Amendments and Reauthorization Act
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
EPCRA = Emergency Planning and Community Right-to-Know Act

required to report their NAICS codes only.

In Calendar Year (CY) 2003, chemical use at SNL/NM was below the reporting thresholds for submitting a TRI report. However, Sandia Corporation continues to document its toxic chemical use in the *Chemical Inventory Report, Calendar Year 2003* (SNL/Outrider 2004), which lists all purchases of chemicals (even though the quantities are below the threshold quantities).

This chemical inventory supports compliance with SARA Title III as well as reporting for Title V of the Clean Air Act Amendments (CAAA) of 1990.

2.1.3 Resource Conservation and Recovery Act (RCRA)

RCRA regulates the generation, transportation, treatment, storage, and disposal of hazardous chemical wastes, non-hazardous solid wastes, and hazardous or petroleum products stored in underground storage tanks (USTs).

Under the authority of the New Mexico Hazardous Waste Act (NMHWA) and under delegated authority from EPA under RCRA, the NMED administers hazardous waste regulatory programs in New Mexico. Hazardous waste management activities at SNL/NM are conducted under NMED regulations. Some additional RCRA requirements and regulations of the EPA also apply. Applicable regulations are listed in Chapter 9.

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

Sandia Corporation generates hazardous and MW through normal operations. Sandia Corporation also generates hazardous and MW through the ongoing environmental restoration (ER) project involving cleanup of sites that were formerly used for operations such

Major Environmental Regulations & Statutes Applicable to SNL/NM

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://nrc.gov/who_we_are/governing_laws.html***

Clean Air Act (CAA) and CAA Amendments (CAAA)
Provides standards to protect the nation's air quality **http://www.epa.gov/oar/oaq_caa.html**

Clean Water Act (CWA)
Provides general water quality standards to protect the nation's water sources and byways
www.epa.gov/region5/water/cwa.htm

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
www.epa.gov/region5/defs/html/cercla.htm

Cultural resources acts
Includes various acts that protect archeological, historical, religious sites, and resources
http://water.usgs.gov/eap/env_guide/cultural.html

Endangered Species Act (ESA)
Provides special protection status for federally-listed endangered or threatened species
www.epa.gov/region5/defs/html/esa.htm

Executive Orders (EOs)
Several EOs provide specific protection for wetlands, floodplains, environmental justice in minority and low-income populations, and greening the government through leadership in environmental management
http://www.archives.gov/federal_register/executive_orders/disposition_tables.html

Federal Facility Compliance Act (FFCA)
Directs federal agencies regarding environmental compliance
http://tis.eh.doe.gov/oepa/laws/ffca.html

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
Controls the distribution and use of various pesticides **www.epa.gov/region5/defs/html/fifra.htm**

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
www.epa.gov/radiation/neshaps/

National Environmental Policy Act (NEPA)
Ensures that federal agencies review all proposed activities and include environmental consideration 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) **www.epa.gov/region5/defs/html/rcra.htm**

Safe Drinking Water Act (SDWA)
Provides specific standards used for drinking water sources **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*
www.epa.gov/region5/defs/html/sara.htm

Toxic Substance Control Act (TSCA)
Specifies rules for the manufacture, distribution, and disposal of specific toxic materials such as asbestos and polychlorinated biphenyls (PCBs) **www.epa.gov/compliance/civil/federal/tsca.html**

as testing and disposal. Sandia Corporation has an active and successful program to minimize hazardous and MW through product substitutions, process changes, material re-use, and recycling. See Chapter 3 (Section 3.3) for more details.

Chapter 3 summarizes Sandia Corporation's hazardous waste management activities during 2003.

Permits – On February 6, 2002, Sandia Corporation and DOE submitted a comprehensive RCRA Part B (final) permit request for operating nine units used for hazardous waste management. The permit request included: requests for renewal of the existing permits for the Hazardous Waste Management Facility (HWMF) and the Thermal Treatment Facility (TTF); updated applications for operating permits for the Radioactive and Mixed Waste Management Facility (RMWMF), the High Bay Waste Storage Facility (HBWSF), and seven Manzano Storage Bunkers (MSB); a new application for operation of the Auxiliary Hot Cell Facility (AHCF); and requests for renewal of existing permits and authorizations for the Corrective Action Management Unit (CAMU), the temporary unit (TU), and the Low-Temperature Thermal Desorption (LTTD) system. During 2003, SNL/NM and DOE revised the permit request several times in response to NMED comments, NMED requests for additional information, and changes in waste management operations. SNL/NM and DOE withdrew the permit applications for the HBWSF and two MSBs because these units will not be needed for future RCRA-regulated waste management. SNL/NM and DOE requested significant modifications to the permit for the CAMU to reflect the completion of treatment activities, placement of all soils in the containment cell, and construction of the cover on the cell. The most recent revision was submitted on November 14, 2003. Active permits are listed in Chapter 9.

Closures – During 2003, Sandia Corporation continued closure activities for hazardous waste management units that were operated under interim status and are no longer used as follows:

<u>Chemical Waste Landfill (CWL)</u>
The CWL was used for hazardous waste disposal under interim status until 1985. Details are included in Section 3.2.2.

<u>CAMU</u> – Some of the soil placed in the CAMU was treated in the LTTD and/or the TU prior to placement in the cell. Details are included in Section 3.2.2.

<u>HBWSF</u> – SNL/NM no longer needs the waste storage capacity provided by the HBWSF. In October 2002, Sandia Corporation and DOE submitted a plan for closing the unit to NMED for approval.

<u>MSB</u> – SNL/NM no longer needs the waste storage capacity provided by two of the MSBs. These units were not used for storage of hazardous or MW under interim status.

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. On October 4, 1995, the NMED, DOE, and Sandia Corporation entered into a Federal Facility Compliance Order (FFCO) for management of MW at SNL/NM. A general Site Treatment Plan (STP) and a schedule for processing the waste was developed.

In 2003, Sandia Corporation continued to characterize and treat MW, and to package them for shipment to permitted off-site treatment, storage, and disposal (TSD) facilities. Sandia Corporation met all milestones in the STP.

2.1.5 Atomic Energy Act (AEA)

In 1946, the AEA was created 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 the control of nuclear energy and nuclear materials primarily to the DOE, the U.S. Nuclear Regulatory Commission (NRC), and the EPA. Federal regulations control radioactive emissions and the transport of nuclear materials. The authority for controlling radioactive waste is retained by the DOE and is governed by DOE Orders.

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 quality of the nation's air. The EPA is responsible for describing and regulating air pollutants from stationary and mobile sources and for setting ambient air quality standards. The City of Albuquerque 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.

National Emission Standards for Hazardous Air Pollutants (NESHAP)

NESHAP regulates releases of hazardous air pollutants to the air. Subpart H of 40 CFR 61 specifically regulates radionuclide emissions, other than radon, from DOE facilities. As required by the regulation, Sandia Corporation calculates an annual dose to potentially exposed members of the public. The regulation requires that Sandia Corporation 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 2003, the MEI was located at Chestnut Test Site, just south of Technical Area V (TA-V). The dose at this location was 0.00219 mrem/yr. The off-site MEI was located at Tijeras Arroyo (West). The dose at this location was 0.000872 mrem/yr. Both doses are well below the EPA standard. Sandia Corporation met all NESHAP compliance requirements in 2003.

2.1.7 Clean Water Act (CWA)

The CWA sets forth goals to protect "Waters of the U.S." by controlling 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 City of Albuquerque administers sanitary sewer discharges based on federal pretreatment standards; (2) the NMED administers regulations concerning oil storage and surface discharges; and (3) the EPA retains oversight over storm water discharges and mandates requirements for oil storage and secondary containment.

New Mexico Stream Standards

New Mexico has not been delegated authority to regulate discharges under the National Pollutant Discharge Elimination System (NPDES). However, 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. Due to the hydrologic conditions at SNL/NM, Sandia Corporation does not specifically monitor for compliance with these standards. In order to determine compliance, SNL/NM compares analytical results from NPDES sampling with the stream standards. Some constituents of concern in New Mexico's Stream Standards that are not on the NPDES analyte list have been added to SNL/NM's analyte list to confirm compliance.

City of Albuquerque Sewer Discharge Regulations

There are five wastewater monitoring stations, or outfalls, at SNL/NM permitted by the City of Albuquerque. Four of these stations discharge directly to the City of Albuquerque public sewer and one is a categorical pretreatment station that is located upstream of the general outfalls.

There was one exceedance of permit limits in 2003. There was also one occurrence due to loss of pH monitoring data. Details related to this exceedance and occurrence are discussed in Section 6.1.5.

Surface Discharge

Surface discharges made to the ground or to containment areas must be first evaluated for compliance with regulations implemented through the New Mexico Water Quality Control Commission (NMWQCC). Sandia Corporation issued 15 one-time surface discharge permits in 2003. Additionally, two evaporation lagoons in TA-IV are permitted by the NMED. The TA-IV lagoons are used to contain and evaporate accumulated storm water pumped from the secondary containment areas around seven oil tanks, which support the pulsed power accelerators. All permit conditions for the permitted sites were met in 2003.

In 2003, there were six reportable surface releases that were reviewed by the Surface Discharge Program (Section 2.2 and 6.2.2).

NPDES

NPDES implements the requirements that are specific to all discharges made to "Waters of the U.S." as defined in the CWA. At SNL/NM, this is applicable to storm water runoff from any point that can drain to the Tijeras Arroyo.

Albuquerque is in a severe drought cycle that began in 2001 and has continued through 2003. Analytical sampling was hampered in the 2003 monitoring period resulting in incomplete sampling of runoff. Although analytical sampling was not required in 2003, the quarterly visual sampling effort was also negatively impacted by the drought. There was only sufficient runoff in the first and second quarters of FY 2003 for visual analysis. No unusual characteristics were noted.

2.1.8 Safe Drinking Water Act (SDWA)

The SDWA sets national drinking water standards, surface water sources, and includes a few provisions for groundwater. SDWA standards are designed to protect human health by regulating the allowable amount of chemicals, metals, radionuclides, bacteria, and other potential pollutants in potable water sources.

Drinking Water Supply at SNL/NM

Potable water for most facilities on KAFB (including SNL/NM) is provided by the KAFB Water System. The system derives its water from deep groundwater wells (discussed in Chapter 7). KAFB routinely samples its water for trihalomethanes, coliforms, volatile organic compounds (VOCs), gross alpha and gross beta radioactivity, and various inorganic chemicals.

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

http://www.epa.gov/safewater

NOTE: Although it is KAFB's responsibility to meet regulatory monitoring and reporting requirements for potable water, SNL/NM's Environmental Management Department routinely collects potable water samples in response to drinking water concerns.

2.1.9 Toxic Substances Control Act (TSCA)

TSCA addresses 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 Corporation was in full compliance with TSCA in 2003. Details related to TSCA are in Chapter 3 (Section 3.2.1).

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

FIFRA regulates the use of pesticides and is enforced under the New Mexico Pesticide Control Act. Sandia Corporation's Biological Control Activity compiles information on pesticide use at SNL/NM, as discussed in Section 3.5. Sandia Corporation was in full compliance with FIFRA in 2003.

2.1.11 National Environmental Policy Act (NEPA)

NEPA requires federal agencies and private entities that perform federally-sponsored projects to include environmental aspects in early project planning and decision-making. A major intent of the law is to ensure that federal agencies are aware of the potential environmental impacts associated with their operations and include this information in early project planning and decision making. NEPA mandates that an agency's decision process be open for public review. Additionally, if a proposed action is determined to have environmentally "significant" impacts, the agency

SWEIS Maintenance

The SWEIS analyzed SNL/NM's operations, processes, site characteristics, and potential operational impacts using 1996 and 1997 baseline conditions. The analysis included expanded operations of selected facilities projected through 2008. In 2003, the SWEIS Annual Review (AR) - CY 2002 (SNL 2003h) was published to provide an updated summary of SNL/NM operational activities compared to the environmental analysis in the SWEIS. SNL/NM will compile summary information in CY 2004 to support DOE's assessment of the SWEIS in 2005. At that time, DOE may choose to prepare a supplement analysis to determine whether the SWEIS continues to represent the environmental impacts of SNL/NM operations, or whether a supplemental or new SWEIS should be prepared.

must prepare an environmental assessment (EA) or an environmental impact statement (EIS) before an irretrievable commitment of resources or funding occurs. Although a major objective of NEPA is to preserve the environment for future generations, the law does not require an agency to select the proposed action alternative with the least environmental impacts. Details are provided in Section 3.7.

2.1.12 Endangered Species Act (ESA)

The law ensures that any action authorized, funded, or carried out by a federal agency 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 threatened and endangered species potentially occurring in Bernalillo County.

2.1.13 Migratory Bird Treaty Act (MBTA)

The MBTA of 1918, as amended, was established by Canada, Japan, Russia, Mexico, and the United States. The MBTA prevents the taking, possession, killing, transportation, and importation of migratory birds, their eggs, parts, and nests. Guidance is being developed by the U.S. Fish and Wildlife Service to assist federal institutions in interpreting the MBTA. 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 are as follows:

- 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 implementing regulations include archaeological sites, historic buildings, and structures. Historic buildings and structures may include those over 50 years old that are historically significant, or younger structures of exceptional significance.

There are no known archaeological sites located on DOE/NNSA-owned property, although cultural and historic sites do exist in proximity to DOE/NNSA-leased property and ER sites. These areas are located both on U.S. Air Force (USAF) property and on portions of the Cibola National Forest land withdrawn area. Sandia Corporation's activities are usually planned to avoid potential impacts to such archaeological sites. It is DOE's responsibility to ensure that cultural resources are not adversely impacted by DOE activities.

Historical Building Assessment

With regard to SNL/NM, DOE completed consultation with the New Mexico State Historic Preservation Office (SHPO) on 30 individual buildings or small complexes of buildings. None were found to be of historic interest. In addition, the consultation was completed on buildings and structures included in the Test Capabilities Revitalization Project. Of these, one building and four districts were found to be eligible for the National Register of Historic Places.

2.1.15 Environmental Compliance Executive Orders (EOs)

EOs related to environmental compliance include:

Floodplain Management (EO 11988), as amended – This EO has 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, mudflats, and areas around natural springs. There are several natural springs on KAFB with a limited wetland setting. These springs, located on USAF property and with in the land

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

Species		Federal Status	State Status	Observed at KAFB
MAMMALS				
Spotted bat	*Euderma maculatum*	--	Threatened	
New Mexican jumping mouse	*Zapus hudsonius luteus*	--	Threatened	
FISH				
Rio Grande silvery minnow	*Hybognathus amarus*	Endangered	Endangered	
BIRDS				
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Threatened	
Common black-hawk	*Buteogallus anthracinus anthracinus*	--	Threatened	
American peregrine falcon	*Falco peregrinus anatum*	--	Threatened	✓
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	--	
White-eared hummingbird	*Hylocharis leucotis borealis*	--	Threatened	
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	Endangered	
Whooping crane	*Grus americana*	Endangered	Endangered	
Bell's vireo	*Vireo bellii*	--	Threatened	✓
Gray vireo	*Vireo vicinior*	--	Threatened	✓
Baird's sparrow	*Ammodramus bairdii*	--	Threatened	✓
Neotropic cormorant	*Phalacrocorax brasilianus*	--	Threatened	

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

withdrawn area, are managed by the USAF and the U.S. Forest Service (USFS). The 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, and 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. SNL/NM performs analysis to assess that its existing or proposed operations do not cause any disproportionate impacts on minority or low-income populations within the area of influence of SNL/NM operations.

Greening the Government Through Leadership in Environmental Management (EO 13148) – EO 13148 requires federal agencies to ensure that "all necessary actions are taken to integrate environmental accountability into agency day-to-day decision-making and long-term planning processes, across all agency missions, activities, and functions." Among the primary agency goals is to support the development and implementation of environmental management systems, and the establishment of environmental compliance audit programs and policies "that emphasize pollution prevention as a means to both achieve and maintain environmental compliance." Sandia Corporation continues to work under DOE/NNSA guidance to meet the requirements of this EO.

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 2003, Sandia Corporation met all requirements stated in these DOE directives. In January 2003, DOE Order 450.1 was incorporated into the contract, which replaced DOE Order 5400.1.

2.1.17 Summary of Radiological Releases

A summary of radiological releases and public dose resulting from Sandia Corporation operations is provided in Table 2-3. More detailed information is found in Chapters 5 and 6 of this report.

TABLE 2-3. SNL/NM Radiological Dose Reporting for Calendar Year 2003

Pathway	Dose to MEI		% 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		Person-rem	Person-Sv		Person-rem	Person-Sv
Air	2.2E-3	2.2E-5	0.0022%	9.5E-2	9.5E-4	793,740	-	-
Water	0	0	0	0	0	0	-	-
Other Pathways	0	0	0	0	0	0	-	-
All Pathways	2.2E-3	2.2E-5	0.0022%	9.5E-2	9.5E-4	793,740	2.9E5	2.9E3

Radiological Atmospheric Releases for 2003 (in Curies)										
Tritium	Kr^{85}	Noble Gases ($t_{1/2}$ <40 days)	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	Other Actinides	Other
15.4	0	6.6	1.1E-3	2.5E-5	0	1.6E-5	1.0E-13	1.4E-5	1.4E-5	18.8

Liquid Effluent Releases of Radioactive Material for 2003						
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

NOTE: mrem = millirem; mSv = millisievert; DOE = U.S. Department of Energy; U = Uranium; Pu = Plutonium; MEI = maximally exposed individual

2.2 2003 RELEASES, COMPLIANCE ISSUES, AND ENVIRONMENTAL OCCURRENCES

Under DOE Order 232.1A, 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 occurrences.

2.2.1 Occurrence Tracking

DOE occurrence reporting is tracked by the Performance Assurance Department. All SNL/NM occurrences are entered into the DOE ORPS database, which also tracks corrective actions and closure of occurrence reports.

During FY02, DOE teamed with its contractors to re-engineer the Occurrence Reporting program. The goal was to streamline the reporting process. The resulting process includes 75 reporting criteria compared to the previous 123. The new process bases the classification of an event on the amount of impact to safe facility operations, worker or public safety and health, regulatory compliance, or public/business interests ranging from Operational Emergencies as defined in DOE Order 151.1A to "significant impact" through "some impact." As a result, the "Unusual" and "Off Normal" classifications were eliminated and Operational Emergencies, Significance Categories (SC), 1, R (Recurring), 2, 3 and 4 and "non-reportable" classifications were instituted. SC 1 events have "significant impact" and SC 4 have "some impact." Previously, operational emergencies were not classified in ORPS. Recurring events result from trends that are tracked on a quarterly basis and rolled up into a recurring occurrence report. Significant Category 3 events may be approved by SNL/NM Managers. Significant Category 4 events consist of a one time report, or notification/final, and causal analyses and corrective actions are optional.

Effective August 2003, SNL/NM transitioned from the old ORPS system to the new one.

DOE Order 232.1A 2003 Environmental Occurrences

DOE Order 232.1A environmental occurrences for five years (1999-2003) are shown in Figure 2-1. This figure shows all occurrences for which "nature of occurrence" (pre August 25, 2003) reporting criteria (post August 25, 2003) included "environmental." The graph shows subcategories within the environmental category. In 2003, there were three reportable environmental occurrences. Two occurrences were categorized as "off-normal" in the old ORPS system and one was categorized as "SC 2" in the new ORPS. Table 2-4 summarizes environmental occurrences in 2003.

2.2.2 Environmental Release Tracking

Environmental releases include releases to the environment that are not tracked through ORPS, including notifications to outside agencies.

2003 Environmental Releases

In 2003, there were six reportable releases to the environment. Two of these releases also met ORPS criteria as an occurrence (Table 2-4). Detailed information regarding these releases can be found in Section 6.2.2.

2.3 2003 Audits and Appraisals

Operations at SNL/NM are routinely subjected to audits by external regulatory agencies including the DOE. Sandia Corporation also conducts its own self-assessments and appraisals. Environmental audits and appraisals conducted by external agencies in 2003 are listed in Table 2-5.

2.4 Summary of Reporting Requirements

External reporting requirements (other than to the DOE) are necessary for both non-routine and 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 2-6 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 2003. This includes permit applications that are pending and are under review by various agencies.

2.6 Environmental Performance Measures

Environmental performance at SNL/NM is tracked through performance measures and indicators, and reported through management reports and annual summaries, such as this report. SNL/NM executive management has established high-level corporate ES&H Objectives, which are:

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

In support of these objectives, seven specific ES&H measures have been adopted, with specific numerical expectations for each. These are listed in Table 2-7.

Performance against these measures and expectations is reported periodically to the Sandia Laboratory Leadership Team (LLT), Lockheed Martin Corporation, and the Sandia Board of Directors.

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) assessing SNL/NM's performance for the FY.

In FY03, ES&H performance was included in the category "Mission Critical Support" in the PEP. ES&H Environmental Compliance received a performance rating of excellent in 2003.

In order to address ES&H expectations for the FY04 PEP, assurance teams have been established through line implementation working group (LIWG) in the following areas:

- Environmental Compliance
- Emergency Management
- Non-Nuclear Safety Basis
- Self-Assessment
- Issues Management
- Occurrence Reporting/ Lessons Learned
- Performance Indicators, and
- Work Control

Each team has established membership, charter, and a project plan for FY04.

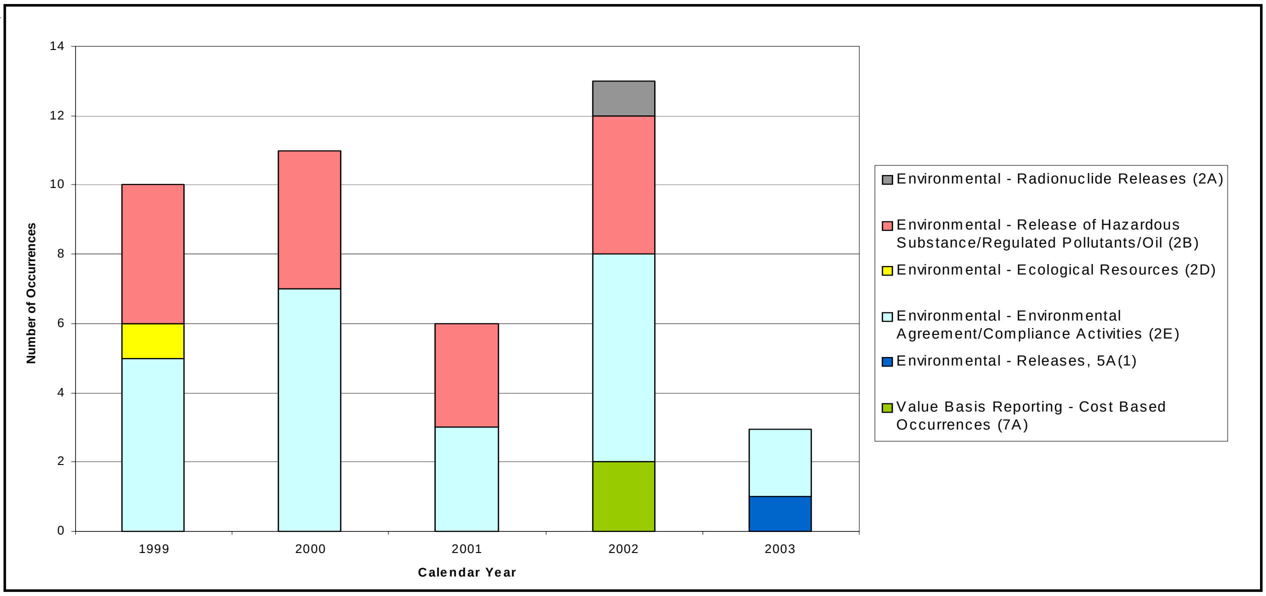


FIGURE 2-1. Environmental Occurrences for Five Years (1999 through 2003)

TABLE 2-4. Summary of Reportable Environmental Occurrences in 2003

Date	Occurrence Category	Description
January 2003	Off-Normal	Deterioration and instabilities of pH system components resulted in the loss of continuous pH monitoring capabilities at one of the five City of Albuquerque (COA) permitted monitoring stations operated by SNL/NM during November and December of 2002 and subsequent loss of continuous pH monitoring data. Details are summarized in Section 6.1.5.
November 2003	SC 2	An ES&H & Emergency Management Center sub-contractor was performing the routine process of discarding Corrective Action Management Unit (CAMU) sump leachate into the sanitary sewer line. They determined that the access hole was not a sanitary sewer line access point, but rather an access point for a water line valve. The leachate water was flowing out the bottom of the hole and directly into the surrounding soil. The Task Leader was informed that 220 gallons of leachate had been discharged into the ground instead of the sanitary sewer. This release exceeded the RQ release reporting requirements. Details are summarized in Section 6.2.2.
February 2003	Off-Normal	Approximately four gallons of diesel fuel were released to the concrete drive at the northwest corner of a building in TA-I. Approximately two gallons of fuel entered the storm drain. The fuel was released from a broken fuel line in a man lift being utilized to install security fencing on the roof of a building. Details are summarized in Section 6.2.2.

NOTE: Occurrences did not present any environment, safety or health issues.

NMED = New Mexico Environment Department
RCRA = Resource Conservation and Recovery Act
TA = Technical Area
EPA = U.S. Environmental Protection Agency
SNL/NM = Sandia National Laboratories, New Mexico
pH = potential of hydrogen (acidity)
SC = Significance Categories

TABLE 2-5. Environmental Program Audits and Appraisals Conducted In 2003

Appraising Agency	Title	Date	Summary
External Audits and Appraisals			
DOE OA	ES&H Emergency Management	January 2003	Office of Independent Oversight and Performance Assurance, ten findings in ES&H, one against SSO and nine against SNL/NM and seven findings in Emergency Management, two jointly against SNL/NM and SSO, and five against SNL/NM alone.
NMED	RCRA Compliance	February 2003	Preliminary information received from NMED indicated that there may be 37 potential violations from the Feb 2003 inspection. In 2003, no final inspection report was received from NMED.
Internal Audits and Appraisals			
DOE/SSO	SSO Programmatic Assessment of the Storm and Surface Water Program at SNL/NM	December 2002 – March 2003	The assessment resulted in four findings. Findings were focused around 1) the need for timely follow up actions by the line associated with quarterly inspections/observations and 2) the need to provide SSO with sufficient information so that all DOE required Notice of Intents regarding construction projects can be submitted to the EPA.
DOE/SSO	SSO Assessment Report for the Pulsed Power Development complex, TA-IV Lagoons permitted under the NMED Discharge Permit 530 at SNL/NM	May – July 2003	The assessment resulted in no findings.
DOE/SSO	SSO Assessment Report of the Integrated Safety Management System Controlling the Hazards Core Function at SNL/NM	June – July 2003	The assessment resulted in two findings. These findings were related to PHS questions, errors, and preparation.
DOE/SSO	SSO Assessment Report for the Pollution Prevention Program	September 2003	The assessment resulted in one finding. Internal performance metrics did not meet the 2005 DOE Leadership goals for Pollution Prevention.
DOE/SSO	SSO Open Burn Permit Process Assessment Reports for SNL/NM	September 2003	The assessment resulted in no findings.
DOE/SSO	SSO Assessment Report for Wastewater pH Monitoring Program	September 2003	The assessment resulted in no findings.
DOE/SSO	SSO Assessment Report for Groundwater Level Data Acquisition and Management for the Groundwater Protection Program	May 2003	The assessment resulted in no findings.
Inspections and Observations			
NMED	DP530 Pulsed Power Lagoons Inspection	May 2003	There were no findings.
NMED	NM Tech Vadose Zone Facility Inspection	May 2003	There were no findings.
COA	Wastewater Inspection	April 2003	COA inspection of 2069I flow basins. There were no findings.
COA	Wastewater Inspection	May 2003	COA inspection of 2069. There were no findings.

NOTE: DOE = U.S. Department of Energy
SSO = Sandia Site Office
SNL/NM = Sandia National Laboratories/New Mexico
OA = Office of Independent Oversight and Performance Assurance
EPA = U.S. Environmental Protection Agency
ES&H = Environment Safety and Health
NMED = New Mexico Environment Department
RCRA = Resource Conservation Recovery Act
COA = City of Albuquerque

TABLE 2-6. Summary of Sandia Corporation's 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 effective dose equivalent (EDE) to the maximally exposed individual (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
Reportable Quantity (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. As discussed in Section 2.1.2, there was one reportable release at SNL/NM under CERCLA or EPCRA in 2003. Details are summarized in Section 6.2.2.	NRC 40 CFR 302
Toxic Release Inventory (TRI) Report	EPCRA, Section 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 Corporation is not currently required to submit a TRI report because its chemical use is below the reporting threshold.	EPA 40 CFR 372, Subpart B
Notification of Discharge	NMED requires reporting of oil or other water contaminate, 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. Six surface discharge releases occurred in 2003. Details are summarized in Section 6.2.2.	NMED 20.6.2.1203 NMAC
Accidental Slug Discharge Notification	The City of Albuquerque 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. Two events were reported to the City of Albuquerque. Details are summarized in Section 6.1.5.	City of Albuquerque Ordinance § 6-3-5

NOTE: NESHAP = National Emission Standards for Hazardous Air Pollutants
NRC = U.S. National Response Center
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
SARA = Superfund Amendments and Reauthorization Act
EPCRA = Emergency Planning and Community Right-to-Know Act
EPA = U.S. Environmental Protection Agency
POTW = Publicly-Owned Treatment Works
SNL/NM = Sandia National Laboratories, New Mexico
NMED= New Mexico Environment Department
NMAC = New Mexico Administrative Code
CFR = Code of Federal Regulations

TABLE 2-7. Environmental Performance Measures

Measure	Performance Expectations, CY04
Total Recordable Case Rate	2.50
Days Away Case Rate	0.35
Days Away Rate	6.3
Hazardous Waste Generated	Less than or equal to 50 metric tons
Percent Solid Waste Recycled	45 %
Number of Notices of Violation	Less than or equal to 1
Amount of fines or penalties	$ 0

In this Chapter ...

Collared Lizard

Environmental Snapshot

- *The Environmental Education Outreach Program participated in the following events in 2003:*

  The School to World Conference

  National Atomic Museum Clean Earth Club

  Dia del Rio at the Albuquerque Aquarium

  New Mexico Environmental Health Conference

- *Waste placement into the Corrective Action Management Unit (CAMU) was completed in March 2003, and the facility was closed in October 2003.*

Chapter Three

Environmental Programs Information

Chapter Summary

Sandia Corporation began environmental monitoring of Sandia National Laboratories, New Mexico (SNL/NM) in 1959. Since then, Sandia Corporation established programs in Environmental Restoration (ER), Waste Management, Biological Control, Pollution Prevention (P2), Oil Storage and Spill Control, the National Environmental Policy Act (NEPA), and Environmental Education Outreach. There are also a variety of surveillance and effluent monitoring programs that are discussed in subsequent chapters of this report.

Sandia Corporation continued forward with many environmental initiatives and accomplishments. The ER Program, with recycling initiatives in place, actively remediated five sites in 2003. In anticipation of the closure of the ER Program in 2006, Sandia Corporation and the U.S. Department of Energy (DOE) worked with the public and key stakeholders to develop a draft Long-Term Environmental Stewardship (LTES) Plan (DOE/SNL 2001) to address future environmental responsibilities. A follow-on plan, which will include implementation activities, will be developed by Sandia Corporation and made available for public review. The plan is scheduled for completion in 2006.

SNL/NM has been recognized for various P2 awards including the U.S. Environmental Protection Agency's (EPA) "2003 Waste-Wise Federal Government Honorable Mention" award.

In 2003, SNL/NM received the following awards:

- The "White House Closing the Circle Award" for success in "Sustainability in SNL Buildings"
- The New Mexico Green Zia Award
- Three DOE P2 Awards

Demonstration of the groundwater model at the 2003 Dia del Rio event at the Albuquerque Biopark.

Environmental programs at SNL/NM are in place to protect the environment, safety, and health (ES&H) of its employees and the community. Sandia Corporation has established and implemented environmental management (EM) programs to meet or exceed the requirements of federal, state, and local environmental regulations. DOE Orders and Executive Orders (EOs) also serve to guide program criteria.

Commitment to Health and the Environment

It is the DOE, National Nuclear Security Administration (NNSA), Sandia Site Office (SSO) and Sandia Corporation's policy to minimize risks to the public and the environment to "as low as reasonably achievable" (ALARA) levels. For example, Sandia Corporation often exceeds regulatory requirements through Best Management Practices (BMPs) and P2 measures implemented on a corporate-wide basis.

Environmental Monitoring History at SNL/NM

Environmental monitoring began at SNL/NM in 1959 when the main 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.

3.1 Environmental Management System (EMS)

In 2003, SNL/NM updated the ES&H Policy, which is a Corporate Policy Statement Requirement. SNL/NM's strategy for managing and implementing the ES&H Program is described in the CPR400.1.2, Integrated Safety Management System (ISMS) (SNL 2003x).

SNL/NM has adopted the core values of: integrity; excellence; service to the nation and each other; and teamwork.

ISMS/EMS

SNL/NM's strategy for managing and implementing the ES&H Program is described in the CPR400.1.2, ISMS (SNL 2003x). More information about ISMS can be found in Chapter 8.

> **Sandia Corporation ES&H Policy**
>
> *The policy of Sandia Corporation is to protect and preserve the environment, safety, and health of its personnel, contractors, visitors, and the public. Sandia Corporation shall make deliberate efforts to reduce hazardous exposures and releases to as low as reasonably achievable (ALARA) considering technical, economic, and social factors.*
>
> *Concern and conduct in matters pertaining to ES&H are the responsibility of all Sandia Corporation employees, contractors, and visitors.* ***No job is more important than your health, your safety, and the protection of our environment.***
>
> *Sandia Corporation's ES&H program mandates compliance with all applicable laws, regulations, and DOE directives (included in the Management and Operating Contract [MOC]) and adheres to the principles of line management responsibility for ES&H as described in Sandia Corporation's ISMS.*

In 2003, DOE Order 450.1, Environmental Protection, was added to the Maintenance and Operation (M&O) Contract, which requires that select DOE facilities have an EMS implemented by 2005. SNL/NM has benchmarked EMS guidance from other DOE sites, DOE Orders and EOs, the EPA, and the International Standards Organization (ISO) 14001, to expedite and improve their program. SNL/NM continued to make progress on developing, and integrating the EMS elements into the ISMS. Additionally, EMS progress has been added as criteria in the Performance Evaluation Plan (PEP) with DOE.

In 2003, SNL/NM began work on a more formal aspects/impacts analysis based on EPA and DOE guidance. The aspects/impacts analysis will be completed in 2004 and then corporate goals and objects will be aligned with the current aspects/impacts data.

In 2003, SNL/NM updated two internal classes, ES&H 100 and Hazardous Waste & Environmental Management, to include guidance on EMS and integration of hazards recognition.

3.2 ER Project

Sandia Corporation's ER Project was created under the DOE Office of EM to identify, assess, and remediate sites potentially contaminated by past spill, release, and disposal activities. The remediation and cleanup of areas of past contamination at SNL/NM are regulated by 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). Specific requirements for SWMUs are described in Module 4 of Sandia Corporation's RCRA Part B Operating Permit. SWMUs that must be addressed are listed in the RCRA Part B Operating Permit.

There are some additional sites at SNL/NM not regulated as SWMUs (primarily closed-out septic systems) that are also under ER investigation. These sites were not identified at the time of issuance of Module 4 of the RCRA Part B Operating Permit; they are being investigated and addressed in the same manner as if they were listed on the permit.

SNL/NM, DOE, and the New Mexico Environment Department (NMED) negotiated a Compliance Order on Consent during 2003 that was signed in April 2004. Agreement has been reached on issues such as milestones, schedules, and stipulated penalties for non-compliance. It supports the goal of completing the ER Project by the year 2006.

3.2.1 Cleanup and Site Closures

Waste generated from SNL/NM ER sites includes RCRA-hazardous waste, radioactive low-level waste (LLW), mixed RCRA, mixed low-level waste (MLLW), Toxic Substances Control Act (TSCA) waste (primarily polychlorinated biphenyls [PCBs] with some asbestos), and industrial solid waste. The waste management section in this chapter shows the waste volumes generated by the ER Project.

No Further Action (NFA) Status

ER sites are proposed for NFA based on insignificant contamination present or after remediation has been completed. At SNL/NM, remediation is accomplished through Voluntary Corrective Measure (VCMs) or Voluntary Corrective Actions (VCAs). Once the NMED grants NFA status, the site is removed from the RCRA permit, although responsibility for any future actions, should they become necessary, remain with the site owner. The majority of ER sites are granted NFA status under a risk based scenario. Risks to human health and the ecosystem are calculated according to guidance from the EPA and the NMED. Risk is calculated for sites with residual contamination. The level of contamination remaining and the appropriate land-use category (i.e., industrial use, residential use, or recreational) are used as input to determine any remaining risk to human health and the ecosystem. This method is used to ensure these calculated risks are small enough to warrant NFA status.

Table 3-1 shows the ER Project status since 1992. Sandia Corporation continues to actively pursue the closure of proposed NFA sites by working with the NMED to provide adequate verification for a successful determination.

3.2.2 2003 Status and Activities

At the close of 2003, there were 125 regulated ER sites remaining on Sandia Corporation's RCRA Part B Operating Permit and five sites were being actively remediated at SNL/NM. In 2003, 15 sites were proposed for NFA, but no sites actually received final Class III Permit modification. All NFA proposals and Class III Permit modifications are available for review at the University of New Mexico (UNM) Zimmerman Library and Community Resources Information Office (CRIO).

ER Project History

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

ER Project Awards and Commendations

All performance measures were completed on or ahead of schedule. In addition, the ER Project received the "Green Zia Environmental Excellence Award" from the NMED for the fourth time in as many years.

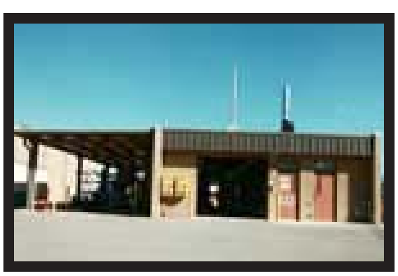
TABLE 3-1. Summary of ER Project Status

	A	B	C	D	E*	F**
Year	**Total ER Sites at Start of FY**	**ER Sites Proposed for NFA in FY**	**Sites Approved for NFA in FY**	**Corrective Actions Completed by End of FY**	**New ER Sites Identified During FY**	**Total ER Sites at End of FY**
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	48	28	3	0	191
1993	219	0	0	0	0	219
1992	172	0	0	0	47	219

NOTE: FY = Fiscal Year
ER = Environmental Restoration
NFA = No Further Action
Column A is the Total ER Sites remaining to be removed from the RCRA Permit
*One Drain and Septic System (DSS) Area of Concern was determined to be active in Fiscal Year (FY) 2003, effectively reducing the number of sites remaining on the permit.
** Column totals: F = A - C + E
Some of the original 219 sites included Tonopah Test Range (TTR), Kauai Test Facility (KTF), and other off-site areas in New Mexico and internationally.

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 regulatory 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 Sandia Corporation's past operations. In addition to the SNL/NM site, other sites included in the original scope of Sandia Corporation'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, both nationwide and internationally.



A view of the HWMF

Currently, the only ER sites remaining to be addressed are located at SNL/NM. All other sites have been closed out or transferred to other agencies. All ER sites at SNL/NM are scheduled for completion in 2006 with LTES to follow.

CAMU

The CAMU is permitted under RCRA and TSCA for the management of remediation waste (primarily contaminated soil) generated during the VCA conducted by the ER Project at the Chemical Waste Landfill (CWL). Storage, treatment, and containment activities are authorized under the CAMU permit (EPA 1997). Details of CAMU operations and closure requirements are contained in the CAMU permit application (SNL 1997e). Closure requirements under TSCA were established in the TSCA Permit (EPA 2002a).

The CAMU is located in Technical Area (TA) III next to the CWL and RMWMF. Construction of the CAMU began in December 1997, and was completed in March 1999. The CAMU began accepting waste from the CWL for storage in January 1999. Waste treatment activities began in August 2002 and were completed by January 2003. Waste placement into the CAMU containment cell began in September 2002 and was completed by March 2003. The staging, treatment, and support

Project Highlights

Of the sites undergoing remediation in 2003, the CWL is highlighted:

CWL (ER Site 74) – Over 52,000 cubic yards of soil, buried debris and chemical wastes were excavated from the CWL between 1998 and 2002. Once completed, the floor and sides of the excavation and the surrounding operational areas were sampled to ensure that the remaining soil met risk-based clean-up criteria. By the end of 2003, approximately 80% of the excavated debris had been disposed at commercial off-site facilities, with the remaining debris, chemicals, and drummed soils pending off-site disposal in 2004. A final report detailing the excavation project was submitted to the NMED in April 2003 followed by backfilling of the remainder of the excavation in October 2003. The backfilling effort is expected to continue into early next year and will form the sub grade for the final remedy. This final remedy selection process was initiated in May 2003 with the submission of a class 3 permit modification request to the CWL Closure Plan. This modification request contained three documents as required by the Closure Plan. These included a Correctives Measure Study Report, a Remedial Action Proposal, and a Post-Closure Care Permit and Application. NMED review and public comment on these documents is expected to occur in 2004.

areas at the CAMU were clean-closed under the RCRA and TSCA provisions as outlined in the Closure Plan (SNL 2002h) and all hazardous waste and hazardous waste residues were removed. The CAMU containment cell was closed with waste remaining in place.

The CAMU containment cell design consists of engineered barriers and incorporates a bottom liner system, a final cover 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), vertical sensor array (VSA), and CWL and sanitary sewer line (CSS) monitoring subsystems.

VZMS monitoring of the containment cell continued on a monthly basis throughout 2003. The PSL, VSA, and CSS monitoring subsystems were monitored for the composition of soil gasses and soil moisture content. Monitoring results for 2003 were generally consistent with baseline data established between January 1999 and December 2000. VZMS monitoring results are compiled and reported on an annual basis; the most recent report was submitted in September 2003 (SNL 2003cc). The annual VZMS monitoring reports are submitted to NMED as required by the CAMU Permit (the EPA also receives a copy).

The majority of waste treatment and placement activities at the CAMU were completed by late 2002. Two treatment processes, Low Temperature Thermal Desorption (LTTD) and stabilization treatment (ST), were used as needed to treat soil wastes before they were placed in the containment cell. LTTD treatment operations were completed in December 2002. The remaining ST treatment activities at the CAMU were performed during January of 2003. During that time, a total of 1,300 yd^3 of soil was stabilized using the ST unit and placed in the containment cell. Of that amount, 100 yd^3 also contained PCB contamination that was placed in the containment cell in accordance with permit requirements. In addition, a total of 8,400 yd^3 of soil not requiring treatment was placed in the containment cell in 2003.

CAMU closure activities were initiated in late January 2003, which included identification and removal of stained areas, decontamination, sampling, and the construction of a final cover system of the CAMU containment cell to encapsulate the newly placed remediation waste. Upon completion of closure activities, the CAMU was certified closed on October 15, 2003, in compliance with the closure requirements documented in the RCRA Closure Report (SNL 2003w). The portion of the CAMU where waste remains (CAMU containment cell) will continue to be monitored and maintained in accordance with post-closure requirements.

Treatment process for contaminated soil

3.2.3 LTES Activities

Sandia Corporation's LTES activities have been increasing as the ER Project completion date of 2006 approaches. The ER Project is focusing on project closure, while also working with the SNL/NM Environmental Management (EM) Department on transitioning LTES activities to EM. The SNL/NM LTES team is taking steps to identify the issues, discuss them, and develop sensible, amicable, and cost effective solutions for the stewardship of our natural resources. In order to best address issues, LTES activities are being addressed through five internal focus groups management and administration, community outreach, monitoring, institutional controls and information management. Regulatory and DOE requirements for LTES are being reviewed, as well as suggestions generated by KAFB tenants and stakeholders.

LTES Draft Plan

A task group of local stakeholders identified 17 areas in Chapter 6 of the draft LTES Plan (DOE/SNL 2001) as needing further information or resolution. These areas were identified as needing further information or resolution. The Task Group ensured that each area was being appropriately addressed in a way that would support project completion by 2006, and updated the plan accordingly. A follow-on LTES Plan, which will include implementation activities, will be developed by Sandia Corporation and made available to the public for review. This plan is scheduled to be completed in 2006.

External Web Site

A task group of local stakeholders created a set of recommendations for website management, maintenance, and a phased approach to inputting Sandia-specific contents. A website that combines LTES and ER information was developed and can be accessed as follows:

http://www.sandia.gov/ltes/

This external website allows members of the public to view information about all ER sites.

Sandia Corporation worked with the Bernalillo County Environmental Health Department's LandTrek pilot project to create a clickable map of KAFB that identified ER site locations. Further enhancements to the site are planned since members of the public stressed the importance of accessing site information through a link with Bernalillo County.

Long-Term Monitoring

Long-term monitoring requirements for LTES are currently in development. Individual sites, such as the CWL, MWL, and CAMU will have site-specific care plans approved by the NMED. The process for generating these plans includes input from stakeholders. Most of the ER Project's sites will be closed to a residential risk-level.

Public Outreach and Education

A task group of local stakeholders, with additional funding from Sandia Corporation, were able to assist WERC (a consortium for environmental education and technology development established through a cooperative agreement with DOE) with the implementation of a summer program involving high school students and teachers. This week long hands-on program helped the students and teachers learn about LTES.

3.3 Waste Management

With hundreds of individual research laboratories, SNL/NM generates over 15,000 different waste streams. Waste at SNL/NM is processed at three facilities: the Hazardous Waste Management Facility (HWMF), the Radioactive and Mixed Waste Management Facility (RMWMF), and the Solid Waste Transfer Facility (SWTF). The primary waste types handled by these waste management facilities are shown below.

3.3.1 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. 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 chemical materials.

All waste is reviewed at the HWMF before being placed in temporary storage. After sufficient quantities of items have accumulated in the 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, and disposal (TSD) facility or recycling center. Waste is usually processed and shipped off-site within 90 days of receipt.

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

2003 Activities at the HWMF

In 2003, a total of 11,979 package items were handled by the HWMF. The HWMF shipped a total of 339,866 kg (747,705 lb) of RCRA-regulated hazardous waste (including recyclable waste). Specific waste categories handled and shipped in 2003 are shown in Table 3-2.

Recycling

Sandia Corporation 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 1,466 kg (3,232 lb) of RCRA hazardous waste and 8,423 kg (18,570 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-PCB ballasts, lead, and capacitors. A total of 55,945 kg (123,338 lb) of material was recycled in this category. Waste recycled at SNL/NM in 2003 is shown in Table 3-3.

Asbestos Waste Handling

The abatement of asbestos-containing equipment and building materials is ongoing. Asbestos material removal is only done if the material presents an inhalation hazard, or if the building is to be torn down or renovated. Typical asbestos-containing building materials consist of 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 is allowed to remain in service or is redistributed through the property reapplication program. Typical asbestos waste generated from equipment abatement consists of fume hoods, ovens, and cable insulation. In 2003, a total of 173,826 kg (383,222 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.

Sandia Corporation has identified and replaced most PCBs and PCB-containing equipment. The largest source of regulated PCBs that remain in use at SNL/NM are capacitors contained inside fluorescent light ballasts manufactured before July 2, 1979. Other than fluorescent light ballasts, ten PCB regulated items remain in use or storage for reuse at SNL/NM. Eight areas of existing PCB spill contamination at SNL/NM are being actively managed through a regulatory use authorization. Significant quantities of PCB-contaminated soils were generated in 2003 as a result of the ER Project at the CWL.

SNL/NM's Radioactive Waste

LLW *- Low Level Waste (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 Corporation's LLW inventory is radioactively-contaminated soils excavated from ER sites, decontamination and demolition (D&D) debris, personnel protection equipment (PPE), and laboratory waste.*

MLLW *- Mixed Low Level Waste (MLLW) generally consists of the same materials as LLW, with the addition of RCRA-hazardous components such as metals and solvents. The radioactive component in mixed waste (MW) results primarily from tritium, cesium, strontium, plutonium, americium, and uranium.*

TRU *- Transuranic Radioactive Waste (TRU) 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.*

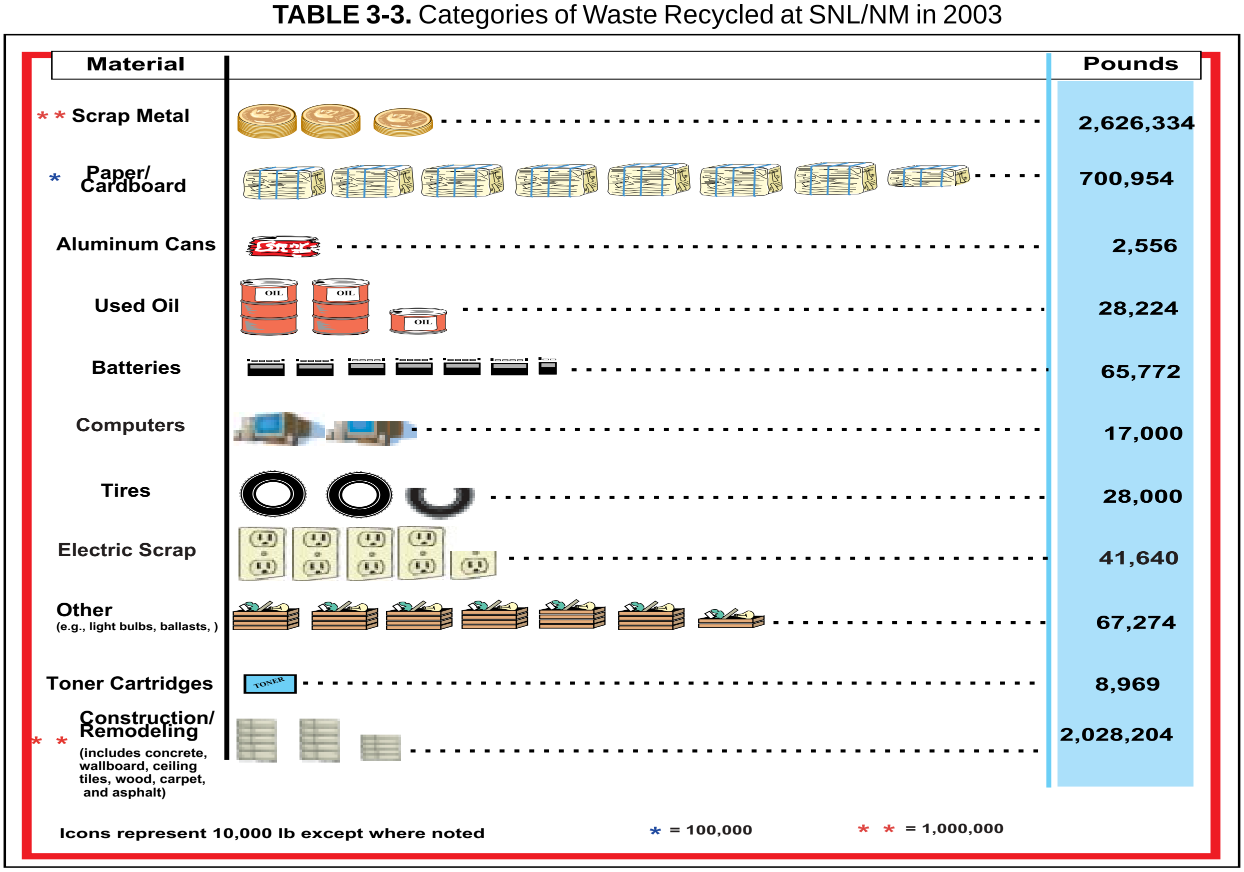
TRU/MLLW *- A combination of radioactive and hazardous waste as described above.*

TABLE 3-2. Waste Shipped By the HWMF in 2003

Waste Categories Handled at the HWMF	2003 Waste Shipped	
RCRA Waste	**(kg)**	**(lb)**
Hazardous Waste	116,921	257,767
Hazardous Waste (Generated by ER Project)	86,349	190,368
Hazardous Waste (recycled)	1,466	3232
Total	**204,736**	**451,367**
TSCA		
Asbestos	173,826	383,222
PCB (recycled NR)	2,446	5393
PCB (recycled RCRA)	8	18
PCB (incin NR)	23	51
PCB (incin RCRA)	135,122	297,894
Total	**311,425**	**686,577**
BIOHAZARDOUS		
Infectious Waste	**357**	**787**
OTHER		
NR Waste (minus asbestos, PCB, subtitle D, ER, recycled)	28,002	61,734
Non-hazardous Solid Waste (RCRA Subtitle D)	1,467	3,234
Non-RCRA (Generated by ER Project)	3,997	8,812
Used Oil	8,423	18,570
Lead (recycled)	23,714	52,281
Other (recycled) – various batteries, fluorescent lamps, and non-PCB (ballasts, capacitors, and oils)	55,945	123,338
Total	**121,548**	**267,969**
Total Waste and Recyclables Shipped	**638,066**	**1,406,700**

NOTE: RCRA = Resource Conservation and Recovery Act
TSCA = Toxic Substances Control Act (primarily regulates asbestos and PCBs)
PCB = Polychlorinated Biphenyl NR = non-regulated
ER = Environmental Restoration kg = kilograms
lb = pounds HWMF = Hazardous Waste Management Facility

TABLE 3-3. Categories of Waste Recycled at SNL/NM in 2003



Sandia Corporation met the 2003 milestone deadline set forth in the Federal Facility Compliance Order (FFCO) and Site Treatment Plan (STP) regarding the treatment and shipment of specific MW stored at SNL/NM (SNL 2003g). Sandia Corporation submitted an annual update for the STP covering FY 2002 activities by the March 2003 deadline (SNL 2003g).

In 2003, a total of 137,599 kg (303,356 lb) of PCB waste was shipped from the HWMF; 135,145 kg (297,945 lb) of PCB-contaminated soil and other PCB waste was shipped for disposal; and 2,454 kg (5,411 lb) of PCB waste was shipped for recycling.

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. SNL/NM operates the Thermal Treatment Facility (TTF), a unit permitted for the treatment of certain explosive waste streams; however, no waste was treated at the TTF in 2003. In 2003, 6,290kg (13,855 lb) of explosive waste was transferred to KAFB for treatment, and two large rocket motors totaling 6,769 kg (14,910 lb) were shopped to Hill Air Force Base in Utah for treatment.

3.3.2 Radioactive and Mixed Waste (MW)

The RMWMF manages LLW, MLLW, transuranic (TRU), and TRU/MLLW. No high-level radioactive waste (HLW) is generated at SNL/NM. The waste processing functions at the RMWMF include waste characterization, segregation, treatment, packaging, storage, and shipment to permitted off-site facilities. Although Sandia Corporation 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 radioactive and MW generators must contact the Radioactive Waste Program before generating waste and obtain prior approval. This will ensure that a proper waste pathway is in place before any waste is generated. Normally, radioactive waste is shipped off-site within a one-year time frame in accordance with DOE Orders. This is similar to the RCRA mandates for hazardous waste and MW. Some LLW may remain on-site greater than one year. Generally, this is due to fully utilizing transport vehicles to ensure that the vehicles are full prior to leaving the site.

Applicable DOE Orders and regulations for radioactive waste and MLLW management are listed in Chapter 9.

Radioactive Waste Storage
Radioactive waste generated from SNL/NM is temporarily stored at the RMWMF and Manzano Storage Bunkers. TRU and TRU/MW will be routed through Los Alamos National Laboratory (LANL) or directly to the Waste Isolation Pilot Plant (WIPP) for final disposal.

2003 Activities at the RMWMF
In 2003, the RMWMF managed all four waste types (LLW, MLLW, TRU, and TRU/MW). LLW was shipped to permitted off-site facilities for treatment and disposal.

In 2003, the RMWMF shipped 106,585 kg (234,486 lb) of LLW, 0 kg (0 lb) of MW, and 0 kg (0 lb) of TRU waste at SNL/NM. A five-year summary of radioactive waste shipped at SNL/NM during 2003 is shown in Figure 3-1. Production facilities make up the bulk of LLW managed at the RMWMF.

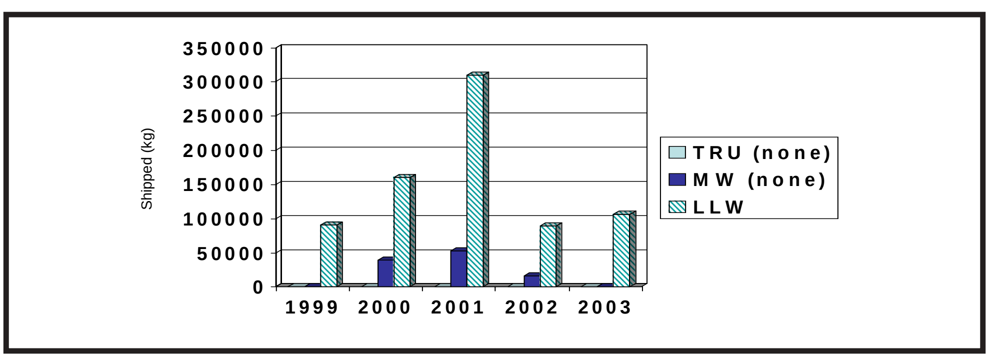


FIGURE 3-1. Five-Year Summary of Total Radioactive Waste Shipped at SNL/NM

3.3.3 MW Regulatory Status

As discussed in Section 2.1.4, Sandia Corporation manages MW in compliance with the Federal Facility Compliance Order (FFCO) (NMED 2003). 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 managed is shown in Table 9-3.

MW Treatment
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 Table 9-4 are performed on-site at the RMWMF: chemical deactivation (including potential of hydrogen [pH] neutralization), thermal deactivation, stabilization, macroencapsulation, and physical treatment (volume reduction). These are described in the current RCRA Part B Operating Permit application (submitted to NMED in 2002).

Status of MW Management in 2003
The majority of MW now being stored on-site consists of low-level radioactive oils and absorbed oils, and radioactive metallic objects with RCRA metals. No off-site MW was received from other DOE sites in 2003.

In 2003, SNL/NM did not ship any MW to off-site facilities; however, 1,457 kg (3,212 lb) of MW was treated at the RMWMF. Of the treated waste, 77.5 kg (171 lb) were rendered non-hazardous.

3.3.4 Solid Waste

The primary purpose of the SWTF is to accept, screen, bale, and ship SNL/NM generated commercial solid waste for disposal in compliance with all applicable regulation. The SWTF also accepts KAFB and DOE/NNSA commercial solid waste for the same purpose. The secondary purpose of the SWTF is as a recycling center for SNL/NM, KAFB, and DOE/NNSA.

Applicable DOE Orders and regulations are listed in Chapter 9.

SWTF Operations
All solid waste accepted at the SWTF must be non-hazardous commercial solid waste. The SWTF does not accept food service waste, radioactive, explosive, or other hazardous waste streams. The SWTF accepts construction and demolition waste, but does not screen or bale it and it is managed separately from the commercial solid waste.

In 2003, the SWTF received 1,028,805 kg (2,268,127 lb) of SNL/NM commercial solid waste and 1,404,117 kg (3,095,549 lb) of KAFB commercial solid waste.

Recyclables
The SWTF is the recycling center at SNL/NM for the following materials: cardboard, white paper, mixed paper, aluminum cans, toner cartridges, plastics, and unusable computers (Table 3-3). Proceeds from the sale of recyclable materials are proportionately divided among the participants and are used to increase recycling programs.

In 2003, construction began on an expansion to the SWTF to collect construction waste materials for recycling. Scrap metal, wood, wallboard, carpet, cardboard, and wire from on-site construction projects will be collected and delivered to off-site facilities for recycling.

SNL/NM is interested in expanding recycling capabilities to include additional materials. An assessment was conducted to investigate several waste materials for recycling potential and evaluate options and priorities. Such an evaluation consists of identifying the current disposition pathways, quantity generated of wastes, availability of recycling resources/options, and potential for recycling implementation. Sixteen materials were reviewed for diverting from the solid waste stream and the highest priority items will be investigated first for future implementation.

3.4 Waste Minimization and P2 Programs

3.4.1 Program Scope

The focus of the P2 Program is to reduce resource use, generated waste, and enhance the overall efficiency of processes and organizations within SNL/NM. The program focuses on reducing all waste streams, air emissions, water discharges, and hazardous, radioactive, and solid wastes. Additional efforts focus on energy and water conservation as well as reduction of overall impacts to the environment. P2 also assists SNL/NM's line organizations to meet regulatory goals associated with recycling, waste generation, purchase of material containing recycled content, and reduction of energy use.

The P2 Program forms partnerships with numerous organizations at SNL/NM, including line organizations and ES&H personnel. P2 also researches waste reduction technologies and products applicable to SNL/NM work processes, performs cost-benefit analyses, and locates funding for new waste reduction processes. Waste minimization and P2 requirements are promulgated by federal EOs as listed in Chapter 9.

<u>P2 Awards</u>

In 2003, SNL/NM received several awards for P2 accomplishments:

Green Zia

SNL/NM received recognition by the NMED for participating in NMED's prestigious Green Zia Environmental Excellence Program. Green Zia is a voluntary program, which encourages participating organizations to develop a system to improve their overall efficiency. Program criteria includes environmental leadership, employee involvement, community involvement, energy conservation, P2 and continuous environmental improvement. Companies that have shown significant efforts can qualify for one of three award levels: Commitment, Achievement, and Environmental Excellence. This is the fourth year SNL/NM organizations have won recognition for their efforts toward excellence. However, this is the first year a site-wide submittal was attempted in the commitment level. In September 2003, Governor Bill Richardson acknowledged SNL/NM's efforts with Green Zia Awards:

<u>Commitment level</u>
Sandia Site-wide

<u>Achievement Level</u>
Fleet Services, Manufacturing Science and Technology, Neutron Generator Production Facility (NGPF)

EPA WasteWise Award

The EPA selected SNL/NM as "2003 Waste Wise Federal Government Honorable Mention" in recognition of accomplishments in the federal government category. The award recognizes noteworthy practices for waste prevention, recycling, and purchasing of recycled-content products. This award specifically recognized SNL/NM for its efforts in purchasing environmentally preferable products, continuing to collect large amounts of recycling every year, and making great efforts to reuse materials.

White House Closing the Circle Award

As a result of receiving a DOE Award for P2 accomplishment in 2002, SNL/NM was considered and was awarded a 2003 "White House Closing the Circle Award" for successes in "Sustainability in SNL Buildings."

DOE Awards for P2 Accomplishments

SNL/NM received three awards in 2003 from the national P2 program. The awards allow SNL/NM to be considered for the prestigious "White House Closing the Circle Award" to be presented in CY 2004.

• *Affirmative Procurement Category:* <u>Green Construction Purchasing.</u> SNL/NM has been continuously improving its purchasing system for construction contracts for several years. This year, a contractual requirement for reporting combined with training, compliance inspections and performance monitoring increased purchases of material containing recycled content by over $300,000 or 40% over purchases made last year.

• *Recycling Category:* <u>Construction Waste Management Team.</u> SNL/NM developed a construction waste recycling program for new building construction projects. The program consists of four key aspects: 1) Identification of Recycling Pathways, 2) Contractual Recycling Requirements, 3) Planning and 4) Tracking and Reporting Performance. This year, the first major construction project that fully implemented the comprehensive waste recycling program successfully diverted over 80% (by weight) of all waste materials generated from direct landfill disposal. The results from this project are being incorporated as standard practice into new construction projects.

• *Sustainable Design (SD) Category (SD Team):* To ensure that SD principles are integrated in all construction efforts, SNL/NM conducted a Sustainable Design Integrated Education Series. This series of seven specific workshops was designed to educate all parties involved with building design and construction on the SNL/NM requirements and the benefits and requirements of recycling, purchasing recycled content and environmentally preferable products, energy efficiency, water conservation and the related environmental performance of buildings. The workshops that utilized in-house experts, drew 289 design and construction professionals from SNL/NM and the local community.

3.4.2 Environmentally Preferable Purchasing (EPP) Program

SNL/NM seeks to purchase environmentally preferable products and employ the most environmentally aware companies. SNL/NM communicates these requirements through its contracts. SNL/NM has issued dedicated contracts to supply some items, and where a dedicated contract is not appropriate, EPP requirements are included in Request for Proposals (RFPs) and used to evaluate the award of a contract. Remanufactured toner cartridges, paper and re-refined motor oil are all purchased using dedicated contracts. The toner cartridge and motor oil contracts also require the vendor to collect and recycle their used product.

Thanks to efforts by SNL/NM's Green Procurement team, contract language was revised to ensure that building construction completed at SNL/NM now requires contractors to report their purchases of recycled-content materials. Construction specifications will soon require construction contractors to purchase environmentally preferable materials for many applications.

SNL/NM's Fleet management and SNL/NM's Green Procurement Team worked diligently to revise Fleet's Just in Time (JIT) Auto Parts Contract to include environmentally preferable chemical purchases.

In 2003, 94% of the construction materials, vehicle products, landscape products, paper products, and non-paper office products purchased by SNL/NM met the EPA's recommendations for recycled content and EPP.

3.4.3 SD Concept

The SD concept addresses the design of resource productivity and P2 for life cycle savings into a facility's construction and operation. Synonymous with green building and high-performance building, SD strives to balance environmental responsibility, resource efficiency, occupant comfort and well-being, and community sensitivity. Aspects of SD include: proper site selection and environmentally preferable materials; recycling construction waste; enhancement of the indoor environmental quality through the use of daylighting, proper controls and elimination of indoor air pollutant sources.

Integrating SD into construction projects at SNL/NM involves the collaborative effort of project managers, building owners, operations, maintenance personnel, environmental professionals, engineers and architects. Design Team members look at materials, components, and systems from different perspectives and work together for the optimum solution. The solutions are based on the following parameters:

- quality of workplace
- initial cost
- life cycle cost
- overall efficiency
- environmental impact
- productivity
- creativity
- future flexibility

SNL/NM has taken steps to ensure that all construction projects institutionalize SD principles as part of the basic design requirements. Architects are evaluated and chosen to design new facilities partially based on their experience with SD. Construction specifications require the use of environmentally preferable products and the selection of energy and water efficient equipment. At the end of projects, required reports summarize the sustainable elements that were included in the completed building. SNL/NM has implemented SD into recent projects using the U.S. Green

Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system. Because of SD practices, a 30 percent reduction in energy costs is expected in new facilities and applications are being submitted for new buildings to obtain U.S. Green Building's LEED certifications. SD was integrated into the following construction projects at SNL/NM:

The Joint Computational Engineering Laboratory (JCEL)
The JCEL facility construction is complete and the building will soon be occupied. SD principles were incorporated early in the design of the 56,000 sq ft facility. Design charrettes emphasized mutual agreement on performance metrics for evaluation of SD. An SD report is included as part of the project's deliverables. Some of the key aspects of the JCEL design include extensive use of daylighting, a water efficient, native landscape, selection of environmentally preferable materials and recycling 82% of construction waste. JCEL will be SNL/NM's first official Green Building.

Microsystems and Engineering Sciences Application (MESA)
The MESA project is currently under construction and consists of three separate buildings, a semi-conductor fabrication plant, a laboratory, and an office complex. This 377,000 sq ft complex is projected to have a $1.9 million energy bill and use 100 to 125 million gallons of water annually. Advanced energy efficiency incorporated into the design criteria are expected to reduce energy use by 30%. Process water will be recycled and reclaimed, eliminating the need to use additional water from the aquifer. The MESA complex features a sustainable landscape that links the buildings together in a campus design. The Design Team also agreed to follow the "Labs for the 21st Century" approach that includes whole building design, lifecycle cost analysis as a decision-making tool, and whole building commissioning. Each building incorporated SD features through an integrated process and will be LEED certified.

Center for Integrated Nanotechnologies (CINT)
The design is complete on CINT, which incorporated sustainability and respect for New Mexico's cultural past into the buildings operation and architecture. Located outside the secured TAs, it will be a feature building for SNL/NM, emphasizing public/private collaboration on nanotechnology research and education. The building includes a healthy working environment, efficient heating and cooling, environmentally preferable material selection, whole-building commissioning and a landscape that complements the surrounding short grass prairie.

3.4.4 Waste Reduction and Recycling

SNL/NM continues to reduce volumes of generated waste and improve recycling programs. Through an analysis known as P2 Opportunity Assessments (PPOA), processes generating wastes are routinely assessed and waste stream methods are established.

Three Views of the Joint Computational Engineering Laboratory

The Materials and Process Sciences Center recognized the environmental impacts associated with the disposal of mercury (Hg) thermometers. Individuals in the organization took the initiative to eliminate all Hg-containing equipment from all their buildings and Sandia Corporation upper management ensured everyone complied with this new ban.

The SNL/NM Manufacturing, Science and Technology Center utilized its Lean Manufacturing quality program to reduce waste acetone in a cleaning process. In this "Green Belt Event," a team reviewed the process and developed ways to improve its efficiency, which included reduced purchases of acetone, labor hours, and disposal costs. The overall savings is about $17,000 annually. By combining waste reduction concepts with lean manufacturing principles, the effort integrated P2 into daily business operations.

As described under the Waste Management sections of this chapter, SNL/NM routinely recycles a variety of materials at our waste management facilities. Additionally, Fleet Services sends tires to be retreaded and the Facilities Department sends construction materials and demolished building components, such as concrete, for recycling. Computers that are usable are donated to local schools and toner cartridges are sent for remanufacturing. Table 3-3 summarizes the quantities of materials that SNL/NM recycled during 2003 in all categories. In 2003, 38% of the materials that could have become solid waste disposed in a landfill were diverted for recycling.

3.5 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 assisting in resolving nuisance animal problems are relayed and documented through Sandia Corporation's Facilities Telecon and Industrial Hygiene. This effort may entail interfacing, as necessary, with 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 such as disinfecting, sanitizing, and cleanup of 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 Corporation uses EPA-registered pesticides that are primarily 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) is documented in quarterly reports. Documents related to the program are listed in Chapter 9.

3.6 Oil Storage and Spill Control

SNL/NM has an oil storage capacity of 5.5 million gallons. In 2003, DOE/NNSA/SSO-owned 98 regulated containers, including oil-containing equipment, transformers, underground storage tanks (USTs), and above-ground storage tanks (ASTs). EPA's revised oil storage regulations that encompass equipment and containers with a capacity of 55 gallons or more has expanded SNL/NM's list of regulated items to over 700 (effective August 17, 2004), the majority of which are transformers. All oil containment 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. The preparation of a Spill Prevention Control and Countermeasures (SPCC) Plan is required under the Clean Water Act (CWA). SNL/NM's SPCC Plan was revised in 2003 to incorporate changes to 40 CFR 112 that EPA made in 2002. 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, 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.

Sandia Corporation's SPCC Plan describes oil storage facilities and the mitigation controls in place to prevent inadvertent discharges of oil (SNL 1999e). Regulated facilities are those that contain 660 gallons of oil or more in one container or 1,320 gallons of oil in multiple containers at one location. Facilities at SNL/NM subject to the regulations include:

- Oil storage tanks (USTs and ASTs),
- Bulk storage areas (multiple containers),
- Electrical transformers and substations,
- Temporary or portable tanks, and
- Other oil-containing equipment with a capacity of 55 gallons or more.

USTs

In 1990, the State of New Mexico adopted federal standards contained in RCRA Subpart I for USTs. There are three fiberglass USTs in inventory at SNL/NM: two 20,000 gallon tanks and one 9,750 gallon tank. Program documents and applicable regulations are listed in Chapter 9.

ASTs

In 2002, New Mexico passed oil storage regulations that required the registration of all oil storage tanks with a storage capacity greater than 1,320 gallons. SNL/NM registered 20 ASTs to comply with the regulations. The list of ASTs can be found in Table 9-1. In 2003, New Mexico changed the regulations. New Mexico currently requires oil storage tanks with a capacity between 1,320 gallons and 55,000 gallons to be registered. SNL/NM will be required to register only three ASTs in 2004.

3.7 NEPA Compliance Activities

NEPA Program

Sandia Corporation's NEPA Compliance Program provides DOE/NNSA/SSO with technical assistance on NEPA and the National Historic Preservation Act (NHPA). Under a self-managed program, Sandia Corporation personnel review projects for conformance to existing DOE NEPA documents and determinations. The use of the Integrated Safety Management System (ISMS) Software NEPA Module facilitates SNL/NM internal project reviews (citing existing NEPA documentation such as the Site-Wide Environmental Impact Statement [SWEIS]), and streamlines NNSA/DOE/SSO's review and approval of NEPA checklists, when required. The NEPA Module also supports NEPA review Quality Assurance (QA) by providing a consistent framework that makes NEPA compliance documentation and information readily available. For some projects, a NEPA checklist or an AF Form 813 is prepared for DOE determination, if the proposed action:

(1) Does not fall within an existing SNL/NM NEPA document, or

(2) Would occur on USAF property.

NEPA program documents and regulations are listed in Chapter 9.

Part of the self-managed NEPA program at SNL/NM includes the training and employing of Qualified NEPA Reviewers (QNRs). Once qualification requirements are met, QNRs are able to use the ISMS NEPA Module software (under the initial supervision of NEPA Subject Matter Experts [SMEs]) to review proposed project activities against existing NEPA assessments and reviews, potentially saving time and effort, by reviewing those activities that are essentially continuing operations at SNL/NM.

SNL/NM SWEIS

As a matter of policy, DOE prepares a SWEIS for its large, multiple-facility sites. In November 1999, DOE issued the final SWEIS for the SNL/NM site (DOE 1999), and in December 1999, issued the Record of Decision (ROD) selecting "Expanded Operations" as the preferred alternative.
The SWEIS allows DOE to "tier" subsequent NEPA documents to the larger analysis and reduce the need to revisit the same impact analysis for each new project proposed. By doing so, DOE can focus on project-specific issues in its NEPA determinations. In accordance with the agency's regulations (10 CFR 1021), DOE will examine the SWEIS in 2005 to decide whether the analysis remains valid, or if a new or supplemental SWEIS should be prepared.

2003 NEPA Documentation

During 2003, NEPA compliance activities at SNL/NM included support to DOE/NNSA/SSO for the completion of two EAs, one for the Test Capabilities Revitalization (TCR) Program, and one for the CINT to be built along Eubank Blvd, north of KAFB. During the year, the NEPA Team published the *SWEIS Annual Review-CY2002*, (SNL 2003h) an annual comparison of SNL/NM operations against the environmental analysis included in the SWEIS (DOE 1999). In 2003, SNL/NM performed a total of 475 NEPA compliance reviews, forwarding 68 NEPA checklists to DOE/NNSA/SSO for review and determination. Summary data for SNL/NM NEPA reviews performed in 2003 are detailed in Table 3-4.

TABLE 3-4. Summary Data for SNL/NM NEPA Reviews Performed in Calendar Year 2003

NEPA Reviews	Review Breakouts	Quantity
NEPA Module Reviews[1]	Total Reviewed by NEPA Team	**333**
	DOE Checklist Submittals[2]	68
EDP Reviews[3]	Total Reviewed by NEPA Team	**120**
	DOE Checklist Submittals[2]	2
	SNL/NM Reviews (Total)	**453**
Air Force (AF) NEPA Reviews[4]	Land Use Permit Renewals	8
	Land Use Permit Terminations	0
	Land Use Permit Modifications	14
	AF-813 Submittals (Total)	**22**
GRAND TOTAL of ALL NEPA REVIEWS		**475**
PERCENTAGE of TOTAL REVIEWS REQUIRING SUBMITTAL to DOE		**15%**
Verification of Work For Others (WFO) NEPA Citations*		**477**

NOTE: [1]SNL reviews cite existing NEPA documents; where existing documents are not available, NEPA checklists are prepared and submitted to DOE. Environmental Restoration (ER) reviews are now included in the Total Reviewed by NEPA Team.
[2]Projects after initial reviews that needed to be forwarded to DOE for review.
[3]Experiment Development Plan (EDP): An electronic system used by the Full-Scale Experimental Complex to record project information, including NEPA reviews. All EDP reviews are subsequently reviewed by the NEPA Team.
[4]All Air Force NEPA documents are prepared by the NEPA Team in cooperation with the project originator.
*DOE/SSO request verification of WFO NEPA citation accompanying funding requests

3.8 Environmental Education Outreach Program

Sandia Corporation's Environmental Education Outreach Program reaches out to the community at large. Presentations on both local and national environmental issues and concerns are held at community centers, schools, and environmental conferences. The hands-on approach is used wherever feasible, such as involving the community and students in field trips to perform environmental sampling, conducting in-field measurements, and observing local ecological systems. In 2003, Sandia Corporation participated in the following events:

- The School to World Conference
- National Atomic Museum Clean Earth Club
- Dia del Rio at the Albuquerque Aquarium
- School presentations throughout Albuquerque
- New Mexico Environmental Health Conference.

SNL/NM employee helping with a groundwater presentation at a local middle school.

Third Annual Photo Contest Winners

First Place Winner:
Jennifer Payne

Tree Cholla

Second Place Winner:
Steve Cox

Townsend's Solitaire

Third Place Winner:
Jennifer Payne

Collared Lizard

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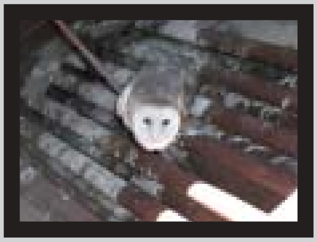
In this Chapter ...



Barn Owl at SNL/NM

Environmental Snapshot

- *Due to the continuing drought, many of the soil samples collected at SNL/NM had a low moisture content that made meaningful soil moisture measurements difficult.*

- *An objective of the Ecological Surveillance Program is to collect information on plant and animal species present to further the understanding of ecological resources on-site.*

- ***Radiological Results:** The results of the statistical analysis showed no on-site or perimeter soil, sediment, or vegetation locations that were both higher than off-site and with an increasing trend (Priority-1).*

- ***Non-Radiological Results:** One perimeter sampling location for soil (Iron) was noted to be Priority 1 (higher than off-site with an increasing trend). However, the concentrations observed at this location are well within the range of background for surface soils in New Mexico.*

Chapter Four

Terrestrial and Ecological Surveillance

Chapter Summary

Terrestrial and ecological surveillance are conducted at Sandia National Laboratories, New Mexico (SNL/NM) to detect the possible 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 to detect if radiological and non-radiological constituents are present.

In 2003, soil samples were collected from 52 locations, sediment samples were collected from ten locations, and vegetation samples were collected from 17 locations.

Radiological parameters include gamma-emitting radionuclides, tritium (H^3) radioisotopes, and uranium. Non-radiological parameters include metals such as aluminum, iron, silver, and zinc.

Employees Performing Terrestrial Surveillance at an Off-site Location for SNL/NM

4.1 Terrestrial Surveillance Program

Terrestrial surveillance began at SNL/NM in 1959 with the collection of environmental samples for radiological analysis. Since 1959, the number of sampling locations has increased to account for the growth of the laboratory. Several other 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 450.1, *Environmental Protection Program* (DOE 2003a):

- 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 radiological or non-radiological constituents in surface soils, vegetation, or sediments; however, 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.

In addition, sample results for metals in surface soils are compared to U.S. surface soil average concentrations, published in *Trace Elements in Soils and Plants* (Kabata-Pendias and Pendias, 1992), or local/regional surface soil average concentrations, published in *Elements in North American Soils* (Dragun and Chiasson, 1991).

The DOE Oversight Bureau of the New Mexico Environment Department (NMED) splits samples with SNL/NM, at several locations, for an added measure of verification. The results are available upon request from the NMED, which can be found at the following website:

http://www.nmenv.state.nm.us/

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 to assist in determining 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 2001, perimeter location 64 showed results that were significantly greater than off-site for manganese in soil surfaces as well as having an increasing trend (Priority 1). All results reported were below the levels identified for background in New Mexico (see Table 4-13). As a result, it was decided to continue monitoring that location since the levels did not trigger remediation actions. In 2002, this location was no longer classified as Priority-1 (higher than off-site with an increasing trend), but as Priority-2 (higher than off-site) for manganese in surface soils. It continues to be Priority-2 (higher than off-site) for manganese in surface soils for 2003 as well.

In past years, the period of time covered by the statistical analysis was from 1991 to present (for soils), and from 1993 to present (for sediments and vegetation). In Calendar Year (CY) 2001, the analysis was limited to a five-year period (beginning in 1998). The reason for the change was that SNL/NM changed analytical laboratories in CY00, with lower detection capabilities for many of the metals. As a result, a large number of false decreasing trends were noted for non-radiological parameters when the whole data set was analyzed. By limiting the analysis to a five-year period, the number of apparent decreasing trends was reduced, and should be eliminated over the next couple of years.

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 local procedures. In 2003, soil samples were collected from a total of 52 locations (31 on-site, 15 perimeter, and six off-site locations).

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 local procedures. In 2003, sediment samples were collected from all ten locations (four on-site, three perimeter, and three off-site locations).

Vegetation

Vegetation is sampled to monitor for potential uptake of pollutants, which could provide an exposure pathway to foraging animals, as well as 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 2003, vegetation was collected at a total of 17 locations (nine on-site, five perimeter, and three off-site locations). Due to the drought and the resulting lack of vegetation, samples were not

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.

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

collected at 13 locations in 2003. Because of recurring difficulties in collected vegetation samples, an investigation was conducted by project staff to determine if recovery can be improved by changing sample locations and/or changing the time of year that vegetation sampling was conducted for CY03. Several additional samples were collected by sampling the vegetation during early September, while the majority of samples were taken during June. Project staff will continue to evaluate means to optimize vegetation collection during the year.

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 laboratory. TLDs were collected from 33 locations (16 on-site, eight perimeter, and 12 off-site) every quarter for 2003.

4.1.3 Sampling Locations

To the extent practical, sampling locations are consistent from year to year in order to establish trends. Occasionally, sampling locations are added or dropped for different reasons, including 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 concerns. In CY02, a perimeter TLD soil sampling location was added (loc. 81) at the KAFB boundary fence, approximately due west of the Mixed Waste Landfill (MWL) in Technical Area III (TA-III). The new location was added in preparation for a proposed environmental research park, La Semilla, in the DOE buffer area west of KAFB. In CY03, a perimeter soil and vegetation location was added (loc. 82) at the KAFB Commissary (near Pennsylvania and Gibson). The location was added to monitor general perimeter conditions on the western portion of KAFB. Only one sample has been collected thus far. Since only two samples have been collected at location 81 and one sample at location 82, no statistical analyses were performed using the data from either location. Sampling locations are shown on Tables 4-2 through 4-4.

On-site

On-site locations (Table 4-2 and Figure 4-1) are selected within or near areas of past or present SNL/NM operations. Sample locations are chosen near sites with known contamination from past operations, and 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 (Table 4-3 and Figure 4-1) are selected to determine if contaminants are migrating from SNL/NM sites toward the off-site community. Perimeter locations are typically off of SNL/NM property, but (with few exceptions) within the boundary of KAFB.

Off-site

Off-site locations (Table 4-4 and Figure 4-2) are selected to establish concentrations of radiological and non-radiological constituents for comparison with on-site and perimeter results. Sample locations have been selected within a 25-mi radius of SNL/NM in areas where the accumulation of pollutants is expected to be minimal.

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 CY03 radiological parameters and analytical results are found in Appendix C of this report. The detailed statistical analyses are documented in *2003 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2004a).

Radiological Results

The results of the statistical analysis showed no on-site or perimeter soil, sediment, or vegetation locations that were both higher than off-site and with an increasing trend (Priority-1). Several locations were identified as either Priority-2 (higher than off-site) or Priority-3 (increasing trend). The Priority-2 and Priority-3 locations and parameters are listed in Tables 4-5 through 4-9.

Cs-137

One on-site location (55) was identified as Priority-2 (higher than off-site) for the second year in a row for Cs-137 in surface soils. Two perimeter locations (12 and 64) continue to be

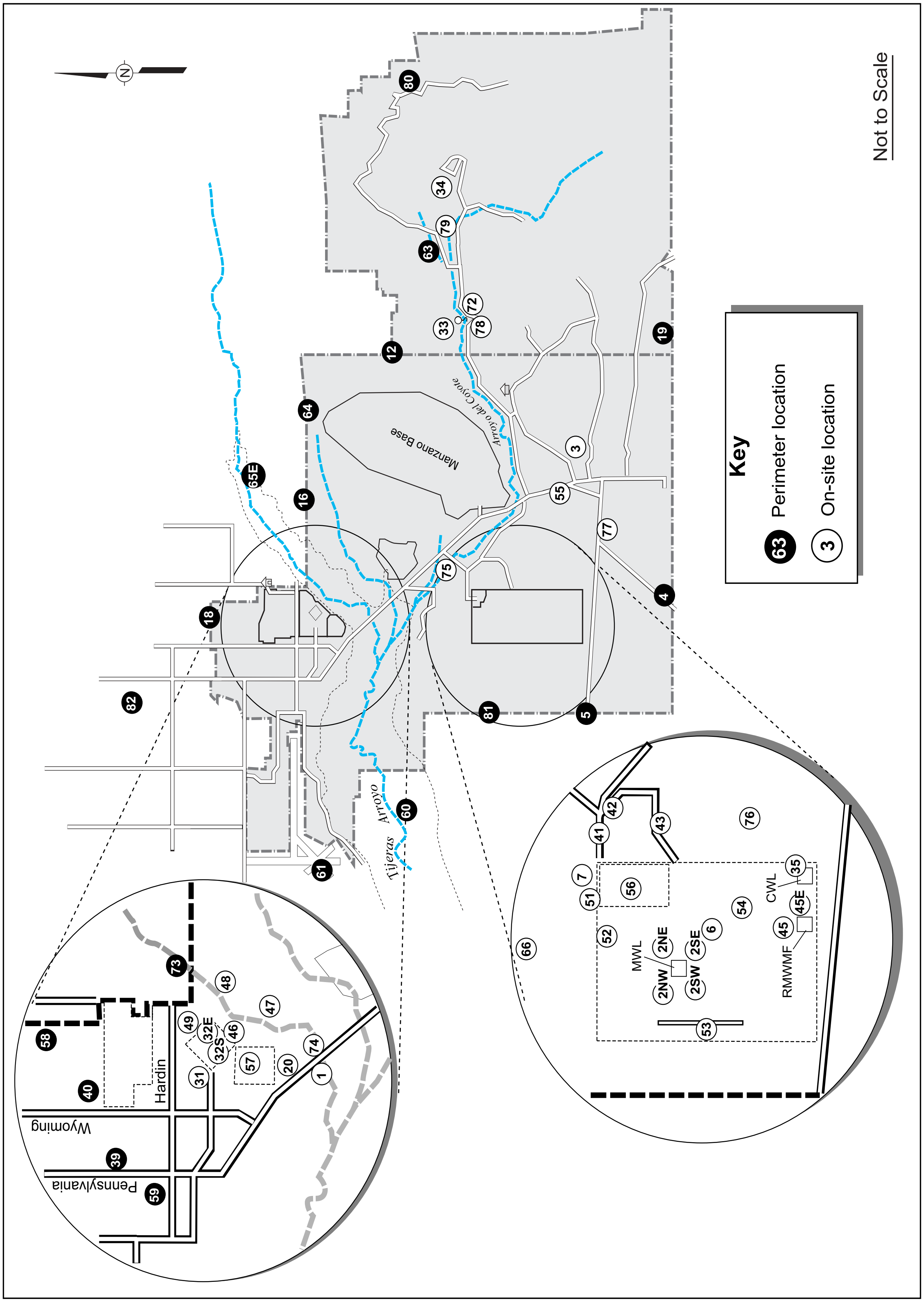


FIGURE 4-1. Terrestrial Surveillance Program On-site and Perimeter Sampling Locations
On-site locations are within areas of SNL/NM operations. Perimeter locations are located both on and off KAFB property.

TABLE 4-2. On-site Terrestrial Surveillance Locations and Sample Types
There are 39 on-site sampling locations.

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
1	Pennsylvania Ave.	X			X
2NW	Mixed Waste Landfill (MWL) (northwest)	X		X	X
2NE *	MWL (northeast)	X		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
20 *	TA-IV (southwest) (KAFB Skeet Range)	X		--	X
31	TA-II Guard Gate				X
32S	TA-II, Bldg. 935 (south bay door)	X			
32E	TA-II, Bldg. 935 (east personnel door)	X			
33 *	Coyote Springs	X		X	
34	Lurance Canyon Burn Site	X		X	
35	Chemical Waste Landfill (CWL)	X		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		X	
52	TA-III, northeast of Bldgs. 6716 and 6717	X		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		

NOTE: *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
-- indicates that no sample was collected during the 2003 sampling period.
TA = technical area
KAFB = Kirtland Air Force Base

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

There are 19 perimeter sampling locations.

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
4	Isleta Reservation Gate	X		X	X
5	McCormick Gate	X		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	X	
61	Albuquerque International Sunport (west)	X			
63	No Sweat Boulevard	X		X	
64 *	North Manzano Base	X		--	
65E	Tijeras Arroyo, east (up-gradient)	X	X		
73	Tijeras Arroyo (up-gradient)		X		
80	Madera Canyon	X			
81	KAFB West Fence	X			X
82	KAFB Commissary	X		X	

NOTE: *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.
-- indicates that no sample was collected during the 2003 sampling period.
TLD = thermoluminescent dosimeter
KAFB = Kirtland Air Force Base
USGS = U.S. Geological Survey
DOE = Department of Energy

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

There are 16 off-site sampling locations within a 25-mile radius of SNL/NM.

Location Number	Sampling Location	Soil	Sediment	Vegetation	TLD
8	Rio Grande, Corrales Bridge (up-gradient)	X	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	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	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		

NOTE: *Replicate sampling locations: In addition to single samples taken for each medium, two replicated samples are collected for internal checks on comparability of sampling and analysis.
TLD = thermoluminescent dosimeter
-- indicates that no sample was collected during the 2003 sampling period.

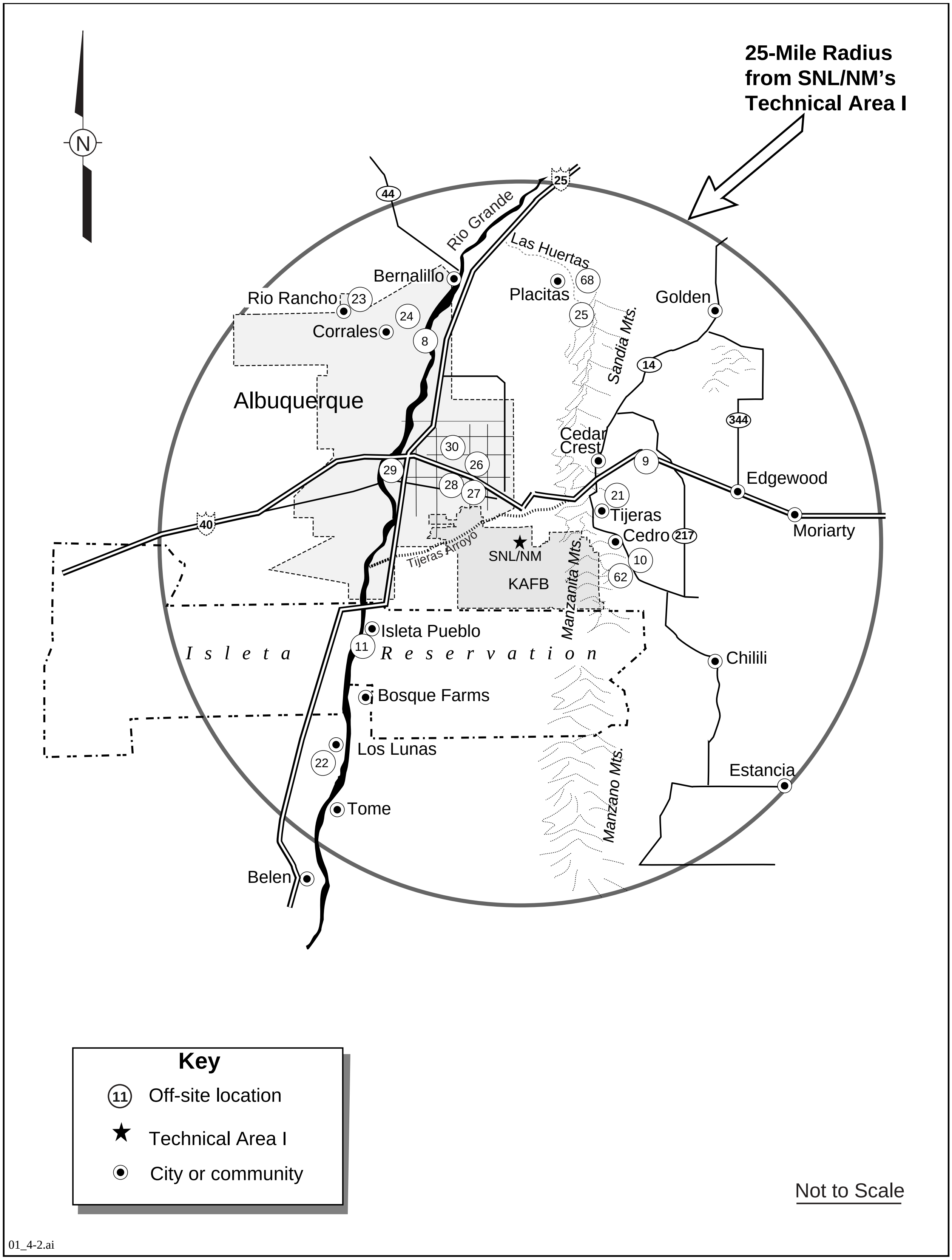


FIGURE 4-2. Terrestrial Surveillance Program Off-site Sampling Locations

identified as Priority-2 for Cs-137 in surface soils. Location 55 is located off of Lovelace Road outside of TA-III. Location 12 is located on the U.S. Forest Service (USFS) land withdrawn area. Location 64 is located north of Manzano Base, near the KAFB boundary. Cs-137 is prevalent in surface soils worldwide as a result of historical nuclear weapons testing. Over the past five years, the values for Cs-137 at location 55 ranged from 0.502 to 0.871 pCi/g, while the perimeter locations ranged from 0.435 to 1.54 pCi/g. No sediment location or vegetation location was identified as Priority-2 (higher than off-site).

Four on-site locations (35, 49, 52, and 76) were identified for the first time as Priority 3 (increasing trend). Location 35 is located near the Chemical Waste Landfill (CWL). Location 49 is located near the Explosive Components Facility (ECF). Location 52 is located in the northeast portion of TA III. Location 76 is located in Thunder Range. Over the past five years, the values for Cs-137 at these four locations have ranged from 0.029 to 0.69 pCi/g.

One on-site location (75) was identified as Priority-3 (increasing trend) for Cs-137 in sediment. Location 75 is located down-gradient along the Arroyo del Coyote. Over the past five years, the values for Cs-137 at this location have ranged from 0.06 to 0.191 pCi/g.

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

Tritium

Due to the drought, many of the soil samples collected had such low soil moisture content that meaningful tritium in soil moisture measurements were frequently not possible. When this occurred, the samples were excluded from any analysis. In 2004, the tritium in soil and vegetation samples will be collected from locations 2NW, 2NE, 2SW, 2SE and 6 only, which are near the MWL. 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.

Location 2NE has previously been identified as Priority-2 for tritium in vegetation (this location was not sampled during CY01 or CY02 due to a lack of vegetation). Although elevated, the concentration of tritium at these locations does not present a hazard to workers in these areas. Results for location 2NW ranged from 0.68 pCi/mL in 1999 to 2.53 pCi/mL in 2003. Location 2NW had previously shown as Priority-2 for soil in years past. Results for location 2NW ranged from

TABLE 4-5. Radiological Results Summary Statistics for Soil Locations (1999-2003) Noted as PRIORITY-2 During CY03

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Cesium-137	pCi/g	55	5	0.676	0.702	0.152	0.502	0.871
		12	5	1.147	1.200	0.408	0.498	1.540
		64	5	0.760	0.710	0.308	0.435	1.240

NOTE: Std Dev = Standard deviation
pCi/g = picocurie per gram

TABLE 4-6. Radiological Results Summary Statistics for Soil Locations (1999-2003) Noted as PRIORITY-3 During CY03

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Cesium-137	pCi/g	35	5	0.395	0.341	0.199	0.194	0.690
		49	5	0.366	0.314	0.180	0.170	0.623
		52	5	0.065	0.742	0.020	0.029	0.076
		76	5	0.166	0.168	0.031	0.130	0.201
Total Uranium	µg/g	76	5	0.415	0.427	0.529	0.360	0.475
		19	4	0.703	0.537	0.445	0.390	1.35

NOTE: Std Dev = Standard deviation
pCi/g = picocurie per gram
µg/g = microgram per gram

TABLE 4-7. Radiological Results Summary Statistics for Sediment Locations (1999-2003) Noted as PRIORITY-2 During CY03

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Total Uranium	µg/g	79	4	1.221	1.280	0.319	0.826	1.500

NOTE: Std Dev = Standard deviation
µg/g = microgram per gram

TABLE 4-8. Radiological Results Summary Statistics for Sediment Locations (1999-2003) Noted as PRIORITY-3 During CY03

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Cesium-137	pCi/g	75	5	0.122	0.132	0.051	0.060	0.191

NOTE: Std Dev = Standard deviation
pCi/g = picocurie per gram

TABLE 4-9. Radiological Results Summary Statistics for Vegetation Locations (1999-2003) Noted as PRIORITY-2 During CY03

Analyte	Units	Location	Sample Size	Average	Median	Std Dev	Min	Max
Tritium	pCi/mL	2NE	3	1.62	1.65	0.925	0.68	2.53
		2NW	3	1.28	0.64	1.506	0.20	3.00

NOTE: Std Dev = Standard deviation
pCi/mL = picocurie per milliliter

0.20 pCi/mL in 1999 to 3.00 pCi/mL in 2003. Soil samples have been collected at this location, with the exception of 2001. In 2002, the samples collected were excluded from analysis because de-ionized water had been added to the sample in an attempt to assay tritium in soil with very low soil moisture, which proved to be unproductive. For the last five years, the only samples that have been included for analysis purposes are from 1999, 2000, and 2003.

All statistically evaluated soil and sediment sample locations, as well as the remaining vegetation sample locations were identified as Priority-4 for tritium.

Total Uranium (U_{tot})

There were no Priority-2 locations for surface soil. There was one on-site location (76) and one perimeter location (19) identified as Priority-3 for total uranium in surface soils. Location 76 is located in the northern portion of Thunder Range and perimeter location 19 is located near the U.S. Geological Survey (USGS) Seismic Center Gate. The values for the on-site sample ranged from 0.36 to 0.475 µg/g, while the values for the perimeter location ranged from 0.39 to 1.35 µg/g.

There was one on-site location (79) identified as Priority-2 (higher than off-site) for sediment. Location 79 is located up-gradient in the Arroyo del Coyote. The values observed at this location ranged from 0.826 to 1.46 µg/g.

All the vegetation sample locations as well as the remaining soil and sediment sample locations were identified as Priority-4 (consistent with off-site values and no increasing trends).

TLDs

TLD exposure by quarter and exposure rate for each location class for 2003 is shown in Appendix C, Table C-19. Overall for 2003, three TLDs were not returned and therefore could not be analyzed for exposure rates: these were off-site location 27 (Q4), off-site location 26 (Q3), and on-site location 46 (Q3). SNL/NM makes all effort to collect TLD's at the end of every quarter and these were not located in or around their associated posts. The exposure rate summary statistics for each location class are presented in Appendix C, Table C-20.

Data for 1999 through 2003 was 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 in any of the five years of interest it was deleted from the analysis. Operational locations are also excluded from the statistical analysis. The statistical analysis showed two distinct groupings of data for 1999

TABLE 4-10. Summary Statistics for TLD Exposure Rates, 1999 - 2003

Location Class	Number of Observations	Units	Mean	Median	Std Dev	Minimum	Maximum
Community	58	μR/hr	92.2	89.9	12.3	73.2	121.8
Perimeter	36	μR/hr	97.2	97.3	11.5	78.9	127.2
On-Site	68	μR/hr	97.8	96.3	10.0	82.7	119.7

NOTE: μR/hr = microroentgen per hour (10^{-6} roentgen per hour)
Std Dev = Standard deviation
TLD = thermoluminescent dosimeter

through 2003 (1999 and 2003 showed a higher average exposure than 2002, 2001, and 2000). As a group, TLD exposure for off-site locations were statistically lower than on-site or perimeter locations. (Note: There was no statistical difference between on-site or perimeter locations.) Table 4-10 shows the overall exposure rate summary statistics for 1999 - 2003. Figure 4-3 shows the TLD exposure rates by year and location class.

4.1.5 Non-Radiological Parameters and Results

All soil, sediment, and vegetation samples are analyzed for the following 21 metals:

Aluminum (Al), Antimony (Sb), Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Magnesium (Mg), Manganese (Mn), Mercury (Hg) Nickel (Ni), Potassium (K), Selenium (Se), Silver (Ag), Thallium (Tl), Vanadium (V), Zinc (Zn)

The CY03 analytical results are found in Appendix C of this report. The detailed statistical analyses are documented in *2003 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2004a).

Non-Radiological Results

One perimeter sampling location for soil was noted to be Priority-1 (higher than off-site with an increasing trend) (See section on Iron). There were no locations identified as Priority-2 (higher than off-site) for sediment. Several locations were identified as either Priority-2 for soil samples and one location was

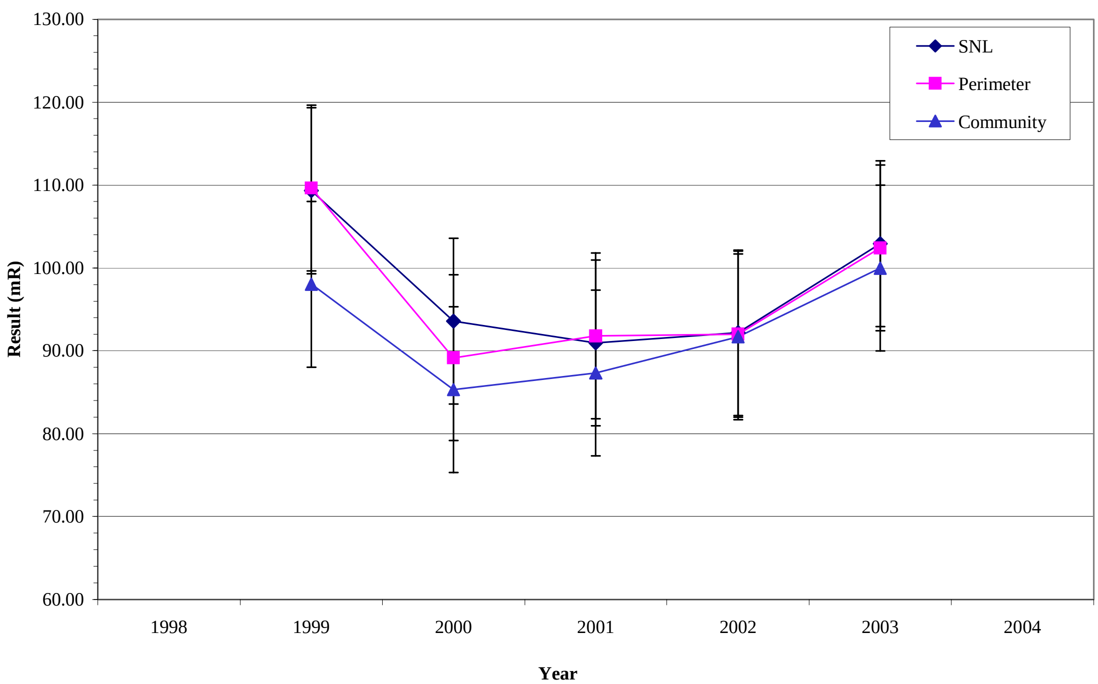


FIGURE 4-3. SNL/NM TLD Results by Year and Location Class (1998-2003)

TABLE 4-11. Summary Statistics for All Locations (1998-2003) Identified as PRIORITY-2 for Metals During CY03 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
Soil	**Aluminum**	On-site	52	5	16740	4990	11700	24600
	Antimony	On-Site	20	5	398	537	0.21	989
	Barium	On-site	3	5	264	129	79	400
	Beryllium	On-site	33	5	1.02	0.30	0.70	1.34
	Cadmium	On-site	2SE	4	1.59	1.39	0.345	2.80
		On-site	20	5	2.42	0.40	2.03	2.89
	Cobalt	Perimeter	64	5	8.44	0.93	7.30	9.35
		Perimeter	65E	5	9.40	1.44	7.91	11.00
	Copper	On-site	32E	4	25.9	29.3	10.6	69.9
	Iron	Perimeter	64	5	21200	3195	18000	25500
		Perimeter	65E	5	23075	2264	19800	25000
	Lead	On-Site	20	5	17707	24591	62.6	53000
	Magnesium	On-site	3	5	5494	1182	4130	6600
		On-site	52	5	5188	1390	3430	7160
		Perimeter	64	5	7088	791	5800	7770
		Perimeter	65E	5	8290	1166	6800	96000
	Manganese	Perimeter	64	5	586	54	510	638
		Perimeter	65E	5	591	74	527	690
	Potassium	On-site	1	5	3926	1662	1020	5160
		Perimeter	60	5	3866	357	3380	4330
		Perimeter	65E	5	5147	481	4510	5660
	Vanadium	Perimeter	65E	5	40.0	3.5	34.9	43.0
	Zinc	On-site	56	5	73.5	20.9	48.7	101.0
		Perimeter	64	5	76.8	7.0	66.0	85.3
		Perimeter	65E	4	80.4	11.4	67.8	95.0
Vegetation	**Magnesium**	Perimeter	60	3	3457	2645	1070	6300

NOTE: Std Dev = Standard deviation
mg/kg = milligram per kilogram

identified as Priority-2 for vegetation. There were several samples identified as Priority-3 (increasing trend) for all sample media; soil, sediment, or vegetation. The Priority-2 and Priority-3 locations and parameters are listed in Tables 4-11 and 4-12.

The following metals were listed as Priority-4 for all soil, sediment, and vegetation samples: arsenic, chromium, mercury, selenium, silver, and thallium. Twelve of the 21 metals analyzed in the samples for sediment were considered Priority-4. Nineteen of the 21 metals analyzed in the vegetation samples were considered Priority-4.

Aluminum

One on-site location (52) was identified as Priority-2 (higher than off-site) for aluminum in surface soils. The concentration at this location is well within the range of background identified for New Mexico surface soils and is expected to be naturally occurring (see Table 4-13). Nine on-site locations (1, 32S, 34, 42, 43, 49, 55, 66, and 76) and two perimeter locations (19 and 64) were identified as Priority-3 (increasing trend). All of these locations were within the range of background identified for New Mexico surface soils and is expected to be naturally occurring.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for aluminum.

Antimony

One on-site location (20) was identified as Priority-2 (higher than off-site) for antimony in surface soils. The concentration at this location exceeds the maximum background level identified for New Mexico surface soils (0.2 to 1.3 mg/kg). Location 20 is associated with the old KAFB skeet range, and the elevated antimony is associated with the operation of the skeet range. The skeet range has been decommissioned and the soil screened to remove shot from the

TABLE 4-12. Summary Statistics for Soil Locations (1998-2003) Identified as PRIORITY-3 for Metals During CY03 (all units in mg/kg)

Matrix	Analyte	Location Type	Location	Sample Size	Average	Std Dev	Min	Max
Soil	**Aluminum**	On-site	1	5	10196	3628	4380	13500
		On-site	32S	4	7273	1057	6000	8280
		On-site	35	5	8342	1556	6580	10100
		On-site	42	5	7610	1691	5930	9760
		On-site	43	5	7816	1741	6220	9870
		On-site	49	5	9384	1636	7760	11200
		On-site	55	5	8215	1961	6140	11200
		On-site	66	5	9722	1650	8500	12600
		On-site	76	5	9282	2992	6600	14000
		Perimeter	19	4	10472	3054	7700	13500
		Perimeter	64	5	11880	2362	8600	14500
	Barium	On-site	32S	4	124.9	43.5	97.0	189.0
		Perimeter	59	5	165.6	72.2	96.9	278.0
	Beryllium	Perimeter	64	5	0.568	0.055	0.500	0.636
	Cobalt	On-site	3	5	3.73	1.13	2.80	5.70
	Copper	On-site	3	5	6.6	2.2	4.7	10.2
		On-site	6	5	21.8	11.9	8.3	36.6
		On-site	20	5	11.3	1.2	9.5	12.9
		On-site	45	5	5.5	1.1	4.7	7.5
		Perimeter	80	4	11.1	1.4	9.7	13.0
	Iron	On-site	57	5	12220	2821	7400	14100
		Perimeter	64	5	21200	3195	18000	25500
	Lead	Perimeter	49	5	12.1	2.1	9.0	14.9
	Magnesium	On-site	49	5	3962	281	3600	4380
		Perimeter	19	4	4268	400	3900	4750
		Perimeter	58	5	4026	197	3740	4180
	Manganese	Perimeter	80	4	305	24	280	331
	Nickel	On-site	6	5	10.93	2.52	8.00	14.00
		Perimeter	19	4	12.97	1.89	11.00	15.40
	Potassium	On-site	55	5	2272	420	1650	2770
		Perimeter	64	5	3452	490	2800	3960
	Vanadium	On-site	76	5	19.3	7.2	11.7	31.1
		Perimeter	59	5	21.4	5.7	11.5	26.2
		Perimeter	64	5	33.0	4.9	26.9	38.9
	Zinc	On-site	34	5	38.2	5.9	29.6	45.0
		On-site	49	5	36.1	3.0	32.0	38.8
		On-site	76	5	28.4	5.9	24.8	38.8
		Perimeter	80	4	43.3	5.9	40.0	52.1
Sediment	**Barium**	Perimeter	60	5	116	27	89	148
	Beryllium	On-site	72	5	0.84	0.32	0.50	1.25
	Iron	Perimeter	65E	4	10652	3698	6910	15600
	Vanadium	On-site	72	5	27.1	5.0	20.0	31.5
		Perimeter	65E	4	20.0	6.1	14.2	27.7
Vegetation	**Copper**	On-site	52	4	3.35	0.67	2.90	4.34

NOTE: Std Dev = Standard deviation
mg/kg = milligram per kilogram

soil (USAF 2001). However, some residuals (this year's and several historical samples) may remain in the soil. Although the concentration exceeds the background levels for antimony in New Mexico surface soils, the elevated concentration of antimony is assumed to be residue of the pellets from the skeet range, which most likely caused the high values. TCLP analysis in the past has shown that the antimony is not leaching into the soils. TCLP is a method used to extract and decompose bound metals in soil samples. By utilizing this method it is easier to determine if contaminants are available for environmental uptake. This method is primarily used for risk assessment pathway analysis. The TCLP analysis will be repeated in 2004 to confirm that no leaching is occurring and that the concentrations pose no environmental or human health risk.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for antimony.

Barium

One on-site location (3) continues to be identified as Priority-2 (higher than off-site) for barium in surface soils. One on-site location (32S) and one perimeter location (59) were identified as Priority-3 (increasing trend) for barium in surface soils. The concentration of barium at all these locations is well within the range of background identified for New Mexico surface soils and is expected to be naturally occurring. In addition, one perimeter location (60) was identified as Priority-3 (increasing trend) for barium in sediment.

All vegetation samples and the remaining soil and sediment sample locations were identified as Priority-4 for barium.

Beryllium

One on-site location (33) continues to be identified as Priority-2 (higher than off-site) for beryllium in surface soils. In addition, one perimeter location (64) was identified as Priority-3 (increasing trend) for beryllium in surface soils. The concentration of beryllium at both these locations were well within the range of background identified for New Mexico surface soils, and is expected to be naturally occurring. Also, one on-site location (72) was identified as Priority-3 (increasing trend) for beryllium in sediment.

All vegetation samples and the remaining soil and sediment sample locations were identified as Priority-4 for beryllium.

Cadmium

One on-site location (20) continues to be identified as Priority-2 for cadmium in surface soils. This location is associated with the old KAFB skeet range, and the elevated cadmium is associated with the operation of the skeet range. The skeet range has since been decommissioned and the soil screened to remove shot from the soil. However, some residuals may remain in the soil. Although the cadmium is recognized as a contaminant (in addition to natural background concentration) at the site, the concentration is within the range of background for New Mexico surface soils, and well below the NMED's residential soil screening level (SSL's) of 70 mg/kg (NMED 2000). One other on-site soil location (2SE) was identified as Priority-2 for cadmium. Concentrations at this location are also within the range of background for New Mexico surface soils.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for cadmium.

Cobalt

Two perimeter locations (64 and 65E) continue to be identified as Priority-2 (higher than off-site) for cobalt in surface soils. The concentration at location 64 is within the range of background for cobalt in New Mexico surface soils, and is expected to be naturally occurring. The maximum concentration observed at location 65E (11.4 mg/kg) is slightly above the published range for New Mexico surface soils (2.1–11 mg/kg), but well below the NMED's residential SSL of 4,500 mg/kg (NMED 2000). The average result over the past five years is 9.4 mg/kg. There is no immediate cause for concern; however, sampling will continue at this location to monitor for trends. One on-site location (3) was identified as Priority-3 (increasing trend). All values observed over the past five years are within the range of background for cobalt in surface soils.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for cobalt.

Copper

One on-site location (32E) continues to be identified as Priority-2 (higher than off-site) and four on-site locations (3, 6, 20, and 45) and one perimeter location (80) were identified as Priority-3 (increasing trend) for copper in surface soils. One on-site location (52) was identified as Priority-3 (increasing trend) for copper in vegetation. Except for locations 6 and 32E, the concentration of copper at these locations was well within the range of background identified for New Mexico surface soils, and is expected to be naturally occurring. The maximum concentration at location 32E (69.9 mg/kg) and the maximum concentration at location 6 (36.6 mg/kg) are greater than the published range in New Mexico surface soils (2.1-30 mg/kg), but well below the NMED's residential SSL of 2,800 mg/kg (NMED 2000). The average result over the past five years is for location 32E is 25.9 mg/kg and for location 6 is 21.0 mg/kg. There is no immediate cause for concern; however, sampling will continue at these locations to monitor for trends.

All sediment samples, and the remaining soil and vegetation sample locations were identified as Priority-4 for copper.

Iron

Perimeter location 64 has been identified as a Priority-1 (both higher than off-site and increasing trend) for iron in surface soils. This location in the past was identified as Priority-2 (higher than off-site), but this is the first year that it was also identified as having an increasing trend. Figure 4-4 shows the concentration of iron in surface soils for the past five years. Although this location has been identified as Priority-1, the concentrations observed at this location are well within the range of background for surface soils in New Mexico.

In addition, one perimeter location (65E) continues to be identified as Priority-2 (higher than off-site) and one on-site location (57) was identified as Priority-3 (increasing trend) for iron in surface soils. The concentration at both these locations is well within the range of background for iron in Western U.S. surface soils, and is expected to be naturally occurring. Also, one perimeter location (65E) was identified as Priority-3 (increasing trend) for iron in sediment.

All vegetation samples, and the remaining soil and sediment sample locations were identified as Priority-4 for iron.

Lead

One on-site location (20) was identified as Priority-2 (higher than off-site) and one on-site location (49) was identified as

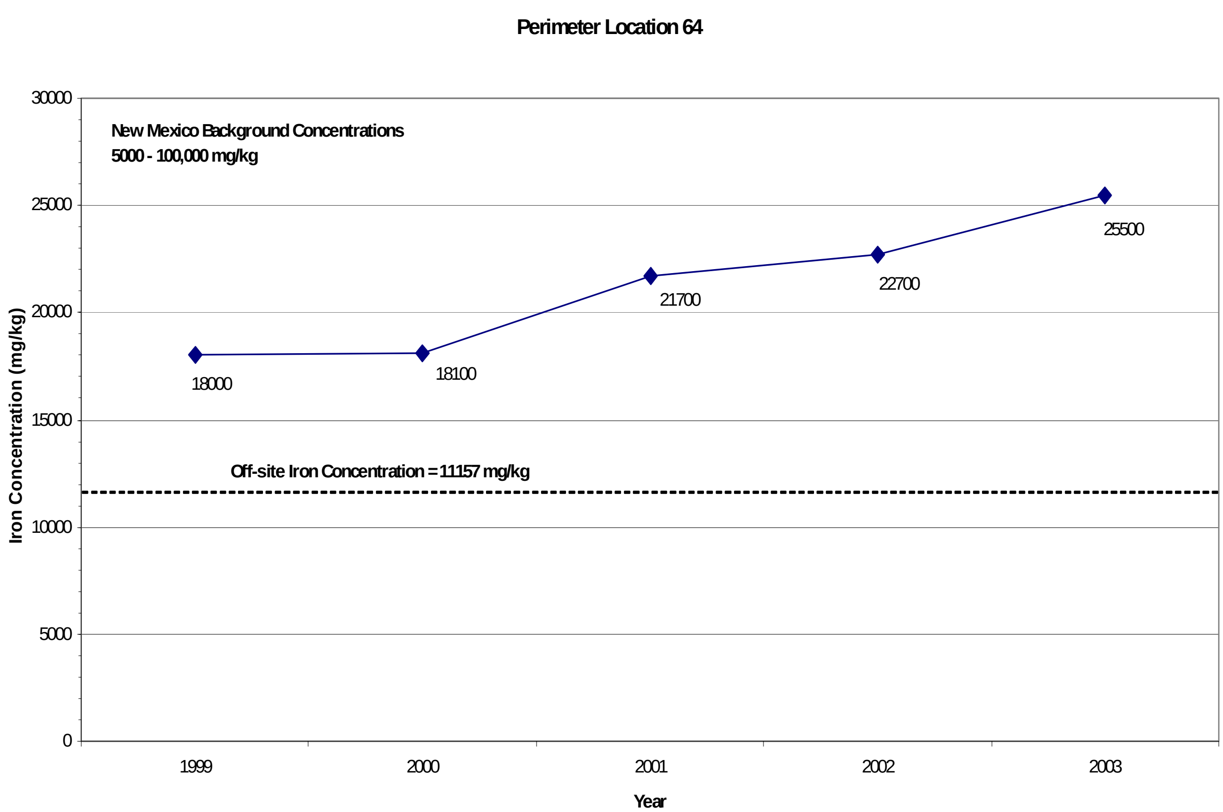


FIGURE 4-4. Iron Concentrations at Perimeter Location 64

Priority-3 (increasing trend) for lead in surface soils. Location 20 is associated with the old KAFB skeet range, and the elevated lead is associated with the operation of the skeet range. The skeet range has been decommissioned and the soil screened to remove shot from the soil (USAF 2001). However, some residuals (this year's and several historical samples) may remain in the soil. Although the concentration exceeds the background levels for lead in New Mexico surface soils, the elevated concentration of lead is assumed to be residue of the pellets from the skeet range, which most likely caused the high values. TCLP analysis in the past has shown that the lead is not leaching into the soils. TCLP is a method used to extract and decompose bound metals in soil samples. By utilizing this method it is easier to determine if contaminants are available for environmental uptake. This method is primarily used for risk assessment pathway analysis. The TCLP analysis will be repeated in 2004 to confirm that no leaching is occurring and that the concentrations pose no environmental or human health risk.

The concentration at location 49 is well within the range of background for lead in New Mexico surface soils, and is expected to be naturally occurring.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for lead.

Magnesium

Two on-site locations (3 and 52) and two perimeter locations (64 and 65E) were identified as Priority-2 (higher than off-site) for magnesium in surface soils. One on-site location (49) and two perimeter locations (19 and 58) were identified to be Priority-3 (increasing trend) for magnesium in surface soils. The concentration at all soil locations is within the range of background identified for magnesium in New Mexico surface soils.

All sediment and vegetation, as well as the remaining soil sample locations were identified as Priority-4 for magnesium.

Manganese

Perimeter locations 64 and 65E continue to be identified as Priority-2 (higher than off-site) for manganese surface soils. One perimeter location (80) continues to be identified Priority-3 (increasing trend) for manganese in surface soils. The concentration at all soil locations is within the range of background identified for manganese in New Mexico surface soils. It should be noted that location 64 was identified as a Priority-1 (higher than off-site and increasing trend) in 2001. It has not shown an increasing trend since that year. It appears that the change in analytical laboratories was the cause and ever since that laboratory has been used since 2000, the values have remained fairly consistent. One perimeter location (60) continues to be identified as Priority-2 (higher than off-site) for manganese in vegetation.

All sediment samples, and the remaining soil and vegetation sample locations were identified as Priority-4 for manganese.

Nickel

One on-site location (6) and one perimeter location (19) were identified as Priority-3 (increasing trend) for nickel in surface soils. The concentration at both these locations are well within the range of background for nickel in New Mexico surface soils, and are expected to be naturally occurring.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for nickel.

Potassium

One on-site location (1) and two perimeter locations (60 and 65E) were identified as Priority-2 (higher than off-site) for potassium in surface soils. One on-site location (55) and one perimeter soil location (64) were identified as Priority-3 (increasing trend). All soil concentrations are within soil concentrations identified in the Western U.S. soils concentrations.

All sediment and vegetation samples, and the remaining soil sample locations were identified as Priority-4 for potassium.

Vanadium

One perimeter location (65E) continues to be identified as Priority-2 (higher than off-site) for vanadium in surface soils. One on-site location (76) was identified for the first time as Priority-3 (increasing trend), as well as two perimeter locations (59 and 64) for vanadium in surface soils. One on-site location (72) and one perimeter location (65E) were identified as Priority-3 for vanadium in

TABLE 4-13. Metal in Soil Concentration Data (compiled from various sources)

	ER Project Background Concentration (1)		NM Surface Soil Concentration (2)	NMED Soil Screening Level (3)		U.S. Surface Soil Concentration (4)
Parameter	**95th UTL % (mg/kg)**	**Geometric Mean (mg/kg)**	**Range (mg/kg)**	**Residential (mg/kg)**	**Industrial (mg/kg)**	**Range (mg/kg)**
Aluminum			5000 - 100,000	74,000	100,000	4,500 - 100,000
Antimony			<0.2 - 1.3	30	92	0.25 - 0.6
Arsenic			2.5 - 19	3.9	17	<1 - 93
Barium	398.1	55.76	230 - 1800	5,200	15,000	20 - 1500
Beryllium	0.785	0.317	1.0 - 2.3	150	440	0.04 - 2.54
Cadmium	3.51	0.411	ND - 11	70	190	0.41 - 0.57
Calcium			600 - 320,000	NA	NA	NA
Chromium	22.9	5.71	7.6 - 42	230(1)	660(1)	7 - 1500
Cobalt			2.1 - 11	4,500	13,000	3 - 50
Copper	16.74	6.179	2.1 - 30	2,800	8,500	3 - 300
Iron			1000 - >100,000	23,000	69,000	5,000 - 50,000
Lead	15	4.575	7.8 - 21	400	1,000	<10 - 70
Magnesium			300 - >100,000	NA	NA	NA
Manganese			30 - 5000	7,800	14,000	20 - 3000
Mercury			0.01 - 0.06	6.5(2)	20(2)	0.02 - 1.5
Molybdenum			<1.0 - 6.5	380	1,200	0.8 - 3.3
Nickel	15.39	6.283	2.8 - 19	1,500	4,400	<5 - 150
Potassium			1900 - 63,000	NA	NA	NA
Selenium			<0.2 - 0.8	380	1,200	<0.1 - 4.0
Silica (Silicon)			150,000 - 440,000	NA	NA	24,000 - 368,000
Silver	4	0.741	<0.5 - 5	380	1,200	0.2 - 3.2
Sodium			<500 - 100,000	NA	NA	NA
Strontium			88 - 440	37,000	89,000	7 - 1000
Thallium			NA	6.1	18	.02 - 2.8
Titanium			910 - 4000	NA	NA	20 - 1000
Vanadium			15 - 94	530	1,600	0.7 - 98
Zinc	46.74	22.15	18 - 84	23,000	69,000	13 - 300

ND = not detectable
(1) chromium as Cr-VI
(2) elemental mercury

(1) ER Background Concentration Report:
Background Concentration of Constituents of Concern to the Sandia National Laboratories/New Mexico, Environmental Restoration Project, 1994 (IT Corp)

(2) NM Surface Soil Concentrations:
Dragun, James, A. Chiasson, Elements in North American Soils, 1991, Hazardous Materials Control Resources Institute (Used "San Juan Basin, A Horizon" to determine values, if available, otherwise Western US values used.)

(3) NMED Soil Screening Levels (SSL):
New Mexico Environment Department Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Technical Background Document for Development of Soil Screening Levels, NMED 2000

(4) US Surface Soil Concentrations:
Kabata-Pendias, A., Pendias, H., CRC, Trace Elements in Soils and Plants, 2nd Edition, 1992

sediments. The concentration at all locations is within the range of background for vanadium in New Mexico surface soils.

All vegetation locations, and the remaining soil and sediment locations were identified as Priority-4 for vanadium.

Zinc

One on-site locations (56) and two perimeter locations (64 and 65E) continue to be identified as Priority-2 (higher than off-site) for zinc in surface soils. Three on-site locations (34, 49, and 76) as well as one perimeter location (80) were identified as Priority-3 (increasing trend) for zinc in surface soils. All Priority-2 locations (56, 64, and 65E) showed at least one concentration greater than the maximum background level for zinc in New Mexico surface soils (84 mg/kg). In all three locations that maximum was exceeded in 2003. The average concentration for zinc in all three of these locations was below the maximum background concentration for zinc in surface soils. The other locations were well within the range of background levels for zinc in surface soils. All zinc results were well below the NMED's residential soilscreening level (55L) of 23,000 mg/kg (NMED 2000).

All sediment and vegetation locations, and the remaining soil sample locations 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 a part of the suggested requirements under DOE Order 450.1 (DOE 2003a). Data are collected on mammal, reptile, amphibian, bird, and plant species currently inhabiting SNL/NM. Data collected includes information on abundance, species diversity, and land use patterns. No contaminant analysis of radionuclides and metals on wildlife were performed in 2003. Table 1-1 represents common species identified at KAFB.

Three Kinds of Birds found on KAFB.

In this Chapter ...

Tritium Bubbler Monitor

Environmental Snapshot

- *The Albuquerque regional collective population dose in 2003 was 0.0949 person-rem/yr. For the purpose of calculating the collective dose, all releases 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.*

Chapter Five

Air Quality Compliance and Meteorological Monitoring

Chapter Summary

Sandia National Laboratories, New Mexico (SNL/NM) conducts air quality monitoring and surveillance under three programs: (1) the Clean Air Network (CAN) Program, (2) the National Emission Standards for Hazardous Air Pollutants (NESHAP) Program, and (3) the Air Quality Compliance (AQC) Program.

In 2003, data was collected from eight meteorological towers located throughout Kirtland Air Force Base (KAFB). The data collected from the meteorological towers provided air dispersion and transport modeling information. The ambient air surveillance data is utilized to establish background concentration levels for pollutants of concern and evaluate potential effects of Sandia Corporation's operations on air quality.

The NESHAP Program monitors radionuclide air emissions at 18 facilities (17 point and one diffuse emission sources). As required by the U.S. Environmental Protection Agency (EPA), the NESHAP Program must assess the dose to the maximally exposed individual (MEI) for radionuclide air emissions.

In 2003, the New Mexico Small Business Assistance (NMSBA) Program, which is managed by SNL/NM, continued assisting a Las Cruces, New Mexico cotton gin cooperative in reaching compliance with air quality requirements.

Meteorological Tower at SNL/NM

The following three programs at SNL/NM conduct air quality monitoring and surveillance:

- CAN Program - conducts meteorological monitoring and ambient air surveillance.
- NESHAP Program - coordinates with facility owners to meet radiological air emission regulations.
- AQC Program - ensures that all nonradiological air emission sources at SNL/NM, such as generators, boilers, chemical users, and vehicles meet applicable air quality standards and permitting requirements.

5.1 Meteorological Monitoring Program

The main objective of the Meteorological Monitoring Program is to provide site-specific representative data for SNL/NM. The 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's research and development (R&D) projects.

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

Tower Instrumentation
Sandia Corporation conducts meteorological monitoring through a network of eight meteorological towers located throughout KAFB on or near SNL/NM property. The network includes:

- Six 10-meter towers,
- One 50-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.

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 availability of data at all instrument levels. Data taken at the A15 50-meter tower, while close to the densely populated area of SNL/NM, shows micro-scale urbanization effects and is not used to describe general meteorology. The 2003 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 CAN network. This real-time variability of meteorological conditions has implications on transport and dispersion of pollutants, which are important in atmospheric emergency release scenarios and air dispersion modeling. Figure 5-2 shows some of the extremes and variations found in meteorological measurements across SNL/NM.

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 presentation 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 I (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.

A comparison of the A15 tower wind speed data with the rest of the CAN network reveals building effects on wind speed. The larger percentage of calms and low wind speeds produces the lowest average annual wind speed, as shown in Figure 5-2. In addition to the lower wind speeds, stability class frequency (not shown in the table) is also affected by the variations in wind direction by flow around and over buildings. 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, the greater the frequency

Meteorological Monitoring Towers

All meteorological towers are instrumented to measure temperature and wind velocity at 3- and 10-meter levels, with the exception of tower A15, which only has a 10-meter level. Temperature and wind velocity are also measured at the top of the two tallest towers (50- and 60-meters).*

Additionally, 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).*

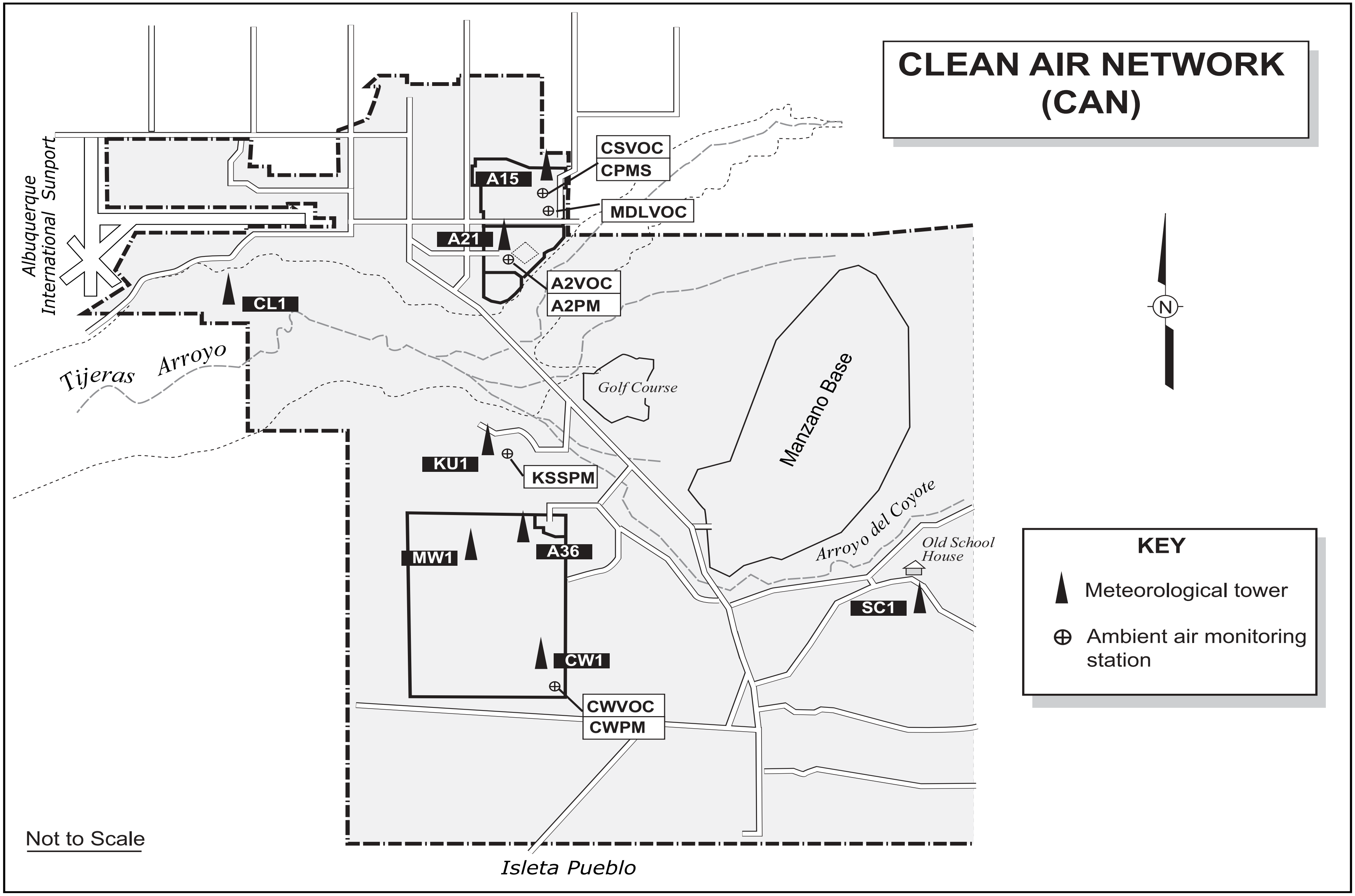


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FIGURE 5-1. The Clean Air Network (CAN) of Meteorological Towers and Ambient Air Monitoring Stations

TABLE 5-1. 2003 Annual Climatic Summary from Tower A36

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (°C)													
Daily Maximum	10.28	10.92	15.37	18.83	26.22	26.74	30.47	27.97	24.13	20.53	16.94	11.50	19.99
Daily Minimum	1.74	-1.57	0.84	6.17	11.81	17.36	24.10	19.35	15.80	6.31	-3.51	-6.36	7.67
Average	6.50	4.57	8.35	13.34	19.42	22.96	27.78	24.27	20.69	16.49	7.29	3.22	14.57
Extremes (°C)													
High	17.74	19.65	21.96	25.43	32.35	34.26	37.37	35.52	30.59	27.50	23.28	16.67	37.37
Low	-5.12	-6.63	-4.05	-1.84	3.88	12.73	15.62	12.37	8.47	-1.79	-7.49	-11.50	-11.50
Relative Humidity (%)	45.53	54.42	43.35	26.00	24.42	27.92	26.53	41.73	39.89	39.00	42.14	45.30	38.02
Precipitation (cm)													
Monthly	0.00	3.28	2.64	0.00	0.05	0.33	0.48	4.85	0.36	2.36	1.78	0.41	16.54
24 Hour Max	0.00	0.91	1.40	0.00	0.03	0.15	0.25	2.49	0.36	1.45	1.37	0.36	2.49
Wind (m/s)													
Monthly	2.98	3.49	3.46	4.73	4.47	4.77	4.07	3.68	3.82	3.26	3.75	3.19	3.81
24 Hour Max	11.60	7.04	7.02	8.93	10.14	8.33	5.99	5.87	6.52	8.55	9.52	8.21	11.60
Maximum Gust	29.26	24.70	18.14	24.98	26.14	29.74	23.94	23.38	25.18	19.18	28.70	22.70	29.74
Barometric Pressure (mb)	838.77	831.08	831.15	831.20	833.01	832.67	836.48	838.03	836.09	836.41	835.10	835.74	834.64

NOTE: 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/s = meters per second
mb = millibars

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 the 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 air monitoring stations located throughout KAFB on or near SNL/NM property. The primary objective of the Ambient Air Surveillance Program is to show compliance with the National Ambient Air Quality Standards (NAAQS) (40 CFR 50) and New Mexico Ambient Air Quality Standards (NMAAQS) (20.2.3 NMAC). Ambient air surveillance is also important to establish background concentration levels for pollutants of concern and evaluate the effects, if any, from SNL/NM operations on the public and the environment due to operations at SNL/NM. DOE Orders and applicable regulations are listed in Chapter 9.

Ambient air surveillance is performed at five locations (illustrated in Figure 5-1).

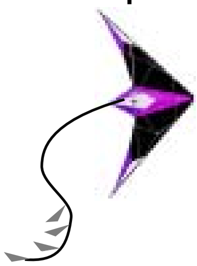
- ***Criteria Pollutant Monitoring Station (CPMS)*** There is one CPMS in the CAN network. The CPMS is located in the NE corner of TA-I. Criteria pollutants are the set of six common pollutants for which the EPA must set national ambient standards according to the Clean Air Act (CAA). For more information on air pollutants go to the following website:

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

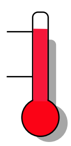
- ***PM Stations*** – There are four PM monitoring locations (CPMS, A2PM, KSSPM, and

Wind Speed



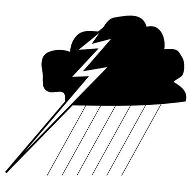
	Minimum (m/sec)	Maximum (m/sec)	Spread (m/sec)
Average Annual Wind Speed	2.90 *tower A15*	4.02 *tower CW1*	1.12
Greatest Difference in Wind Speed over 24 hours	5.5 *tower A15*	10.0 *tower MW1*	4.5
Greatest Difference in Daily Maximum Wind Speed	11.7 *tower SC1*	24.6 *tower MW1*	12.9
Average Difference in Daily Wind Speed	1.41 *(all towers)*		

Temperature



	Minimum (°C)	Maximum (°C)	Spread (°C)
Average Annual Temperature	14.24 *tower SC1*	14.90 *tower Multille*	0.66
Network Annual Temperature Extremes	-13.3 *tower KU1*	38.7 *tower CW1*	52.0
Greatest Difference in Daily Minimum Temperature	-3.6 *tower KU1*	4.6 *tower A15*	8.2
Greatest Difference in Average Daily Temperature	5.0 *tower CL1*	7.5 *tower A15*	2.5
Greatest Difference in Daily Maximum Temperature	7.3 *tower A15*	10.5 *tower MW1*	3.2

Precipitation



	Minimum (cm)	Maximum (cm)	Spread (cm)
Annual Precipitation (Extremes)	15.60 *tower A21*	19.38 *tower SC1*	3.78
Daily Rainfall Variation	0	3.35 *tower SC1*	3.35
Greatest Monthly Precipitation Difference	2.89 *tower A21*	5.89 *tower SC1*	3.00
Greatest in Monthly Rainfall		5.89 *tower SC1*	

NOTE: Winter precipitation that falls as snow is underestimated (mostly at the SC1 tower)

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FIGURE 5-2. Variations and Extremes in Meteorological Measurements Across the Meteorological Tower Network During Calendar Year 2003

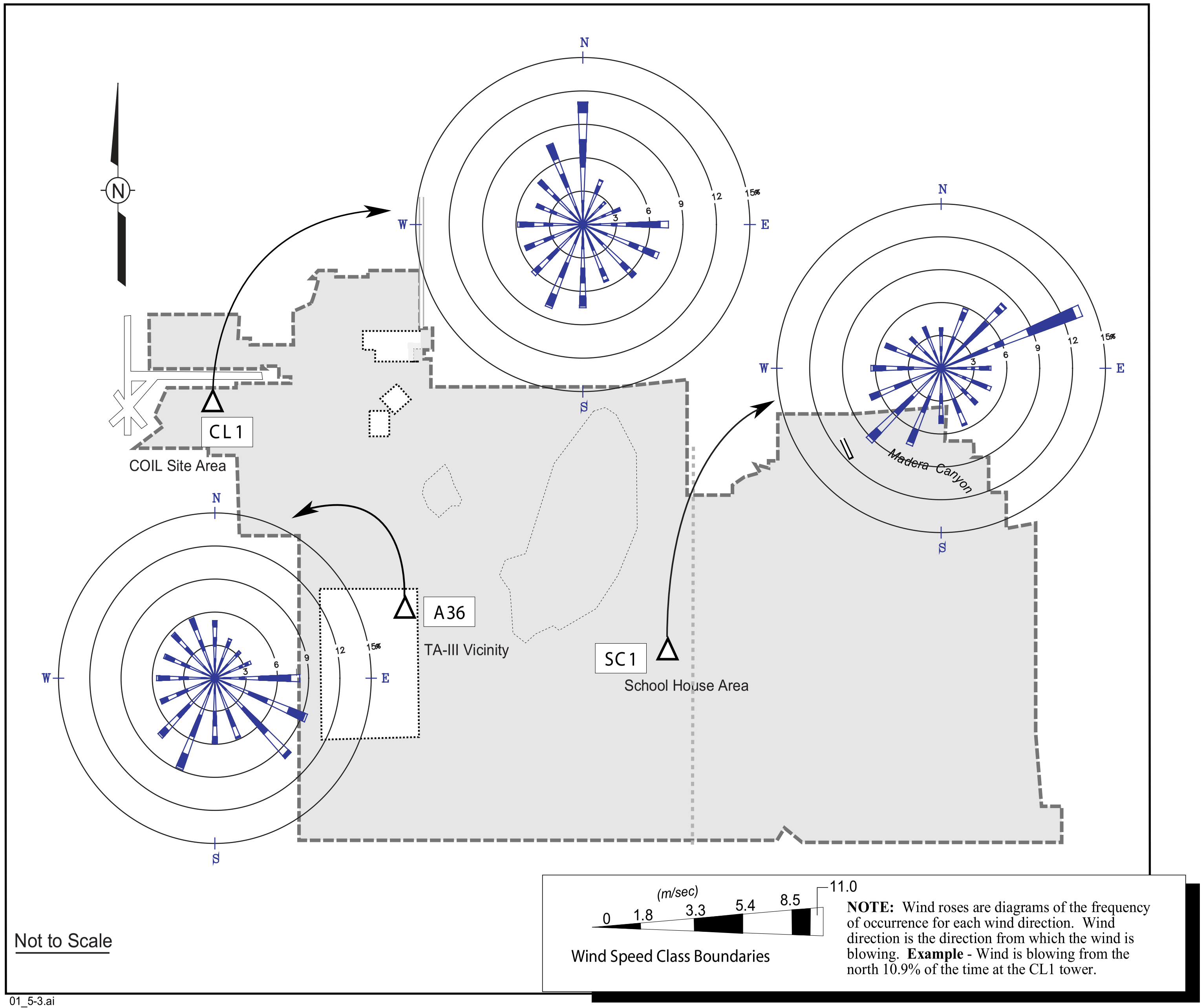


FIGURE 5-3. 2003 Annual Wind Roses for Towers CL1, A36, and SC1

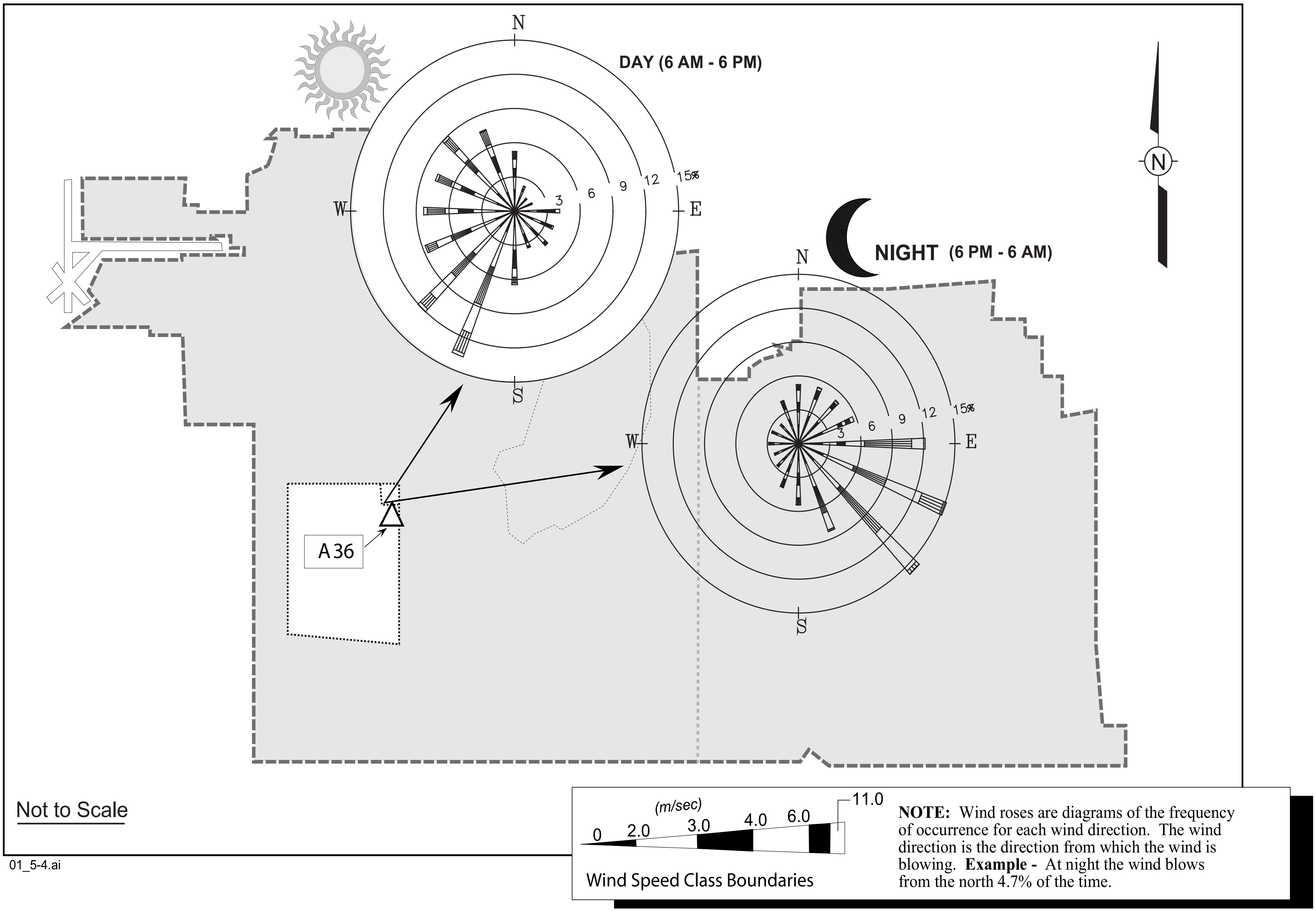


FIGURE 5-4. 2003 Annual Wind Roses for Daytime and Nighttime Wind Frequency at the A36 Tower

CWPM) distributed throughout SNL/NM. 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.

- ***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.

New national air quality standards for $PM_{2.5}$ (with a diameter equal to or less than 2.5 microns) were finalized in 2002. The annual $PM_{2.5}$ standard is 15 µg/m^3 and the 24-hour standard is 65 µg/m^3.

5.2.1 Ambient Air Monitoring Results

Criteria Pollutants

In 2003, the automated data recovery for criteria pollutants was 96 percent for SO_2, 99 percent for NO_x, 99 percent for CO, and 99 percent for O_3. Table 5-2 lists the results from the CPMS and PM_{10} 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 such as in the case of an atmospheric inversion where air mixing may be extremely restricted. There were no exceedances of the gaseous criteria pollutants.

PM

Data recovery for PM_{10} (with a diameter equal to or less than 10 microns) was 94 percent complete based on an every-sixth-day sampling schedule. The highest daily particulate loading occurred at the KSSPM site. A PM_{10} concentration of 410 µg/m^3 occurred in February of 2003. This concentration is greater than the NAAQS. High concentrations of PM were caused by strong and gusty winds in most locations during February. The conditions that caused the dust storms in February meet the criteria of exceptional events as identified in the EPA document *Guidelines on the Identification and Use of Air Quality Data Affected by Exceptional Events* (EPA 1986). The monthly and annual averages for PM_{10} are listed in Table 5-3. The KSSPM site conditions included a 400 ug/m^3 reading in November, which created the spiked monthly average.

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 2003, monthly composites varied from two to six filters per month, depending on the sampling schedule and sampler power problems. A change in the methodology of reporting PM_{10} analytical results was established in 2002. 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 5-4 lists the averaged results of the PM analysis. It should be noted that the radionuclides are naturally occurring and not emitted from sources at the laboratories.

An Analysis of Variance (ANOVA) was performed to determine if statistical differences existed between stations. The results of the ANOVA indicated that cadmium, copper, and zinc were statistically higher at the CPMS site. These heavy metals are associated with multiple activities in proximity to the CPMS station. The combustion of fuels, automotive road dust, and machine shop activities can produce all three pollutants. The concentrations are very low, but the differences are statistically valid, and provide an excellent example of the impact of TA-I activities and how road proximity factors effect particulate constituents.

VOCs

The VOCs generally observed at SNL/NM are products or by-products of fossil fuels or are from lab operations. In 2003, the data recovery for VOC monitoring was 96 percent. Monthly VOC samples were analyzed for 26 VOC species plus total non-methane hydrocarbon (TNMHC). Table 5-5 shows the compiled results for compounds detected.

The concentrations in Table 5-5 show that there is no one site that has the highest concentration for all analytes. The VOC 1,1,1–Trichloroethane at the minimum detection limit (MDL) was driven by higher summer concentrations.

An ANOVA was performed to determine if statistical differences existed between locations for each VOC. The ANOVA revealed that benzene was statistically slightly higher at the CPMS site, which is the site closest to a main road. The 1,1,1-TCA at the MDLVOC did not pass the statistical difference test because there were not enough detections of the compound at the A2VOC or CPMS sites to compare the results of the MDLVOC site.

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 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 Corporation 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's Environmental Health Division. The NESHAP report is complemented by a more comprehensive report detailing facility emission factors, demographic data, and dose assessment calculations and is available to the EPA, the DOE, and the City of Albuquerque upon request. The NESHAP reports prepared in 2003 include the *NESHAP Annual Report for CY03, Sandia National Laboratories, New Mexico* (SNL 2004b) and the *Radiological Dose Calculations and Supplemental Dose Assessment Data for NESHAP Compliance, Sandia National Laboratories, New Mexico 2003* (SNL 2004c).

TABLE 5-2. 2003 Criteria Pollutant Results as Compared to Regulatory Standards

Criteria Pollutant	Averaging Time	Unit	NMAAQS Standard	NAAQS Standard	Maximum or Measured Concentrations
Carbon Monoxide	1 hour 8 hours	ppm ppm	13.1 8.7	35 9	7.88 2.09
Nitrogen Dioxide	24 hours Annual	ppm ppm	0.10 0.05	- 0.053	0.038 0.025
Sulfur Dioxide§	3 hours 24 hours Annual	ppm ppm ppm	- 0.10 0.02	0.50 0.14 0.03	0.033 0.003 <0.001
Ozone	1 hour 8 hour	ppm ppm	0.12 -	0.12 0.080	0.085 0.074[a]
PM_{10}	24 hours Annual	$\mu g/m^3$ $\mu g/m^3$	- -	150 50	400[b] 32.4
$PM_{2.5}$	24 hours Annual	$\mu g/m^3$ $\mu g/m^3$	- -	65 15	- -
Total Suspended Particulates	7 days 30 days	$\mu g/m^3$ $\mu g/m^3$	110 90	- -	- -
Lead	30 days Any quarter	$\mu g/m^3$ $\mu g/m^3$	- -	- 1.5	0.0083 0.0045

NOTE: 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] Reported as the 2nd highest average during the year – per regulatory standards.

TABLE 5-3. Monthly and Annual Averages for Particulate Matter ($\mu g/m^3$)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
A2PM	6.5	30.0	6.4	26.3	48.4	16.6	22.0	14.2	23.0	18.6	13.4	11.6	19.7
CPMS	12.4	28.4	7.2	16.4	31.5	16.5	23.0	14.2	25.0	19.0	10.4	13.0	18.1
CWPM	7.8	67.5	5.0	40.4	35.8	18.2	20.0	11.3	16.6	18.5	12.4	7.6	21.8
KSSPM	13.2	87.4	7.8	17.5	58.0	14.8	20.6	13.0	25.0	17.3	105.8	8.2	32.4

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

TABLE 5-4. Averaged Results of PM_{10} Analysis

Analyte	Units	A2PM	CPMS	CWPM	KSSPM	TLV
Aluminum						
Antimony	µg/m3	0.00028	0.00025	0.00012	0.00011	500
Arsenic	µg/m3	0.00010	0.00014	0.00023	0.00034	10
Barium	µg/m3	0.00823	0.00568	0.01287	0.00448	50
Beryllium	µg/m3	ND	0.00001	ND	0.00006	2
Cadmium	µg/m3	0.00003	0.00008	0.00003	0.00002	10
Calcium	µg/m3	0.79049	0.85191	0.54865	1.42571	2000
Chromium	µg/m3	0.00053	0.00055	0.00074	0.00065	10
Cobalt	µg/m3	0.00010	0.00021	0.00011	0.00024	20
Copper	µg/m3	0.00802	0.02382	0.00761	0.00904	1000
Iron	µg/m3	0.31849	0.34024	0.24521	0.54853	5000
Lead	µg/m3	0.00115	0.00158	0.00117	0.00123	150
Magnesium	µg/m3	0.09633	0.12109	0.08144	0.19191	10000
Manganese	µg/m3	0.00789	0.00844	0.00584	0.01255	200
Nickel	µg/m3	0.00036	0.00043	0.00027	0.00064	50
Potassium	µg/m3	0.14681	0.14103	0.12629	0.20819	2000
Selenium	µg/m3	0.00022	0.00036	0.00018	0.00017	200
Silver	µg/m3	0.00018	0.00024	0.00016	0.00012	10
Sodium	µg/m3	3.39844	3.72404	6.22404	0.92383	5000
Vanadium	µg/m3	0.00077	0.00079	0.00056	0.00118	50
Zinc	µg/m3	0.00291	0.00639	0.00250	0.00394	10
Uranium	µg/m3	0.00002	0.00002	0.00001	0.00002	200
RADIONUCLIDES						
Gross Alpha	pCi/m3	0.00340	0.00514	0.00561	0.00448	
Gross Beta	pCi/m3	0.01584	0.02223	0.01720	0.01949	
Beryllium-7	pCi/m3	0.10658	0.13001	0.11831	0.12300	40000
Bismuth-214	pCi/m3	0.00438	0.00095	0.00131	0.00229	2000
Cesium-137	pCi/m3	0.00047	0.00076	ND	ND	400
Lead-212	pCi/m3	0.00066	0.00062	ND	0.00064	80
Lead-214	pCi/m3	0.00076	0.00176	0.00301	0.00184	2000
Potassium-40	pCi/m3	0.01429	0.00837	0.00610	0.01224	900
Radium-226	pCi/m3	0.00241	0.00249	0.00176	0.00208	1
Thorium-232	pCi/m3	ND	0.00061	0.00423	0.00114	0.01
Thorium-234	pCi/m3	0.02669	0.04718	0.01616	0.00449	400
Uranium-238	pCi/m3	0.04810	0.03693	0.02060	0.01175	0.1

NOTE: µg/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 2004).
The TLVs listed for the radionuclides are derived from DOE Order 5400.5 dose concentration guidelines defined for 100 m/rem.
ND = not detected

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

Compound	CSVOC ppbv	CWVOC ppbv	MDLVOC ppbv	A2VOC ppbv	TLV ppbv
1,1,1-Trichloroethane **	0.07	4.97	19.18	ND	350000
1,1,2-Trichlorotrifluoroethane **	0.26	0.09	0.09	0.10	1000000
1-Butene/Isobutene	0.29	0.16	0.29	0.17	NA
2,2,4-Trimethylpentane	0.28	0.19	0.37	0.30	NA
2-Butanone (MEK)	0.35	0.41	0.32	0.41	200000
2-Methylbutane	1.24	1.67	1.26	1.32	1770000
3-Methylpentane	0.13	0.16	0.20	0.14	500000
Acetone	3.94	3.77	3.64	2.71	500000
Benzene	0.32	0.14	0.20	0.21	500
Carbon tetrachloride **	0.11	0.15	ND	ND	5000
Chlorobenzene	ND	0.19	ND	ND	10000
Chloromethane	0.52	0.49	0.53	0.50	50000
Dichlorodifluoromethane **	0.63	0.62	0.63	0.64	1000000
Ethylbenzene	0.10	0.09	0.08	ND	100000
Isohexane	0.21	0.15	0.32	0.19	100000
Methylene chloride	0.62	0.62	2.09	0.35	50000
n-Butane	1.43	1.30	1.11	1.19	800000
n-Hexane	0.18	0.30	0.37	0.18	50000
n-Pentane	0.67	0.95	0.65	0.76	600000
o-Xylene	0.11	0.09	0.06	ND	100000
p-Xylene/m-Xylene	0.24	0.25	0.17	0.15	100000
Tetrachloroethene	ND	ND	0.18	ND	25000
Toluene	0.75	0.63	0.61	0.50	50000
Trichloroethene	ND	0.24	ND	ND	50000
Trichlorofluoromethane **	0.42	0.31	0.33	0.35	1000000
TNMHC	17.27	18.62	23.84	12.65	NA

NOTE: 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 2002)
** Ozone depleting compounds.

Values listed are time-weighted averages (TWAs) except where marked. TWA is the concentration for a normal 8-hour workday and a 40-hour week, to which nearly all workers may be repeatedly exposed without adverse effect. Short-term exposure limit (STEL) is a 15-minute TWA which should not be exceeded at any time during the workday even if the 8-hour TWA is within the TLV.

5.3.2 SNL/NM NESHAP Facilities

SNL/NM currently has 18 potential NESHAP facilities that may be defined as either point or diffuse emissions sources. 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 5-6 lists the radionuclides and the total reported emissions (in curies) from each SNL/NM NESHAP source in 2003. Of the 18 sources, 17 were point sources and one was a diffuse source (landfill). Six of the 18 facilities reported no emissions in 2003.

The 18 SNL/NM NESHAP facilities are illustrated in Figure 5-5 and are described below.

TA-I Sources

Calibration Laboratory – Calibration on radiation detection equipment resulted in small releases of tritium.

Cleaning and Contamination Control Laboratory (CCCL) – The CCCL is used for R&D of new and superior materials for government and industrial needs. Carbon-14 was the only radionuclide emission reported in 2003.

Metal Tritide Shelf-Life Laboratory – This laboratory, which conducts research on tritium materials, released negligible levels of tritium (five billionths of a curie).

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 2003, 0.41 Curies (Ci) were reported released from the North Wing stack, based on continuous stack monitoring. Although anticipated tritium releases do not exceed the regulatory threshold requiring continuous monitoring, it is performed voluntarily at the NGF as a best management practice (BMP).

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

Sandia Tomography and Radionuclide Transport (START) Laboratory – This laboratory is used to perform small-scale experiments. In 2003, the facility reported emissions of technetium-99 and uranium-238.

TANDEM Accelerator – This is an ion solid interaction and defect physics accelerator facility. Although the TANDEM did not operate in 2003, the facility reported potential emissions of tritium that were being housed in the facility.

TA-II Sources

Explosive Components Facility (ECF) – The ECF conducts destructive testing on neutron generators. There were no emission releases reported in 2003.

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, three special studies were conducted to quantify the tritium emissions (URS 2004).

Radioactive and Mixed Waste Management Facility (RMWMF) – The RMWMF primarily handles low-level waste (LLW), mixed waste (MW), and some transuranic (TRU) waste. In 2003, the RMWMF reported tritium releases, americium-241, strontium-90, and cesium-137 as determined by continuous stack monitoring. The tritium releases were significantly higher than previous years due to the treatment of large amounts of tritiated oil (18.33 Ci/yr in 2003 compared to 2.49E-02 Ci/yr in 2002). 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.

Saturn Accelerator – This is a modular, high powered, variable spectrum, x-ray simulation source that reproduces the radiation effects of nuclear countermeasures on electronic and material components. No emissions were reported in 2003.

Short Pulsed High Intensity Nano-second X-Radiator (SPHINX) Facility – The SPHINX is a high voltage, high shot rate bremsstrahlung accelerator used to measure the x-ray induced photo currents from short, fast rise time pulses in integrated circuits. No emissions were reported in 2003.

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. In 2003, the stainless steel targets were utilized.

TABLE 5-6. Summary of Radionuclide Releases from the 18 NESHAP Sources in 2003

TA	Facility Name	Monitoring Method *	Used in Dose Calculation?	Radionuclide	Reported Release (Ci/yr)
I	Sandia Tomography and Radionuclide Transport (START) Laboratory	Calculation	no	^{99}TC ^{238}U	1.0E-13 1.0E-13
I	Radiation Laboratory	Calculation	no	^{3}H ^{16}N ^{13}N ^{41}Ar	1.0E-05 2.0E-07 1.0E-06 1.0E-09
I	Calibration Laboratory	Calculation	no	^{3}H	2.04E-04
I	Neutron Generator (NGF)	Continuous	yes	^{3}H	0.41
I	TANDEM Accelerator	Calculation	no	^{3}H	1.0E-05
I	Metal Tritide Shelf-Life Laboratory	Calculation	no	^{3}H	5.0E-09
I	Cleaning and Contamination Control Laboratory (CCCL)	Calculation	no	^{14}C	3.5E-05
II	Explosive Components Facility (ECF)	Calculation	no	N/A	N/A
III	Mixed Waste Landfill (MWL)	Periodic	yes	^{3}H	0.09
III	Radioactive & Mixed Waste Management Facility (RMWMF)	Continuous	yes	^{3}H ^{241}Am ^{90}Sr ^{137}Cs	18.33 1.45E-05 1.61E-05 3.45E-06
CTF	Shock Thermodynamic Applied Research Facility (STAR), CTF	Periodic	no	N/A	N/A
IV	HERMES III	Periodic	no	^{13}N ^{15}O	1.0175E-03 1.0175E-04
IV	Saturn Facility	Calculation	no	N/A	N/A
IV	SPHINX	Periodic	no	N/A	N/A
IV	Z-Facility (Accelerator)	Calculation	no	^{32}P ^{3}H ^{60}Co ^{54}Mn ^{63}Ni ^{55}Fe	5.783E-06 1.23E-07 1.3E-06 6E-09 3.4E-09 6E-06
V	Hot Cell Facility (HCF)	Periodic	yes	N/A	N/A
V	Annular Core Research Reactor (ACRR)	Periodic	yes	^{41}Ar	6.65
V	Sandia Pulsed Reactor (SPR)	Periodic	no	N/A	N/A

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

HERMES III = High Energy Radiation Megavolt Electron Source III
Ci/yr = curies per year
SPHINX = Short Pulse High Intensity Nanosecond X-Radiator
CTF = Coyote Test Field
N/A = not available
TA= Technical Area

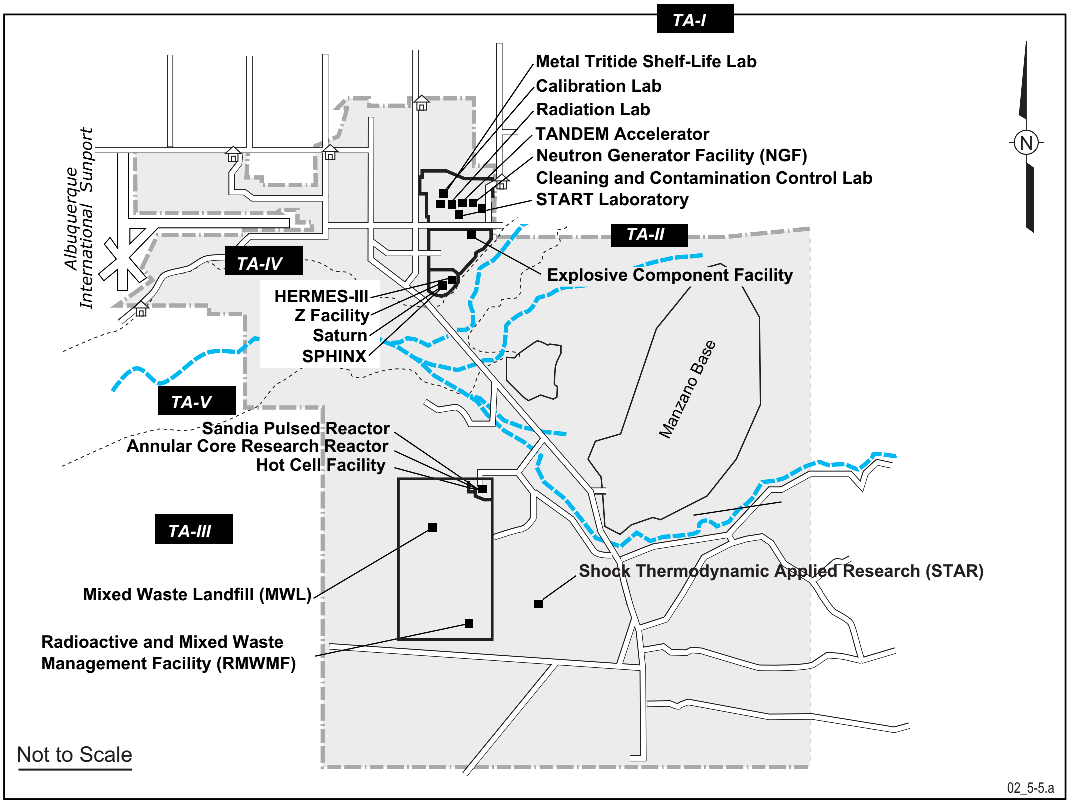


FIGURE 5-5. Locations of the 18 Facilities at SNL/NM that Provided Radionuclide Release Inventories in 2003

Consequently, the facility reported releases of tritium, cobalt-60, manganese-54, nickel-63, iron-55, and phosphorus-32.

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 2003.

Hot Cell Facility (HCF) – The HCF provides full capability to remotely handle and analyze radioactive materials such as irradiated targets. The facility is in standby mode to support MIPP should production be required in the future. No emissions were reported in 2003.

Sandia Pulsed Reactor (SPR) – The SPR is used to produce intense neutron bursts for effects testing on materials and electronics. There were no emission releases reported in 2003.

CTF Sources

STAR Facility - The STAR facility uses four types of guns as research tools to provide controlled loading conditions from ambient to multi-Mbar pressure for material research studies. There were no emission releases reported in 2003.

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 given 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 seven "primary" sources (ACRR, SPR, HCF, Z Facility, NGF, RMWMF, and MWL) are modeled using version 2 of the EPA's CAA Assessment Package-1988 (CAP88) (EPA 2002) to estimate the annual dose to each of 29 identified public receptors. Primary sources are those that determine their emissions by direct measurements or by calculations based on measured operational parameters. The HCF and SPR were the only primary sources to report no emissions in CY03.

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 2003, the highest emissions were argon-41 and tritium. Historically, these radionuclides have been the most significant contributors to the effective dose equivalent (EDE) of the MEI. Figure 5-6 shows the annual reported release in curies of argon-41 and tritium over the past 13 years.

Demographic Data

Demographic data includes resident population, the number of beef and dairy cattle, and the utilized food crop area fraction for the 50-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 2003, 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 2004). 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 2004). The following values were used in the 2003 CAP88 calculation:

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

On-site and Off-site Public Receptors

A total of 29 receptor locations (22 on-site at KAFB and seven 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, the Four Hills subdivision north of KAFB, the Manzanita Mountains (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.

Meteorology

Data from four meteorological towers (CW1, A36, A21, and MW1) in the proximity of NESHAP emission sources were used in 2003. Data from each tower consisted of approximately 35,000 hourly observations of wind direction, wind speed, and stability class (inferred from wind and solar insolation 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 the horizontal and vertical directions. Individual EDEs to off-site and on-site receptors are presented in Tables 5-7 and 5-8, respectively. Dose assessment results are summarized in Table 5-9.

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 2003, the MEI was located on KAFB, at the Chestnut Test Site southwest of TA-V. The previous MEI was located on KAFB, at the KAFB Storage Facility, northwest of TA-V, but due to the large volume of waste being handled at RMWMF, the location was changed. The MEI dose of 0.00219 mrem/yr resulted primarily from releases of tritium and argon-41. The off-site MEI was located at Tijeras Arroyo (West). The MEI was 0.000872 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 5-9). 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. SNL/NM calculates the collective population dose for both the KAFB housing areas and the general Albuquerque area population within an 80-km (50-mi) radius.

- ***Regional*** – The Albuquerque regional collective population dose in 2003 was 0.0949 person-rem/yr. For the purpose of calculating the collective dose, all releases 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 six main housing areas. The total population dose for KAFB was obtained by summing the six areas based on a total residential population of 2,522. This resulted in an estimated population dose of 0.000745 person-rem/yr.

5.5 Air Quality Requirements and 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. A complete list of air quality regulations applicable to SNL/NM is given in Chapter 9.

5.5.1 SNL/NM Air Emission Sources

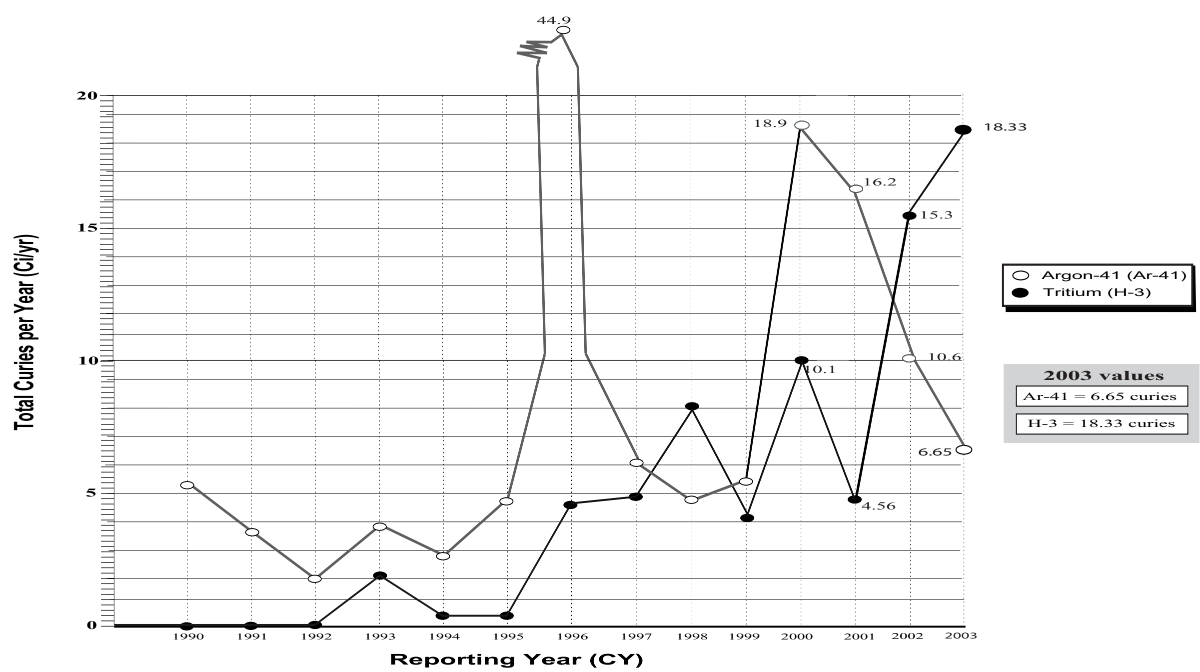
As discussed in Section 5.2, criteria pollutants include SO_2, NO_2, CO, O_3, PM, and lead. For these criteria and other pollutants, the EPA:

- 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, "National Ambient Air Quality Standards" and implemented in 20.11.01NMAC "General Provisions." Compliance with criteria pollutant standards for ambient air is met through ambient air surveillance, periodic direct emission sampling, and fuel throughput tracking and reporting. As discussed in the previous section, 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 significant sources of criteria pollutants at SNL/NM are listed below.

Steam Plant
The Steam Plant produces steam heat for buildings in TA-I. The plant has run continuously since 1949. The five boilers (Boilers 1, 2, 3, 5, and 6) run primarily on natural gas, but can also burn diesel. All five boilers were used in 2003. The volume of fuel throughput used in the boilers is reported to the City of Albuquerque. In 2003, fuel throughput



NOTE: The atmosphere contains 72% nitrogen, 21% oxygen, 0.93% argon, 0.03% carbon dioxide, and minor concentrations of neon, methane, hydrogen, helium, and kyrpton. Some of these constituents are susceptible to isotope transformations during high energy processes, which result in air activation products such as Ar-41.

FIGURE 5-6. Summary of Atmospheric Releases in Argon-41 and Tritium from SNL/NM Facilities Since 1990 (Emissions vary from year to year based on operations within the facility) reported at the Steam Plant was as follows:

Natural Gas (scf)	Diesel (gal)
431,639,000	0

NOTE: scf = standard cubic feet
gal = gallon

As defined by 20.11.67 NMAC, "Equipment, Emissions, Limitations," the Steam Plant Boilers 1, 2, and 3 fall below the applicable minimum emission limits for NO_x; however, Boilers 5 and 6 cannot allow NO_x emissions to the atmosphere in excess of 0.3 pounds per million British thermal units (BTU) of heat input. Stack sampling is not required for the Steam Plant since it is a "grandfathered" source and no permit has been previously required. There are no other air quality regulations that apply to the Steam Plant. However, the Steam Plant's air emissions are no longer subject to the requirements of Title V, since Application No. 515 was amended to limit the potential to emit greater than 100 tons per year (tpy) of criteria pollutants. As a "grandfathered" existing source, Title V does not require the Steam Plant to change or replace equipment. However, Sandia Corporation initiated the Steam Plant Optimization Project in 1997 to determine ways to improve fuel efficiency and reduce emissions and remain below 100 tpy by retrofitting all five boilers with Flue Gas Recirculation.

Vehicles

The majority of government vehicles at SNL/NM are owned and managed by the General Services Administration (GSA). Currently, there are approximately 775 GSA vehicles in SNL/NM's fleet. 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 Corporation submits an annual vehicle inventory update and inspection plan to the City of Albuquerque for approximately 11 SNL/NM-owned vehicles.

Emergency Generators

Sandia Corporation operates four main standby diesel generators for emergency power supply. These generators are some of SNL/NM's largest generators, each with a 600-kilowatt (kW) capacity. These generators, permitted by the City of Albuquerque (Chapter 9, Table 9-1) are exercised monthly and their electrical systems are tested quarterly. An additional generator is planned at the Microsystems and Engineering Sciences Applications (MESA) Facility in 2004.

In 2003, the generator fuel throughput was 6,430 gallons of diesel. Sandia Corporation is permitted a maximum use of 500 hours a year for the main standby generators, which is the same usage assumed for all other on-site generators.

Open Burns

As required by 20 NMAC 11.21, "Open Burning," DOE obtains open burn permits for each of Sandia Corporation's applicable scheduled event or test series. The regulation differentiates the permit basis into two categories: multiple-event and single-event. The single-event permit was designed to regulate individual burns having significant impact. As shown in Chapter 9, Table 9-1, there were 14 permits issued in 2003. 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 research and development activity; and
- Igniting Rocket Motors with greater than 4,000 lb of fuel.

5.5.2 New Directions Under 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 tpy or greater of any criteria pollutant,
- 10 tpy of any HAP, or
- 25 tpy of any combination of HAPs.

SNL/NM used to be considered a major source based on its potential to emit NO_x and CO. Since potential emissions from the Steam Plant were greater than 100 tpy of criteria pollutants, this facility was considered a major source in itself. The intent of Title V is not to add new requirements, but rather to pull together existing requirements under one umbrella regulation, thereby eliminating the need to permit individual sources. SNL/NM sources listed on the permit application include the Steam Plant, the emergency generators, and smaller combustion sources (Burn permits will continue to be permitted on an individual basis).

Background

The DOE/NNSA/SSO submitted Sandia Corporation's Title V Operating Permit application (DOE 2002a) on March 1, 1996; the application was deemed complete on May 1, 1996. Although the regulatory due date was March 13, 1998, and the permit was anticipated to be issued in 2003, the City of Albuquerque has yet to issue the final permit. Application No. 515 Volume I was amended and updated in 1999 and again in 2002. A synthetic minor permit application for the Steam Plant was submitted in 2003.

TABLE 5-7. Annual Source-Specific Effective Dose Equivalent (EDE) to Off-site Receptors in 2003

Receptor	ACRR	SPR	RMWMF	MWL	NGF	Z Facility	EDE (mrem/yr)
Albuquerque City Offices	1.50E-04	0.00E+00	3.80E-04	2.50E-06	1040E-05	4.20E-07	**5.47E-04**
East Resident	8.10E-06	0.00E+00	2.10E-04	1.70E-06	1.10E-05	5.80E-08	**2.31E-04**
Eubank Gate Area	9.50E-05	0.00E+00	2.80E-04	2.00E-06	1.70E-05	8.00E-07	**3.95E-04**
Four Hills	1.10E-04	0.00E+00	3.00E-04	2.00E-06	1.30E-05	3.80E-07	**4.25E -04**
Isleta Bingo	2.10E-05	0.00E+00	3.00E-04	1.80E-06	1.20E-05	1.10E-07	**3.35E-04**
Northeast Resident	4.00E-05	0.00E+00	2.60E.04	1.70E-06	1.20E-05	1.10E-07	**3.14E-04**
Tijeras Arroyo (West)	2.20E-04	0.00E+00	4.40E-04	3.00E-06	1.40E-05	5.00E-07	**6.78E-04**

NOTE: mrem/yr = millirem per year
SPR = Sandia Pulsed Reactor
RMWMF = Radioactive Mixed Waste Management Facility
ACRR = Annular Core Research Reactor
MWL = Mixed Waste Landfill
NGF = Neutron Generator Facility

TABLE 5-8. Annual Source-Specific Effective Dose Equivalent (EDE) to On-site Receptors in 2003

Receptor	ACRR	SPR	RMWMF	MWL	NGF	Z Facility	EDE (mrem/yr)
Airport	2.00E-04	0.00E+00	1.30E-04	3.40E-07	5.10E-06	7.00E-07	**3.36E-04**
Airport East	1.00E-04	0.00E+00	1.10E-04	2.70E-07	3.50E-06	5.50E-07	**2.14E-04**
USAF #1	1.40E -04	0.00E+00	1.10E-04	3.60E-07	1.10E-05	2.20E-06	**2.64E-04**
USAF #2	8.60E-05	0.00E+00	8.90E-05	2.80E-07	3.90E-06	6.00E-07	**1.80E-04**
Capehart West	1.00E-04	0.00E+00	8.80E-05	2.00E-07	1.70E-06	2.30E-07	**1.90E-04**
Chestnut Site	1.90E-04	0.00E+00	2.00E-03	7.30E-07	8.00E-07	1.10E-07	**2.19E-03**
Golf Course Clubhouse	5.60E-04	0.00E+00	2.40E-04	9.30E-07	2.50E-06	5.40E-07	**8.04E-04**
Golf Course Maintenance Area	3.30E-04	0.00E+00	1.90E-04	7.20E-07	4.00E-06	1.10E-06	**5.26E-04**
Honeywell Instrument Support Site	1.90E-04	0.00E+00	1.30E-04	4.50E-07	3.30E-05	9.90E-06	**3.63E-04**
LLRI	6.60E-05	0.00E+00	1.80E-04	1.70E-07	4.20E-07	5.60E-08	**2.47E-04**
KAFB Fire Station #4	8.80E-05	0.00E+00	3.20E-04	4.20E-07	5.20E-07	6.40E-08	**4.09E-04**
KAFB Landfill	1.80E-04	0.00E+00	1.30E-04	4.70E-07	7.10E-06	3.00E-06	**3.21E-04**
KAFB Storage Facility	1.20E-03	0.00E+00	2.80E-04	1.80E-06	2.30E-06	4.5 0E-07	**1.48E-03**
Loop Housing	7.70E-05	0.00E+00	8.30E-05	2.60E-07	4.30E-06	6.40E-07	**1.65E-04**
Manzano Offices (Fire Station)	2.40E-04	0.00E+00	2.30E-04	3.40E-07	8.70E-07	1.50E-07	**4.71E-04**
Maxwell Housing	9.80E-05	0.00E+00	8.50E-05	1.90E-07	1.70E-06	2.30E-07	**1.85E-04**
Pershing Park	6.80E-05	0.00E+00	7.80E-05	2.40E-07	4.00E-06	5.50E-07	**1.51E-04**
Riding Club	6.20E-04	0.00E+00	2.90E-04	7.80E-07	1.60E-06	3.80E-07	**9.13E-04**
Sandia Federal Credit Union	1.30E-04	0.00E+00	9.70E-05	3.20E-07	8.30E-06	1.30E-06	**2.37E-04**
Sandia Elementary School	6.70E-05	0.00E+00	7.80E-05	2.40E-07	4.00E-06	5.40E-07	**1.50E-04**
USGS	6.10E-05	0.00E+00	1.70E-04	2.10E-07	5.00E-07	7.00E-08	**2.32E-04**
Zia Park Housing	1.20E-04	0.00E+00	1.20E-04	3.00E-07	5.30E-06	1.00E-06	**2.47E-04**

NOTE: ACRR = Annular Core Research Reactor
SPR = Sandia Pulsed Reactor
RMWMF = Radioactive Mixed Waste Management Facility
mrem/yr = millirem per year
LLRI = Lovelace Respiratory Research Institute
MWL = Mixed Waste Landfill
NGF = Neutron Generator Facility
USGS = U.S. Geological Survey
KAFB = Kirtland Air Force Base
USAF = U.S. Air Force

TABLE 5-9. Calculated Dose Assessment Results for On-site and Off-site Receptors and for Collective Populations in 2003

Dose to Receptor	Location	2003 Calculated Dose	NESHAP Standard
Individual Dose			
On-site Receptor EDE to the MEI	Chestnut test-site	0.00219 mrem/yr *(0.000021 mSv/yr)*	10 mrem/yr *(0.1 mSv/yr)*
Off-site Receptor EDE to the MEI	Tijeras Arroyo (West) West of KAFB	0.0007 mrem/yr *(0.000007 mSv/yr)*	10 mrem/yr *(0.1 mSv/yr)*
Collective Dose			
Collective Regional Population[1]	Residents within an 80-km (50-mi) radius	0.0949 person-rem/yr *(0.000949 person-Sv/yr)*	No standard available
Collective KAFB Population[2]	KAFB housing	0.000745 person-rem/yr *(0.0000745 person-Sv/yr)*	No standard available

NOTE: [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 3,285 people estimated to be living in permanent on-base housing.
mSv/yr = millisievert per year
person-Sv/yr = person-sievert per year
mrem/yr = millirem per year
EDE = effective dose equivalent
MEI = maximally exposed individual
KAFB = Kirtland Air Force Base
NESHAP = National Emissions Standards for Hazardous Air Pollutants

Small Business Assistance
In 2003, the New Mexico Small Business Assistance (NMSBA) Program, which is managed by SNL/NM, continued assisting a Las Cruces, New Mexico cotton gin cooperative in reaching permitting compliance. Assistance was also provided in 2003 to a brick manufacturer in Sunland Park, NM.

Title V Fee Structure
The City of Albuquerque's regulation requires source owners to pay air emission fees, which are implemented under 20.11.02 NMAC, "Permit Fees." Since 1997, source owners were able to submit an inventory of their actual emissions or fuel throughput for the year and pay an annual fee based on this amount. This fee reduction provision was eliminated in a modification to 20.11.02 NMAC that became effective on July 1, 2001. Annual fees are based on an assessed value of a source's maximum allowable to emit regardless of actual emissions, thereby increasing SNL/NM's fees from $2,290 for 2000 to potentially $78,430 for 2001 and 2002. For example, the Steam Plant would be assessed on the assumption that it operated at full capacity year-round. Sandia Corporation now intends to apply for a synthetic minor permit to take federally-enforceable limits on its emission sources to remain below the 100 tpy Title V threshold, and took a step towards that goal in 2002 by amending its application, and again in 2003 by submitting a synthatic minor permit application for the Steam Plant.

5.5.3 Ozone Depleting Substance (ODS) Reductions

Sandia Corporation did not make any progress in Calendar Year (CY) 2003 towards the DOE secretarial goal of replacing Class I refrigerant chillers greater than 150 tons capacity, manufactured prior to 1984, by 2005. Replacement is part of a larger upgrade to improve the reliability and the overall efficiency of the associated chilled water system.

Electric vehicles used at SNL/NM.

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Chapter Six

Wastewater, Surface Discharge, and Storm Water Monitoring Programs

In this Chapter ...
Wastewater Discharge Program
Surface Discharge Program
Storm Water Program

Groundwater Measurements

Environmental Snapshot

- *Sandia Corporation received five "Gold Pre-treatment Awards" from the City of Albuquerque for 100 percent compliance to discharge limits set in permits during the 2002-2003 reporting year (November 2002 to November 2003).*
- *SNL/NM reduced its toxic discharges by implementing Toxic Organic Management Plans (TOMPs) and general good housekeeping and engineering practices.*
- *Due to the continuing drought, visual samples were only collected in the 1st and 2nd quarters of FY 2003.*

Chapter Summary

Sandia National Laboratories, New Mexico (SNL/NM) conducts effluent monitoring through wastewater, surface water, and storm water monitoring and surveillance programs.

The Wastewater Discharge Program currently monitors both sanitary discharges and industrial discharges at five on-site wastewater outfalls that are permitted by the City of Albuquerque. In 2003, there were two wastewater events reported to the City of Albuquerque.

Surface discharges are monitored through an approval and permitting process by the Surface Discharge Program as a domestic potable water source. The Surface Discharge Program also tracks and reports any accidental surface releases or spills. In 2003, six surface discharge releases were reported to the New Mexico Environment Department (NMED). There were eight internal surface discharge requests made and approved after verification that state standards were met.

The Storm Water Program monitors storm water runoff at nine stations throughout SNL/NM. The program strives to maintain compliance with the National Pollutant Discharge Elimination System (NPDES) and protects "Waters of the U.S." At SNL/NM, Tijeras Arroyo is defined as a "Water of the U.S." In 2003, six storm water construction permits were in effect.

Crews repair water line break at SNL/NM

Sandia Corporation 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 NMED and the City of Albuquerque. Currently, EPA Region VI implements storm water regulations under the NPDES; SNL/NM's five on-site outfalls are permitted by the City of Albuquerque. Storm water is the only discharge at SNL/NM regulated by NPDES. Sandia Corporation also adheres to the water quality guidelines contained in U.S. Department of Energy (DOE) Orders 450.1, *Environmental Protection Program* (DOE 2003a) and 5400.5, *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 Corporation closely monitors its liquid effluent discharges to meet regulatory compliance. Sandia Corporation further reduces its toxic discharges by implementing 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 3.3.

6.1.1 SNL/NM and the City of Albuquerque Sewer System

City of Albuquerque Publicly-Owned Treatment Works (POTW)

SNL/NM's sewer system connects to the City of Albuquerque's sanitary sewer line at four permitted outfalls. SNL/NM also has one additional industrial permitted wastewater outfall at the Microelectronics Development Laboratory (MDL), which is upstream of the final discharge location, COA Permit 2069I. Wastewater effluent discharged from any of the five outfalls must meet the City of Albuquerque'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 City of Albuquerque's Code of Ordinances:

www.amlegal.com/albuquerque_nm/

All SNL/NM effluent discharge standards were within the City of Albuquerque's SUWCO established limits except for the August 2003 fluoride excursion detailed in Section 6.1.5.

Wastewater Compliance Awards

The City of Albuquerque's reporting requirements are defined under its SUWCO. The SUWCO specifies the discharge quality and requirements that the City of Albuquerque will accept at its POTW. Sandia Corporation received five "Gold Pre-treatment Awards" from the City of Albuquerque for the 2002 to 2003 reporting year (November 2002 to November 2003). A "Gold Pre-treatment Award" is given based on a facility's 100 percent compliance with reporting requirements and discharge limits set in permits or exceptional source reduction and P2.

6.1.2 Permitting and Reporting

The City of Albuquerque Public Works Department, Liquid Waste Division, implements the EPA's water quality standards under the authority of the SUWCO. Sandia Corporation submits semi-annual wastewater reports to the City of Albuquerque. 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 Sandia Corporation 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

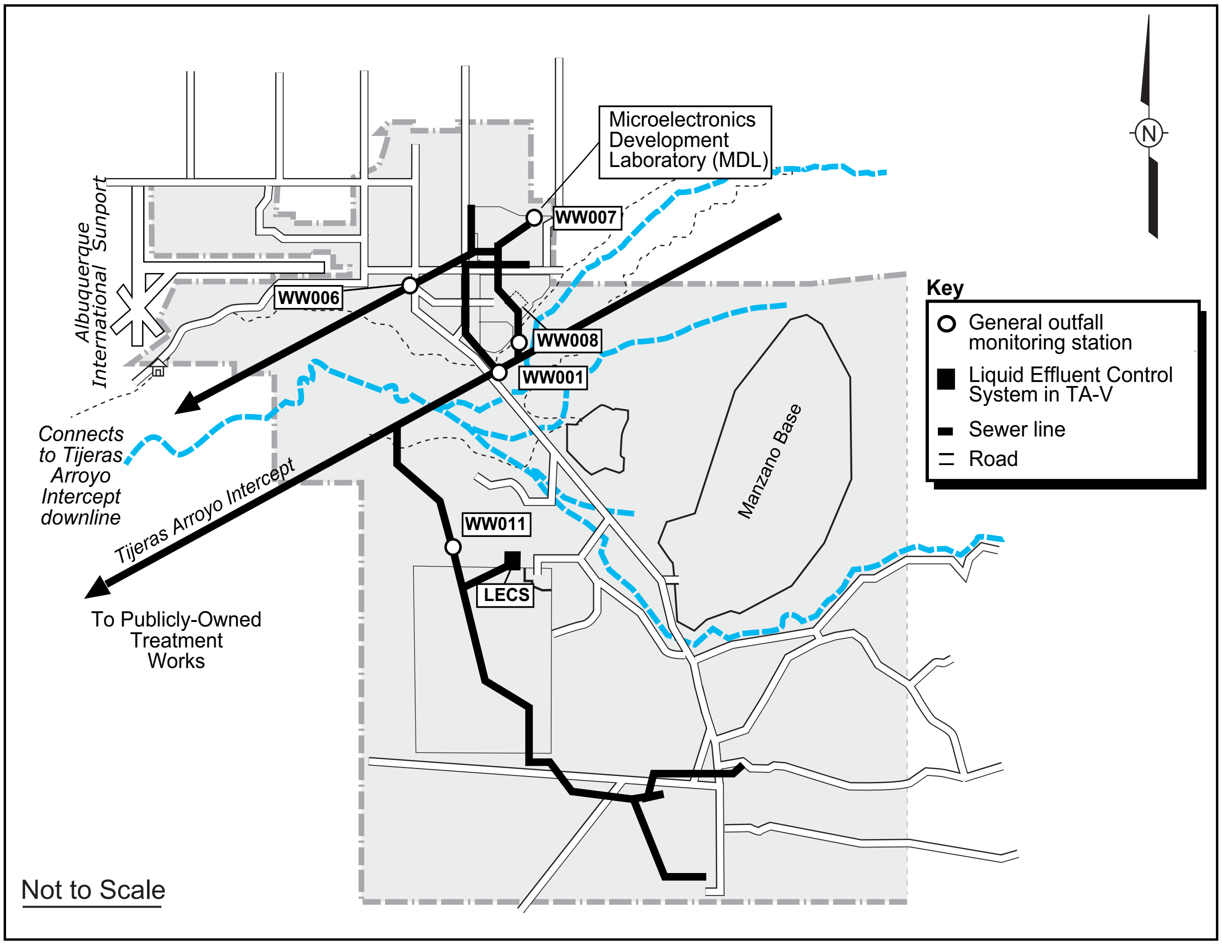

FIGURE 6-1. Wastewater Monitoring Station Locations

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.

The MDL uses acids for etching electronic boards and other components.

6.1.3 Wastewater Monitoring Stations

SNL/NM has five on-site outfalls permitted by the City of Albuquerque (Figure 6-1). Wastewater permits are listed in Chapter 9, Table 9-1. Four of these stations discharge directly to the public sewer, which flows into the Tijeras Arroyo Intercept and one station is for an upstream categorical pre-treatment process. SNL/NM discharges approximately 800,000 gallons of wastewater per day to the public sewer.

The EPA has established categorical pre-treatment standards for specified classes of industrial discharges. Station WW007 (COA Permit 2069G) monitors the wastewater discharged from the Acid Waste Neutralization (AWN) System at the MDL in Technical Area (TA) I.

Wastewater Monitoring

All outfall stations are equipped with flow meters and pH sensors to continuously monitor wastewater 24 hours-a-day, 365 days-a-year. In the event that an exceedence is detected, an auto-dialer will contact personnel at SNL/NM and the DOE/NNSA/SSO will notify the City of Albuquerque within 24 hours. Wastewater Discharge Permits and Station Characteristics are listed in Table 6-1.

Sandia Corporation splits wastewater samples taken from SNL/NM outfalls with the City of Albuquerque to determine compliance with permit

Wastewater Analyte Parameters

Metals
Aluminum, Arsenic, Chromium, Copper, Lead, Mercury, Nickel, Silver, Selenium, Zinc

Radiological
Tritium, Gross beta, Gross alpha, Gamma spectroscopy

General Chemistry
Cyanide, Soluble fluoride, Formaldehyde, Phenolic compounds, Oil and grease, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), chemical oxygen demand (COD)

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

Permit	Waste Stream Process
General Outfall	
WW001	All waste streams
WW006	All waste streams
WW008	All waste streams
WW011	All waste streams
Categorical	
WW007	MDL
Not Permitted	
LECS	Radiological screening of TA-V process water

NOTE: "All waste streams" include both domestic and industrial discharges.
TA-V = Technical Area V
LECS = Liquid Effluent Control System
MDL = Microelectronics Development Laboratory

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 Corporation sends SNL/NM split samples to an EPA-approved laboratory for analysis. Sampling results are compared with results obtained by the City of Albuquerque. Currently, the procedure is to sample randomly from a list of potential pollutants. The City of Albuquerque determines which parameters it plans to analyze. Station parameters are listed in the shaded box (shown above on page 6-4).

Septic Systems

Sandia Corporation maintains three 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 Corporation periodically obtains samples from these active tanks prior to pumping and discharge.

6.1.4 TA-V Radiological Screening

SNL/NM maintains research and engineering reactors in Technical Area V (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 building 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 City of Albuquerque's sanitary sewer system by collecting, analyzing, and handling SNL\NM reactor process wastewater from TA-V reactor 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, which became operational in 1994, consists of three 5,000-gallon 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 2003, Sandia Corporation split SNL/NM wastewater samples with both the City of Albuquerque and the NMED. In 2003, laboratory analytical results for these wastewater samples, based on the parameters shown above, confirmed that Sandia Corporation was in compliance with all City of Albuquerque regulations. The City of Albuquerque staff also inspected SNL/NM facilities to ensure that Sandia Corporation was in compliance with the City of Albuquerque's discharge requirements. All water discharged from the LECS in 2003 also met federal regulatory standards and DOE Orders for radiological levels in wastewater.

Reportable occurrences and environmental releases in 2003 are discussed in Sections 2.2.1 and 2.2.2 (please note that the definitions for reportable occurrences and environmental releases have been changed, which is discussed in Chapter 2). There were two reportable events (City of Albuquerque permit violations) in 2003:

In August 2003, during construction activities, a three-way valve was inadvertently left in a position that allowed de-ionized water to flow to the Hydrogen Fluoride (HF) holding tank in the AWN room. The tank subsequently overflowed. The overflow of dilute HF went to the AWN area floor drains connected to the sump pit tank, and was pumped into the AWN system where the HF was neutralized. This caused the system effluent levels for fluoride to exceed 36mg/L at the MDL AWN System (Permit 2069G). The system was repaired and the release did not present an imminent danger to the health and safety of persons, to the sanitary sewer system, or to the environment. The City of Albuquerque approved the corrective actions taken during the event and has not required additional actions or issued a notice of violation (NOV) to SNL/NM.

In January 2003, deterioration and instabilities of pH system components resulted in the loss of continuous pH monitoring capabilities at one of the five City of Albuquerque permitted monitoring stations operated by SNL/NM during November and December of 2002. There was a subsequent loss of continuous pH monitoring data, which could result in the City of Albuquerque issuing a NOV to SNL/NM. Monitors for pH were replaced. The City of Albuquerque accepted the semi-annual report for Permit 2069F on March 10, 2002 for the reporting period July 1, 2002 through December 31, 2002, and has not issued any NOV and/or has required no additional reporting. This event was also a DOE Occurrence Reporting Processing System (ORPS) reportable occurrence.

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.

2003 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 2003, eight individual surface discharge requests were made; all met state standards and were approved.

6.2.2 Surface Discharge Releases in 2003

The Surface Discharge Program must be contacted in the event of an accidental release or spill to the ground surface. In 2003, six reportable surface discharge releases occurred. Environmental releases and occurrences are briefly summarized in Section 2.2.2 (please note that the definitions for reportable occurrences and environmental releases have been changed, which is discussed in Chapter 2). Two of these releases also meet ORPS criteria as an occurrence.

(1) In February 2003, a release of diesel fuel was detected near the SW corner of TA-I. A faulty fuel line on the engine of a boom lift caused the release of the diesel fuel. The lift equipment was in use by a construction crew working on the roof of the building. A crew member noticed the diesel leaking from the equipment and notified the operator. The equipment was immediately shutdown and placed out of service. Approximately four gallons of diesel fuel was released to a concrete drive. Approximately two gallons of fuel entered the storm drain. SNL/NM emergency responders were dispatched and contained the release and immediately cleaned the area. The NMED was notified and SNL/NM submitted the 7-day notification.

(2) In March 2003, a contractor was digging a trench when a cap on a 10-inch water line failed, resulting in a release of approximately 35,000 gallons of potable water. The failure was located outside of the TA-I fence line at 9th and Hardin Streets. The released water flowed to the south and east where it entered a storm drain inlet. The release caused minor deposits of silt on an adjacent roadway, but there was no structural damage to roads or buildings. No sites or potable water well sites were impacted.

3) In August 2003, a release was detected from the one million gallon water tank that is used for thermal energy storage for heating and air-conditioning (HVAC) systems in several buildings. A contractor was starting up an HVAC system in a newly constructed building and turned on a valve that was within a closed loop make-up system that was tied into the thermal storage system. The contractor was unaware that the new line was not locked out at the thermal storage water tank. The line filled the head space and the tank overflowed for approximately 30 minutes before the valve was turned off. The release was a mixture of water treated with corrosion inhibitors, biocides and potable water. After the overflow, it was fitted with a water pressure-reducing unit and is now locked-out and under SNL/NM Facilities control. Also, the tank level alarms have been adjusted such that the alarms will be triggered before the tank overflows.

(4) In August 2003, a release occurred within TA-I. The water, which is used for domestic service, was isolated and shut off. The release was from a 10-inch water line (domestic potable water) within the Joint Computational Engineering

Laboratory (JCEL) construction zone. A contractor was performing demolition on a concrete block, which punched a 4-inch hole in a 10-inch water line that was encased in the block. The concrete block was in an unlined storm ditch that was being lowered per new drainage requirements. Approximately 115,000 gallons of water flowed within the storm drainage ditch and infiltrated the soil column before reaching any major arroyo channel that enter "Waters of the U.S." No sites or potable water well sites were impacted.

(5) In October 2003, a worker on the Microsystems and Engineering Sciences Applications (MESA) construction site damaged an eight inch chilled water line. The water spilled directly into the MicroFab's Central Utility Building (CUB) excavation pit. It is estimated that approximately 10,000 to 20,000 gallons of chilled water was released into the pit before the valves were shut off. The release was a mixture of potable water treated with corrosion inhibitors and biocides. The City of Albuquerque was contacted and SNL/NM requested approval to discharge the released water into the sanitary sewer system. The City of Albuquerque gave verbal approval for this activity if the contractors would keep the sediment out of the sanitary sewer system. The release did not impact groundwater or cause damage to the environment.

6) In November 2003, a subcontractor was discarding Corrective Action Management Unit (CAMU) sump leachate into the sanitary sewer line (the leachate had been sampled and met the SUWCO discharge limits). The leachate was to be pumped directly from the "less than 90-day storage area" through a hose to the sanitary sewer line access point. The subcontractor set up a drum pump to a location that he thought was the sanitary sewer line access point. Pumping of the first of four 55-gallon drums begun. After the fourth drum was emptied, the subcontractor noticed that the ground was subsiding around the access hole. The process was immediately discontinued and the manager of this process was notified. It was determined that the access hole was not a sanitary sewer line access point, but rather an access point for a water line valve. The leachate water was flowing out the bottom of the hole and directly into the surrounding soil. The leachate is a listed Resource Conservation and Recovery Act (RCRA) Hazardous Waste, FO39. The reportable quantity (RQ) for FO39 is one pound or approximately 0.121 gallons. All necessary reports to DOE/SSO were made. DOE/SSO reported the spill to the U.S. National Response Center (NRC). Procedures were developed to prevent future events of this nature.

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 due to the ongoing nature of the discharges and the large volumes of water involved.

Storm Water Station 5 (the roofline shown just to the right of this channel) samples storm water at a discharge point to Tijeras Arroyo.

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 largest tank is 250,000 gallons in capacity. The secondary containments are designed to hold the entire contents of a tank in the event of a spill. Significant volumes of precipitation can collect in the containments during the monsoon season. The water is visually inspected for oil contamination and any oil present is skimmed off prior to discharge. Lagoon I is a 137,500-gallon capacity rectangular pond, approximately 50 by 70 ft and 11 ft deep. Lagoon II is a 127,000-gallon capacity trapezoidal-shaped pond, approximately 40 by 70 ft and 8 ft deep.

Water Level Measurements
Water levels in the lagoons are measured annually and water quality samples are taken biennially during even numbered years, as required by DP-530 (SNL 2001b). Water level measurements will be taken in 2004.

6.2.4 Sandia Corporation/ New Mexico Tech Vadose Zone (STVZ) Infiltration Test Facility Discharge Plan

NMED approved Discharge Plan DP-1381 on March 4, 2002 for the STVZ. SNL/NM and New Mexico Institute of Mining and Technology (New Mexico Tech) staff used the STVZ Facility during 2002 to conduct research on contaminant flow and transport through a heterogeneous vadose zone. Potable water and water with low concentrations of NaCl (salt) were used during the experiment.

Infiltration at the STVZ was stopped on July 31, 2002. The permit expired on March 4, 2003 and transfer of the STVZ Facility to New Mexico Tech operational control occurred in October 2003.

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 Corporation 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. SNL/NM also limits storm water contact with chemical storage containers and carefully controls runoff in areas where wastes, chemicals, and 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 the basin 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 City of Albuquerque for discharges to the sanitary sewer. Required approval to outside agencies is obtained through the DOE.

NPDES Regulations

The NPDES regulates storm water runoff from industrial facilities in order to protect "Waters of the U.S." as defined by the Clean Water Act (CWA). As it applies to SNL/NM, the Tijeras Arroyo, which discharges to the Rio Grande, is a "Water of the U.S." The arroyo is generally dry, but during heavy downpours, it has significant water-carrying capacity. Any runoff that flows into the arroyo through a channel, arroyo, conduit, or overland surface flow is considered a discharge point.

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." Sandia Corporation 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 Corporation 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.

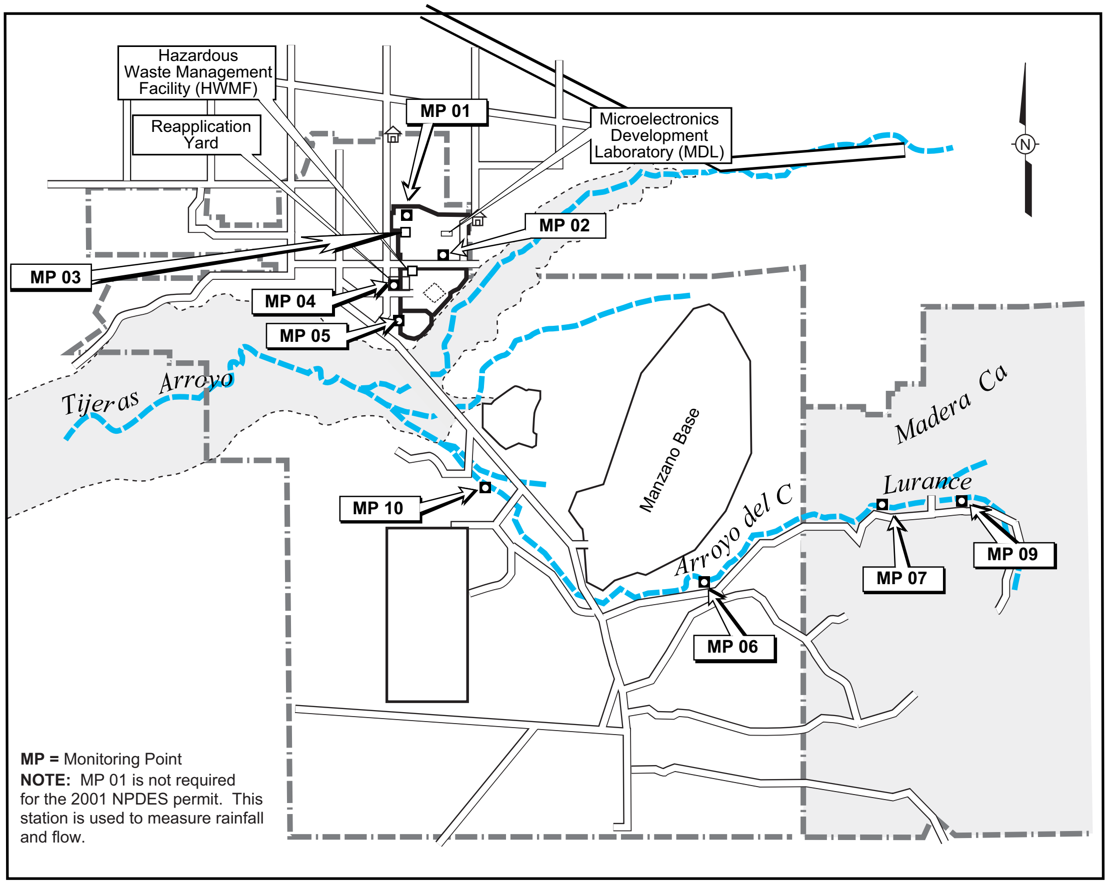

FIGURE 6-2. Storm Water Monitoring Point Locations at Nine Sites

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."; therefore, NPDES permits are not required for facilities in this area. TA-III, TA-V, and several remote sites are located in this area.

A new NPDES permit was issued in January 2001. Four stations were added to monitor runoff in the Arroyo del Coyote watershed at that time.

NPDES Permit

The EPA provides regulatory oversight for SNL/NM's Storm Water Program. SNL/NM facilities are covered under the NPDES "Multi-Sector General Storm Water Permit" issued by the EPA in January 2001 (EPA 2001). Currently, there are nine SNL/NM monitoring points (MPs) on the permit. The permit was reissued in 2001 for five years and covers four primary industrial activities at SNL/NM as defined in 40 CFR 122. Key facilities affected by NPDES regulations are listed in Table 6-2. Chapter 9 of this report lists all applicable regulations and program documents.

Beginning in 2003, construction activities that disturb over one acre (previously was five acres) also require permitting under NPDES. A construction permit requires the ground to be stabilized upon completion of the project. In 2003, six storm water construction permits were in effect: the Storm Drain, Sanitary Sewer, Domestic Water System Modernization (SSWM) Project, MESA Project, CINT Core Facility Construction Project, Scientific Computing Annex (SCA)/CUB Project, Aerial Cable Facilities Renovations Project, and the JCEL. Storm water permits are listed in Chapter 9, Table 9-1.

6.3.2 Storm Water Monitoring Stations

Figure 6-2 illustrates the location of the nine MPs. MP 1 monitors the runoff from the Machine Shop located in TA-I. MP 2 through 5 monitor runoff from the majority of industrial activities in TA-I, TA-II, and TA-IV. MP 6,7,9, and 10 monitor discharges in Arroyo del Coyote.

TABLE 6-2. 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
Short-Term Construction Permits		
Construction Activities in 2003	- Building material pollutants - Disturbed soil	- MESA - Storm Drain Modernization Project - JCEL - CINT - SCA/CUB

NOTE: *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 2001a).

AMPL = Advanced Manufacturing Process Laboratory
CSRL = Compound Semi-Conductor Research Laboratory
HWMF = Hazardous Waste Management Facility
SWMU = Solid Waste Management Unit
SNL/NM = Sandia National Laboratories, New Mexico
MDL = Microelectronics Development Laboratory
MESA = Microsystems and Engineering Sciences Applications
JCEL = Joint Computational Engineering Laboratory
CINT = Center for Integrated Nano-Technologies
SCA/CUB = Scientific Computing Annex/ Central Utility Building

6.3.3 Routine Inspections

All routine inspection results are attached to the Storm Water Pollution Prevention Plan (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** 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. 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 SNL/NM is in compliance with 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 to the SWP3 are initiated. If potential pollution problems are uncovered at the facilities, this is also noted in the report along with a schedule for addressing the problem areas.

Sampling Protocols
The NPDES permit requires quarterly analytical sampling to be conducted in the second and

fourth year of the five-year permit, weather permitting. In FY 2003 analytical monitoring was not required under the NPDES. 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. In general, the most consistent storm water sampling occurs during the rainy season from April through September. 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.

6.3.4 2003 Activities

2003 Sampling Results

Visual sampling was conducted in 2003. Due to Albuquerque's continuing drought, visual samples were only collected in the first and second quarters of FY 2003.

No unusual characteristics were noted in the visual samples. Analytical samples were not required to be taken in FY 2003.

SNL/NM employees preforming wastewater calculations.

Wastewater flow meter.

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Chapter 7
Groundwater Programs

In this chapter ...

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

Groundwater Sampling at SNL/NM

Environmental Snapshot

- *The ER Project and the GWPP sampled 71 groundwater monitoring wells in Fiscal Year (FY) 2003.*
- *Water levels are measured at SNL/NM as a means to assess the physical changes of the groundwater system over time. This included changes in the local water table, the quantity of water available, as well as the direction and speed of groundwater movement.*

Chapter Summary

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.

The GWPP establishes baseline water quality and groundwater flow information, determines if any impact from SNL/NM operations is affecting the quality of groundwater, and maintains compliance with local, state, and federal regulations. Groundwater sampling is conducted at various locations. The samples are analyzed for a variety of constituents, including Volatile Organic Compounds (VOCs), metals, and radionuclides. Results are described in subsequent sections of this chapter.

The ER Project conducts groundwater monitoring in six project areas. These areas include the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), Technical Area V (TA-V), Tijeras Arroyo Groundwater (TAG) Investigation, Canyons Area, and Drain and Septic Systems (DSS). The New Mexico Environment Department (NMED) provides oversight for these monitoring activities.

The ER Project utilized the Vapor Extraction Project (VEP) to remove VOCs from the groundwater and vadose zone at the CWL in 1996. This method was effective in the reduction of the concentration of trichloroethene (TCE) in groundwater systems to below the drinking water maximum contaminant level (MCL).

Installation of Groundwater Monitoring Well at SNL/NM

Groundwater monitoring wells are located at and around SNL/NM operational areas and environmental remediation sites. Groundwater monitoring is conducted on an annual, biannual, or quarterly basis, depending on individual project areas. Water level measurements are conducted quarterly and monthly.

Data results generated from both the ER Project and the GWPP at SNL/NM are summarized in the *FY 2003 Annual Groundwater Monitoring Report* (SNL 2004d). Specific tasks performed in FY 2003 under both programs are shown in Figure 7-1. As shown in Figure 7-1, coordination with outside groundwater monitoring agencies is a key component of the GWPP and the ER Project.

Figure 7-2 shows groundwater wells located on and around Kirtland Air Force Base (KAFB). Wells shown in Figure 7-2 include ER monitoring wells, GWPP surveillance wells, City of Albuquerque production wells, KAFB production wells, U.S. Geological Survey (USGS) monitoring wells, and KAFB Installation Restoration Program (IRP) wells. In FY03, 71 wells were sampled by the GWPP or the ER Project and are shown in Figure 7-2.

Please note Groundwater data is reported for the FY03.

7.1 Overview of Groundwater Programs At SNL/NM

7.1.1 GWPP Activities

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

- Establish baseline water quality and groundwater flow information for the groundwater system at SNL/NM;
- Determine the impact, if any, of Sandia Corporation'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 Corporation, 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. The GWPP works together with SNL/NM 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 and abandonment of a well or borehole is required.

In 2003, the Groundwater Surveillance network consisted of 11 wells and one spring. Two new wells (MRN-3D and SWTA3-MW2) were installed to replace wells that were previously plugged and abandoned. The new wells were not sampled in FY03; sampling of these wells will begin in FY04.

DOE Orders and regulations applicable to the GWPP are listed in Chapter 9.

Trend Data

The GWPP performs statistical trending on groundwater surveillance results by comparing past years' data with current year results. Trend data for groundwater contaminants that exceed regulatory limits is presented in Appendix B, which provides statistical descriptors and graphical representation. Data are analyzed to determine if the results are within a normal range of expected values or if a significant difference is present. By doing so, early detection and possible source identification can be made when contaminants are at levels far below regulatory concern. Conversely, unchanging baseline levels demonstrate Sandia Corporation's successful best management practices (BMPs) for groundwater protection.

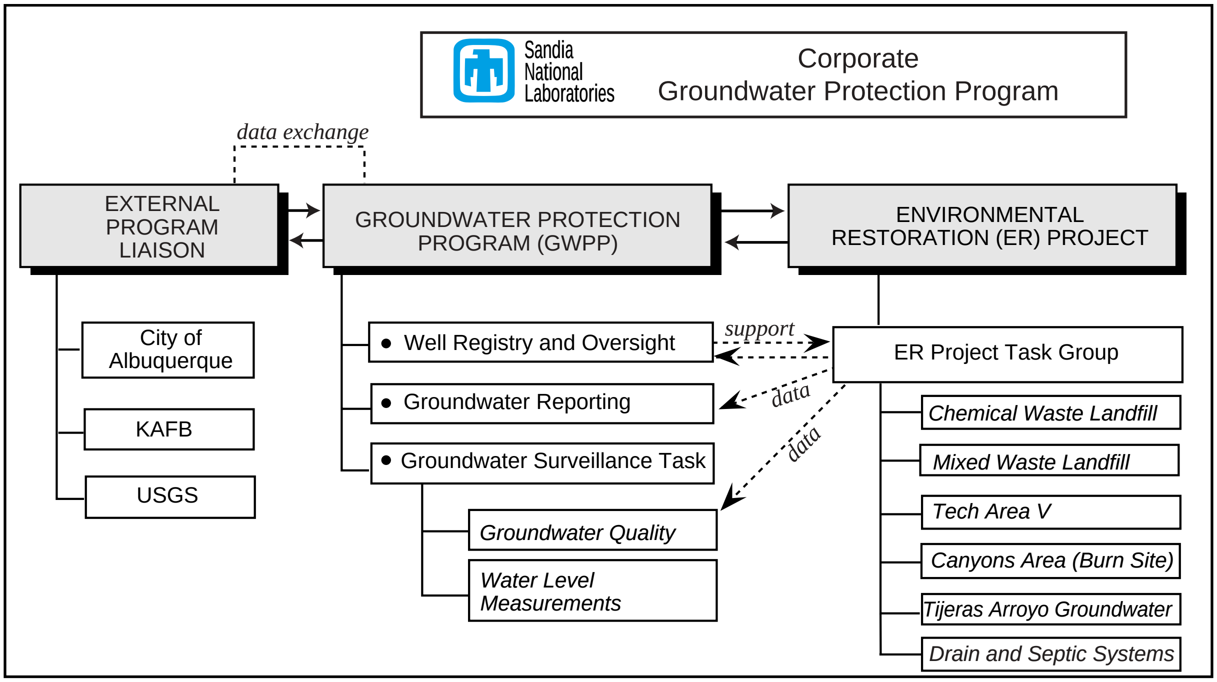

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FIGURE 7-1. SNL/NM's Groundwater Programs and Interfaces

7.1.2 ER Project Groundwater Activities

ER Project activities are directed by Resource Conservation and Recovery Act (RCRA) regulations that mandate the cleanup and management of active and inactive treatment, storage, and disposal (TSD) facilities. Applicable regulations are listed in Chapter 9. The regulatory basis for the ER Project is discussed in Section 3.2.1.

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

- CWL
- MWL
- TA-V
- TAG
- Canyons Area
- DSS

CWL – From 1962 to 1989, the CWL, covering just over two acres in the southeast corner of TA-III, was used to dispose of liquid chemical wastes by discharging them into pits. In 1985, the first monitoring wells were installed at the request of NMED. Currently, there are nine active wells in the network. Two of the wells are background (upgradient) wells and three wells have two screened intervals.

A Corrective Action Management Unit (CAMU) was established adjacent to the CWL to facilitate site cleanup as described in Section 3.2.2. The CAMU has extensive containment and detection systems to prevent groundwater contamination at the facility.

MWL – The MWL is a 2.6-acre site located in TA-III that was operational from 1959 to 1989 and was used to dispose of radioactive and mixed waste (MW). Cesium-137 and tritium are the contaminants on concern (COC) at this site. The groundwater monitoring network at the MWL consists of seven 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. Groundwater COCs at the LWDS are nitrates and VOCs such as TCE,

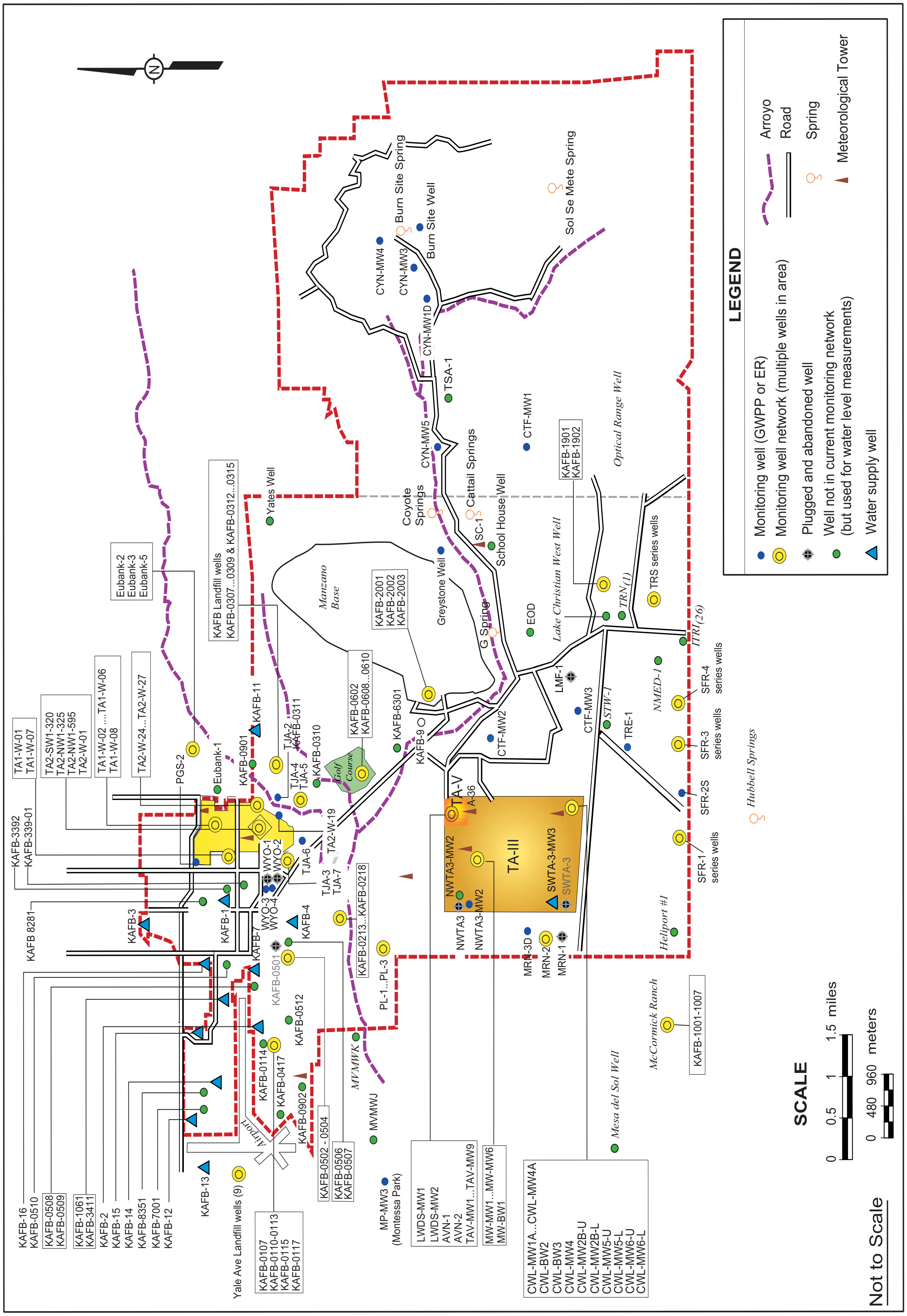

FIGURE 7-2. Wells and Springs on SNL/NM and KAFB

which was first detected in the groundwater in 1993. There are currently 13 active monitoring wells at this site. Gamma spectroscopy and radioisotopic analyses were conducted on four new wells in FY03.

TAG – The TAG Investigation includes groundwater beneath TA-I, TA-II, and the Tijeras Arroyo. There are currently 26 monitoring wells in the TAG study area. Of these, 12 are regional aquifer wells and 14 are shallow groundwater system (SGWS) wells. The SGWS consists of water-bearing strata located above the regional groundwater system (water table) that have not been developed for domestic use. TCE and nitrates are the COCs for TAG.

Canyons Area – The Canyons Area is located around the active Lurance Canyon Burn Site (LCBS) facility. Groundwater investigations were initiated in 1997 at the request of NMED after elevated nitrate levels were discovered in the LCBS water well. In 1997, one groundwater monitoring well was installed, and 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.

DSS – Operable Unit 1295 (Septic Tanks and Drainfields) originally included 23 individual septic and drain sites located throughout TA-III, and other remote sites east and south of TA-III. Passive soil vapor and soil samples were collected at 22 of the 23 sites from 1994 to 1997. Significant COC concentrations [high explosives (HE) compounds] were found at only one site (Solid Waste Management Unit [SWMU] 154) at which samples were collected. The 23rd site (SWMU 139) was granted a non-sampling administrative No Further Action (NFA) proposal by the NMED in 1995.

NFA proposals for the 22 sites were submitted to NMED from 1995 to 1997. NMED responded to the NFA proposals for SWMUs 49, 116, 149, and 154 and consequent to analysis of previously collected soil gas samples required that at least one groundwater monitoring well be installed at each of the four sites. These required monitor wells were installed in FY01 and initial sampling began in FY02. Quarterly sampling at these locations will continue for at least two years.

An additional 121 individual DSS sites not originally included in the OU 1295 project have also been identified within the SNL/NM area. The NMED has required that environmental characterization be completed at 61 out of the 121 systems. Characterization work includes surface passive soil vapor surveys, shallow soil sampling, deep soil vapor monitoring well installation and sampling, and potential groundwater monitoring well installation depending on results of the shallow characterization work. Environmental characterization work started at these additional DSS sites in 1998, and is on-going.

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 as shown in Table 7-2. The frequency of groundwater monitoring performed at SNL/NM is shown in Table 7-3. All groundwater samples are analyzed in accordance with U.S. Environmental Protection Agency (EPA) protocols.

Water quality results for both the GWPP and the ER Project are summarized in the following pages and in Table 7-1. Detailed data is published in the *FY 2003 Annual Groundwater Monitoring Report for SNL/NM* (SNL 2004d).

7.2.1 GWPP Surveillance Results

During June and July 2003, annual sampling of groundwater was conducted by the GWPP Groundwater Surveillance Task. Samples were collected from 11 wells and one spring. Groundwater surveillance samples for the GWPP were analyzed for the following parameters:

- VOCs
- Major ions including nitrate
- Total halogenated organics (TOX)
- Selected radionuclides
- Metals
- Alkalinity/total phenols
- Gamma spectroscopy
- Gross alpha & beta activity

TABLE 7-1. Summary of SNL/NM Groundwater Monitoring Activities During Fiscal Year 2003

	ER	GWPP		
Number of Active Wells Monitored	63	14		
Number of Samples Taken	148	15		
Number of Analyses Performed	12,630	1,710		
% of Analyses that are Non-Detect	77.96%	76.20%		
	ER	**GWPP**	**MCL**	**MAC**
Range of Results for Positive Detections				
Tritium (pCi/L)	-171 - 785	186 - 241	20,000	N/A
TCE (µg/L)	0.371 – 21.2	ND	5	100,000
Chloroform (µg/L)	0.402 – 0.649	0.805	N/A	N/A
Other VOCs (µg/L)				
Acetone	4.92 – 13.1	0 – 7.48	N/A	N/A
Methylene chloride	N/A	N/A	5	100
Trace Metals (mg/L) / (MCL, MAC)				
Aluminum	0.0093 – 0.187	0.00939 – 0.175	N/A	5
Antimony	0.000295 – 0.000689	ND	0.006	N/A
Arsenic	0.00101 – 0.0774	0.00209 – 0.00908	0.01	0.1
Barium	0.0165 – 0.2	0.011 – 0.148	2	1
Beryllium	0.00253	0.000104 – 0.006321	0.004	N/A
Cadmium	0.000041 – 0.0163	0.000057 – 0.000125	0.005	0.01
Calcium	19 – 447	45.6 – 504	N/A	N/A
Chromium	0.000659 – 0.189	0.00085 – 0.0034	0.1	0.05
Cobalt	0.000061 – 0.00823	0.000112 – 0.00871	N/A	0.05
Copper	0.000691 – 0.0104	0.000696 – 0.00686	1.3	1
Fluoride	0.207-2.36	0.318-2.65	4	1.6
Iron	0.0532 - 2.48	0.0913 – 22.1	N/A	1
Lead	0.000051 - 0.000921	0.000076 - 0.000389	0.015	0.05
Magnesium	8.88 - 87	3.61 - 108	N/A	N/A
Manganese	0.00174 - 3	0.0128 - 1.33	N/A	0.2
Mercury	0.000056 - 0.000172	ND	0.002	0.002
Nickel	0.000501 - 0.485	0.000626 - 0.0683	N/A	0.2
Potassium	1.6 - 51.7	1.6 - 40.5	N/A	N/A
Selenium	0.000691 - 0.0176	0.00145 - 0.00329	0.05	0.05
Silver	0.00004 - 0.000749	ND	N/A	0.05
Sodium	15.4 - 523	22.5 - 448	N/A	N/A
Thallium	0.00002 - 0.00133	0.000068 - 0.0014	0.002	N/A
Uranium	0.00216 - 0.00953	0.000356 - 0.026	0.03	5
Vanadium	0.00367 - 0.0162	0.00599 - 0.00601	N/A	N/A
Zinc	0.00131 – 1.34	0.00265 - 0.0501	N/A	10
Other Contaminants				
Nitrate as N (mg/L)	0. 828 - 23.2	N/A	10	10
Nitrate plus Nitrite	0.01 - 26	0.11 – 7.05	10	10

NOTES: ER = Environmental Restoration; GWPP = Groundwater Protection Program; pCi/L = picocurie per liter; N/A = not applicable; MCL = maximum contaminant level; µg/L = microgram per liter; mg/L = milligram per liter; MAC = maximum allowable concentration; ND = not detected

TABLE 7-2. 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 NMAC)	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)

NOTE: [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.

TABLE 7-3. Sample Collection Periods for Groundwater Quality Monitoring at SNL/NM During FY03

Sampling period	GWPP	CWL	MWL	TA-V	TAG	Canyons Area	DSS
Oct 02			√				
Nov 02				√			
Dec 02							√
Jan 03		√					
Feb 03		√		√		√	
Mar 03				√			√
Apr 03			√				
May 03				√		√	
Jun 03	√	√				√	√
Jul 03	√				√		
Aug 03				√	√		
Sep 03			√	√	√		√

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 was analyzed for total mercury.

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

VOCs

No groundwater samples exceeded MCLs for VOCs. Trace concentrations of acetone and chloroform were detected. Acetone is attributed to laboratory contamination of samples because it was also detected in quality control (QC) sample blanks. Chloroform was detected in well TRE-1 at a concentration of 0.805 µg/L.

Although there is no specific MCL established for chloroform, an MCL of 0.1mg/L is established for total thihalomethanes. Chloroform is a trihalomethane. In drinking water systems, trihalomethanes are the product of a disinfection chemical. The maximum allowable concentration (MAC) established by the NMWQCC for chloroform specifically is 100 µg/L.

Non-metal Inorganic Compounds and Phenolics

No groundwater samples exceeded established MCLs for any non-metallic inorganic constituent:

- Nitrate plus nitrite (NPN) (as nitrogen)
- TOX
- Alkalinity (calcium carbonate)
- Phenolics
- Total cyanide
- Ions (bromide, chloride, fluoride, and sulfate)

Chloride exceeded the NMWQCC domestic use MAC for groundwater in water samples collected from Coyote Springs and the EOD monitor well. Sulfate in SFR-4T exceeded the domestic use MAC. The elevated concentrations are from natural sources and are consistent with background concentrations determined for this location.

Metals

The analyses were conducted for dissolved metals using filtered samples, except for mercury, for which the total concentration was determined in an unfiltered aliquot of sampled groundwater. The groundwater standards of the NMWQCC are based on dissolved concentration.

The metals list was compiled from the EPA's primary drinking water standards and NMWQCC standards. This was the first year uranium concentration was determined as a metal analyte in addition to the various radioactive isotopes.

The water sample collected from Coyote Springs exceeded the MCL for beryllium. The exceedance is thought to be naturally occurring. The sample from the spring also exceeded the NMWQCC domestic water supplies MAC for manganese, which is primarily of aesthetic significance. The spring is located on KAFB property and is not located near any known source of contamination. The historical trend for beryllium is provided in Appendix B, Figure B-1.

BERYLLIUM MCL = 4 µg/L		
Well	**Concentration**	**Period**
Coyote Springs	6.31 µg/L	June/July 2003
MANGANESE MAC = 0.2 mg/L		
Well	**Concentration**	**Period**
Coyote Springs	1.15 mg/L	June/July 2003

NOTE: µg/L = micrograms per liter; mg/L = milligrams per liter; MCL = maximum contaminant level; MAC = maximum allowable concentration

All other metals analyses were below drinking water standards, where established.

Radionuclide Activity

Radioisotopic analyses were conducted on all samples. Specific analyses included:

- Gamma spectroscopy
- Radium-226 and -228
- Uranium-235 and -238
- Gross alpha & beta
- Uranium-233/234

Gamma spectroscopy analyses indicated the presence of radium, uranium, and thorium-isotopes in some of the groundwater samples. However, gamma spectroscopy is not the analytical tool of choice for what are primarily alpha particle emitting radionuclides. More reliable results for these isotopes were obtained from isotopic specific activities.

Uncorrected gross alpha results for samples from EOD Hill, SFR-2S and TRE-1 exceeded the MCL of 15 pCi/L. When the results are corrected by subtracting the uranium activity, the results for SFR-2 and TRE-1 are below the MCL.

GROSS ALPHA MCL = 15 pCi/L			
Well	**Activity**	**Corrected Activity***	**Period**
EOD Hill	53.9 pCi/L	-28.4	June/July 2003
SFR-2S	28.4 pCi/L	3.0 pCi/L	June 2003
TRE-1	35.8 pCi/L	6.3 pCi/L	June 2003

*Corrected Activity is minus the activity of uranium isotopes: U-234, U-235, and U-238
*Negative numbers occur because radiochemistry counting instrument backgrounds must be subtracted to obtain net counts.

All groundwater samples were analyzed for uranium-234, -235/236, and -238. The activities for uranium-234 in samples from TRE-1, EOD Hill, and SFR-25 exceeded the DOE drinking water guideline of 20 pCi/L. Wells with elevated uranium are located east of the Tijeras fault complex (Figure 7-3). In this region, groundwater contacts bedrock material that contains minerals that are naturally high in uranium. Although the analysis for isotopic uranium-234 exceeds the DOE drinking water guideline, the total uranium concentration is below the newly promulgated EPA MCL for total uranium of 30 µg/L (40 CFR 141).

URANIUM - 234 DOE Drinking Water Guideline = 20.0 pCi/L		
Well	**Concentration**	**Period**
EOD Hill	73 pCi/L	June/July 2003
SFR-2S	21.2 pCi/L	June/July 2003
TRE-1	22.8 pCi/L	June/July 2003

pCi/L = picocuries per liter

7.2.2 ER Project Water Quality Results

CWL Results

Semi-annual groundwater monitoring for VOCs and total metals (40 CFR 264, Appendix IX) were performed in January, February, and June 2003. Additional samples for anions, cations, and alkalinity were collected in June 2003. Groundwater monitoring at the CWL is a compliance-driven activity with specific requirements mandated in Appendix G of the *Chemical Waste Landfill Final Closure Plan and Postclosure Permit Application* (SNL 2003v). Samples were collected from 12 monitoring wells.

Analytes Sampled

Statistical trending data for groundwater contaminants that exceed regulatory limits is presented in Appendix B, Figures B-2 through B-4. Additionally, the *Quarterly Closure Progress Reports* (SNL 2003y-bb) for the CWL gives full details of each sampling event. All analytical results were compared with MCLs and MACs.

VOC Analyses

No VOCs were detected above established MACs, where applicable. No VOCs were detected above established MCLs, except TCE. In June 2003, TCE was detected in CWL-MW2A above the MCL of 5.0 mg/L at a concentration of 12.5 ug/L. Trend data TCE concentrations in CWL-MW2A is presented in Appendix B, Figure B-2.

TRICHLOROETHENE (TCE) MCL = 5.0 µg/L MAC = 100 µg/L		
Well	**Concentration**	**Period**
CWL-MW2A	12.5 µg/L	Jun 2003

µg/L = micrograms per liter
MCL = maximum contaminant level
MAC = maximum allowable concentration

Metals

As required by the NMED's Hazardous Waste Bureau (HWB), all metal samples were analyzed for total metals. No Appendix IX metal parameters were detected above established MCLs or MACs, except chromium. The MCL for chromium is 0.1 mg/L and the MAC is 0.05 mg/L.

Chromium is thought to be a result of corrosion of the stainless steel well screens used in these wells. Wells at the CWL constructed with PVC well screens have significantly lower chromium concentrations. Trend data chromium concentrations in CWL-BW3 and CWL-MW2A are presented in Appendix B, Figure B-3 and Figure B-4. The stainless steel corrosion product is in a particulate form. As such the chromium is unlikely to migrate in the groundwater so as to present a hazard to a potential receptor.

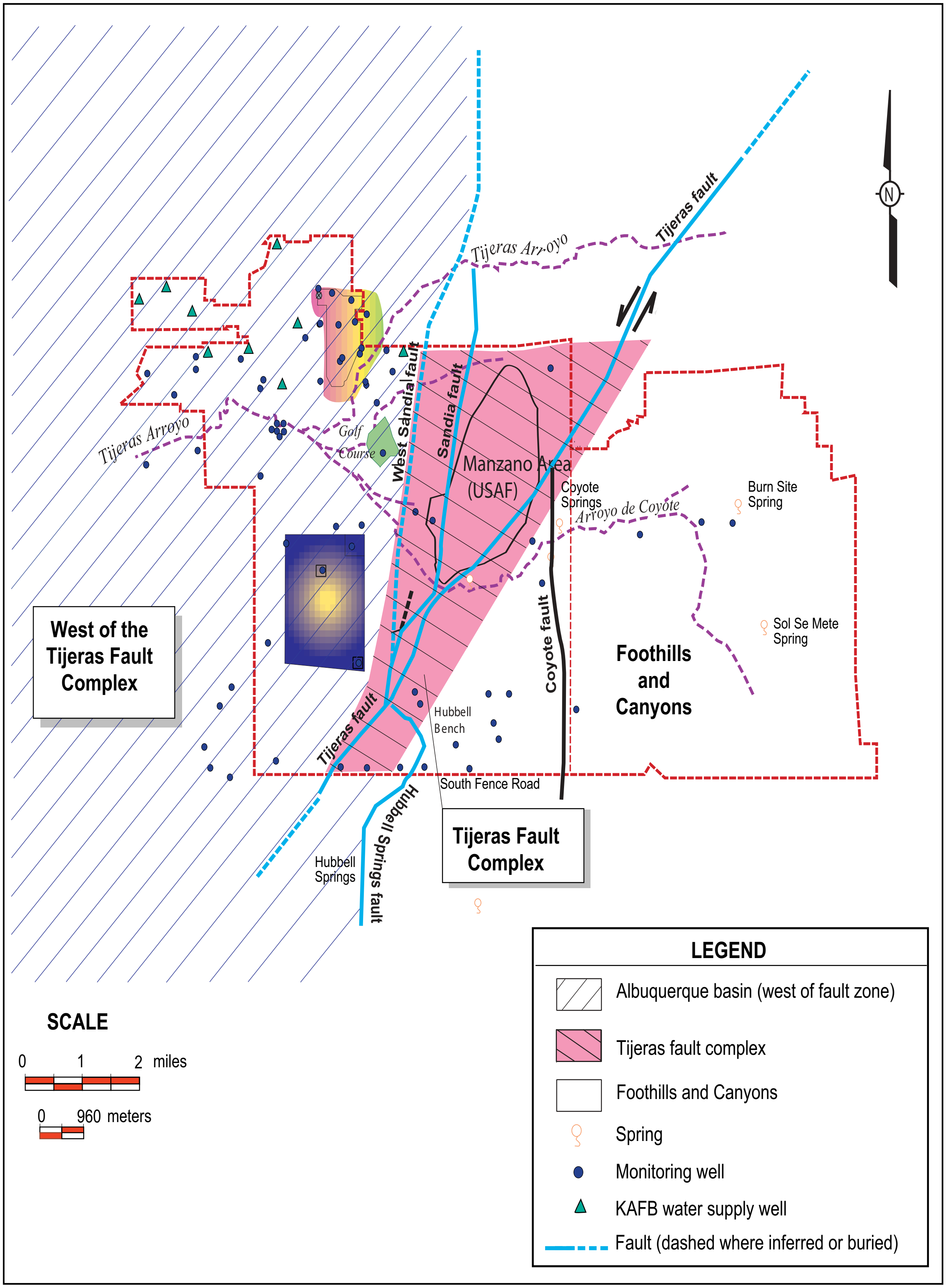

FIGURE 7-3. Hydrogeologically Distinct Areas at KAFB

CHROMIUM MCL = 0.1 mg/L MAC = 0.05 mg/L		
Well	**Concentration**	**Period**
CWL-BW3	0.0726 mg/L	Jan 2003
CWL-MW2A	0.189 mg/L	Jan 2003
CWL-BW3	0.0805 mg/L	Jun 2003
CWL-MW2A	0.0847 mg/L	Jun 2003

mg/L = milligrams per liter MCL = maximum contaminant level
MAC = maximum allowable concentration

Anions, Cations, and Alkalinity Analyses

In June 2003, anions (as bromide, chloride, fluoride, and sulfate), cations (as calcium, magnesium, potassium, and sodium), and alkalinity were analyzed from CWL-MW7 and CWL-MW8 only. No parameters were detected above established MCLs. No parameters were detected above the established MAC, except for fluoride.

FLUORIDE MCL = 4.0 mg/L MAC = 1.6 mg/L		
Well	**Concentration**	**Period**
CWL-MW7	1.61 mg/L	Jun 2003
CWL-MW8	1.64 mg/L	Jun 2003

mg/L = milligrams per liter MCL = maximum contaminant level
MAC = maximum allowable concentration

MWL

Annual groundwater sampling of MWL-BW1, MWL-MW1, 2, 3, 4, 5 & 6 was conducted in April 2003. The last round of quarterly sampling of MWL-MW5 and MWL-MW6 was conducted in October 2002. Verification samples were collected in September 2002 from MWL-MW1, 2 & 4.

Analytes Sampled

MWL groundwater samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), Target Analyte List (TAL) metals and total uranium, NPN, major ions, and radionuclides.

VOCs and SVOCs

No VOCs or SVOCs exceeded MCLs in any MWL wells in 2003.

NPN (as nitrogen)

NPN (reported as nitrogen) was detected in all monitoring wells at levels below the MCL of 10mg/L.

Metals

The April 2003 sample from MWL-MW2 showed a cadmium concentration of 0.0152, considerably higher than the EPA MCL of 0.005 mg/L and the MAC of 0.01 mg/L. Reanalysis of the April sample from MWL-MW2 confirmed the elevated cadmium with concentrations of 0.0157 and 0.0163 mg/L, respectively. Verification samples from MWL-MW2 collected in September 2003 showed cadmium concentrations ranging from 0.00042 to 0.000502. These values are consistent with the historical range of cadmium values for this well. The elevated cadmium concentration detected in MWL-MW2 in April 2003 is considered anomalous, inconsistent with the historical values prior and subsequent to the April 2003 sample. SNL/NM will continue monitoring this location and future results to confirm that the concentration was an anomaly.

No other metals in MWL groundwater samples collected in FY 2003 exceeded MCLs. Chromium exceeded the MAC of 0.05 mg/L in the April 2003 sample collected from MWL-MW3, with a concentration of 0.0506. Appendix B, Figure B-5 shows total chromium concentrations in MWL-MW3 over the last six years. The elevated chromium concentrations in this well are attributed to corrosion of the stainless steel screen installed in the well. No other metals exceeded MACs or DOE drinking water guidelines in MWL groundwater.

Radionuclide Activities

Radionuclide analysis of FY03 MWL groundwater samples included gross alpha/beta activities, gamma-emitting radionuclides, strontium-90 (in MWL-MW5 and MWL-MW6 only), tritium, and isotopic uranium. Gross alpha radioactivity in the MWL-MW5 sample was reported slightly greater than the MCL; however, when the gross alpha value is corrected for uranium activity, the value is below the MCL. No other radionuclides were detected above standards. Gamma spectroscopy analyses did not detect any isotopes above associated MDAs. Tritium was not detected above MDAs in any samples. Isotopic uranium ratios of uranium-235 to uranium-238 indicated that uranium in groundwater beneath the MWL is naturally occurring.

TA-V Results

Quarterly groundwater sampling at TA-V was performed in November 2002, February/March 2003, May 2003, and August/September 2003. Samples were collected from 13 wells.

Analytes Sampled

Quarterly groundwater samples collected from all wells were analyzed for VOCs, NPN (as nitrogen), cations (as calcium, magnesium, potassium, and sodium), anions (as bromide, chloride, fluoride, and sulfate), and alkalinity. Additional samples were collected from wells TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9 and analyzed for SVOCs, TAL metals, total uranium, tritium, gross alpha, gross beta, and gamma spectroscopy.

VOC and SVOC Analyses

VOCs were detected in samples from TA-V wells at concentrations exceeding MCLs in monitoring wells LWDS-MW1 and TAV-MW8. Appendix B, Figures B-6 and B-7 show that the TCE concentrations in LWDS-MW1 and TAV-MW8 are consistent over time.

TRICHLOROETHENE (TCE) MCL = 5 µg/L		
Well	**Concentration**	**Period**
LWDS-MW1	16.2/16.4 µg/L (dup)	Nov 2002
LWDS-MW1	18.9/20.6 µg/L (dup)	Mar 2003
LWDS-MW1	21.2/20.6 µg/L (dup)	May 2003
LWDS-MW1	16.9/15.4 µg/L (dup)	Aug/Sep 2003
TAV-MW8	6.82/6.94 µg/L (dup)	Nov 2002
TAV-MW8	5.69 µg/L	Mar 2003
TAV-MW8	8.18 µg/L	May 2003
TAV-MW8	6.01 µg/L	Aug/Sep 2003

NOTE: dup = duplicate µg/L = micrograms per liter
MCL = maximum contaminant level

Inorganic and Other Chemical Analyses

Nitrate concentrations exceeded the MCL of 10 mg/L in LWDS-MW1 for all four quarters of FY03. Appendix B, Figure B-8 shows that the nitrate in this well has consistently exceeded the MCL over the past three years and the nitrate concentrations appear to be increasing over time.

NITRATE (AS NITROGEN) MCL = 10 mg/L		
Well	**Concentration (mg/L)**	**Period**
LWDS-MW1	10.8/10.8 mg/L (dup)	Nov 2002
LWDS-MW1	12.8/13 mg/L (dup)	Mar 2003
LWDS-MW1	13.4/11.4 mg/L (dup)	May 2003
LWDS-MW1	12.6/12.2 mg/L (dup)	Aug/Sep 2003

NOTE: dup = duplicate mg/L = milligrams per liter
MCL = maximum contaminant level

Metals

In FY03, dissolved metal analyses were conducted for the four newer wells (TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9) in all four quarters and the other nine wells in the first quarter.

Radionuclide Activities

Gamma spectroscopy and radioisotopic analyses were conducted on the four new wells in FY03. All radionuclide activities were below MCLs and DOE drinking water guidelines, where established.

TAG

Due to scheduling constraints with the preparation of the TAG Investigation Work Plan, only one quarterly groundwater sampling event (July/August/September) was completed in FY03. The initial sampling was completed in July and August. However, one well (TA2-W-19) required re-sampling in September when it was discovered that all the VOC vials had broken during transport.

TAG wells are either screened in the regional aquifer or within a SGWS several hundred feet above the regional aquifer. COCs include TCE and nitrate, which have been detected at concentrations exceeding the EPA's established MCLs for drinking water. Samples were collected from 22 wells. There were 11 SGWS wells and 11 regional aquifer wells sampled in FY03.

VOC Analyses

TCE was detected in groundwater samples of several wells in the SGWS. Monitoring well WYO-4 (SGWS) had TCE concentrations above the MCL. Appendix B, Figure B-9 shows the TCE concentration trend in well WYO-4 since its installation in FY01. The TCE concentration for the three samples obtained from WYO-4 are in a very narrow range of concentration (7.25-5.3 ppb). The trend of values over the three year period appears to be steady or slightly decreasing.

TRICHLOROETHENE (TCE) MCL = 5 µg/L		
Well	**Concentration**	**Period**
Shallow Groundwater System Wells		
WYO-4	6.57 µg/L	Jul/Aug/Sep 2003
WYO-4 (dup)	6.39 µg/L	Jul/Aug/Sep 2003

NOTE: µg/L = micrograms per liter; MCL = maximum contaminant level; dup = duplicate

Inorganic Chemical Analyses

Inorganic chemical analysis of quarterly groundwater samples consisted of alkalinity and major anions such as bromide, chloride, fluoride, nitrate, and sulfate. During FY03, sampling, nitrate exceeded the MCL in five wells. TJA-7, TA2-SW1-320, and TJA-4 had nitrate concentrations two to three times the MCL; whereas TA2-W-19 and TJA-2 had nitrate concentrations that slightly exceed the MCLs. Appendix B, Figures B-10 through B-14 show nitrate concentrations in these five wells. Nitrate concentrations in TJA-7 appear to be decreasing. The four remaining wells have increasing nitrate trends. All other inorganic analytes were below MCLs, where established.

NITRATE PLUS NITRITE (AS NITROGEN) MCL = 10 mg/L		
Well	**Concentration**	**Period**
Shallow Groundwater System Wells		
TA2-SW1-320	25 mg/L	Jul/Aug/Sep 2003
TA2-W-19	10.4	Jul/Aug/Sep 2003
TJA-2	10.1	Jul/Aug/Sep 2003
TJA-7	26 mg/L	Jul/Aug/Sep 2003
Regional Aquifer Wells		
TJA-4	25 mg/L	Jul/Aug/Sep 2003

NOTE: mg/L = milligrams per liter; MCL = maximum contaminant level

Canyons Area

Semiannual sampling at Canyon monitoring wells in Lurance Canyon was conducted in February 2003 and May/June 2003. Three wells were sampled.

Analytes Sampled

The samples were analyzed for the following constituents:

Organic Analyses:
VOCs
SVOCs
Diesel range organics
Gasoline range organics
HE

Inorganic Analyses:
Total dissolved metals
Generally chemical analyses (including Nitrogen species)
Major Ions
Alkalinity (as $CaCO_3$)

Radiological analyses:
Gross alpha
Gross beta
Tritium

VOCs and Other Organic Compounds

No VOCs were detected in any of the samples. Trace levels of SVOCs were present in samples collected from all wells. The SVOCs detected in these wells were 2,6-Dinitrotoluene and phthalates (commonly found lab contaminants). All SVOC concentrations were "J" values (an estimated value) as reported by the laboratory.

Other organics found in groundwater samples included low levels of diesel range organics with up to 381 µg/L in a sample from CYN-MW3. Some of the diesel range organics were given a "J" in the data validation process. All analysis of samples from monitor wells for gasoline range organics were non-detect. MCLs have not been established for diesel range organics or gasoline range organics.

HE analyses of samples from CYN-MW1D and CYN-MW3 revealed trace levels of 1,3,5-Trinitrobenzene, 1,3-Dinitrobenzene, 2,6-Dinitrotoluene, 2-Amino-4,6-dinitrotoluene, 2-Nitrotoluene, and 4-Nitrotoluen. Many of these values were rejected in the data validation process. No MCLs have been established for these analytes.

Inorganic and Other Chemical Analyses

Fluoride exceeded the MAC of 1.6 mg/L in CYN-MW1D in both sampling events. The fluoride concentration versus time plot in Appendix B, Figure B-15 shows that fluoride in CYN-MW1D has consistently exceeded the MAC for the past five years.

FLUORIDE MCL = 4.0 mg/L MAC = 1.6 mg/L		
Well	**Concentration**	**Period**
CYN-MW1D	2.01 mg/L	February 2003
CYN-MW1D (dup)	1.96 mg/L	February 2003
CYN-MW1D	1.82 mg/L	May 2003

mg/L = milligrams per liter MAC = maximum allowable concentration
dup = duplicate

Nitrate results exceeded the MCL of 10 mg/L in samples from CYN-MW1D and CYN-MW3 in all sampling events. Appendix B, Figures B-16 and B-17 show that the nitrate concentrations in these two wells have consistently exceeded the MCL for the life of the wells. Only low levels of nitrate (<0.01 mg/L to 0.03 mg/L) were detected in the CYN-MW4, which is upgradient of the Burn Site Facility. All other major ions results were below established MCLs.

NITRATE PLUS NITRITE MCL = 10.0 mg/L		
Well	**Feb 2003**	**May/Jun 2003**
CYN-MW1D	24.3 mg/L	23.6 mg/L
CYN-MW1D (dup)	25.3 mg/L	--
CYN-MW3	11 mg/L	13.2 mg/L
CYN-MW4	ND (0.01) mg/L	0.03 J mg/L
CYN-MW4 (dup)	--	0.01 J mg/L

NOTE: J = Estimated value determined in data validation process dup = duplicate
mg/L = milligrams per liter MCL = maximum contaminant level
ND = Not detected above method detection limits (shown in parenthesis).

Metals
There were no metal results that exceeded established MCLs.

Radionuclide Activities
Groundwater samples were analyzed for gross alpha, gross beta, and tritium. All radionuclide activities were below MCLs and DOE drinking water guidelines, where established.

DSS

Quarterly groundwater sampling of the four new DSS wells CYN-MW5, CTF-MW1, CTF-MW2, and CTF-MW3 commenced in July 2002. A total of eight quarters of sampling is planned for these wells.

Analytes Sampled
DSS groundwater samples from each well were analyzed for all or part of the following list of constituents: VOCs, SVOCs, HE compounds, total RCRA metals, hexavalent chromium, total cyanide, NPN (reported as nitrogen), and major anions/cations.

VOC and SVOC Analyses

No SVOCs were detected in any wells. In Well CTF-MW3, chloroform was detected quarterly below the practical quantitation limit (PQL) from 0.402 - 0.649 Jµg/L. Dibromochloromethane was detected once below the PQL at 0.297 Jµg/L.

HE Compounds

One sample from CTF-MW2 contained a trace concentration (0.762 Jµg/L) of 1,3,5-trinitrobenzene. No HE compounds were detected in samples from the other three wells.

Inorganic Chemical Analyses

Samples for alkalinity and major anions (bromide, chloride, fluoride, and sulfate) and cations (calcium, magnesium, potassium, and sodium) were also collected from all four DSS wells. Concentrations of these additional inorganic analytes were below MCLs, where established. Fluoride was detected above the MAC in CTF-MW2 and CTF-MW3 at concentrations from 1.84 J - 2.36 mg/L (Appendix B, Figures B-18 and B-19).

FLUORIDE MCL = 4.0 mg/L MAC = 1.6 mg/L		
Well	Concentration	Period
CTF-MW2	2.31 mg/L	October 2002
CTF-MW3	1.84 mg/L	November 2002
CTF-MW2	2.02 mg/L	February 2003
CTF-MW2	1.94 mg/L	February 2003 (dup)
CTF-MW3	2.27 mg/L	February 2003
CTF-MW2	2.36 mg/L	April 2003
CTF-MW2	2.16 mg/L	April 2003
CTF-MW2	2.04 mg/L	August 2003
CTF-MW2	2.16 mg/L	August 2003

mg/L = milligrams per liter MAC = maximum allowable concentration
dup = duplicate MCL = maximum contaminant level

NPN (reported as nitrogen) samples were collected from the four DSS wells. NPN was detected in all four wells at levels below the MCL of 10 mg/L. NPN concentrations ranged from 0.01J to 7.6 mg/L in these wells. Cyanide was not detected in any of the three wells (CTF-MW1, CTF-MW2, or CTF-MW3).

Total RCRA Metals and Hexavalent Chromium

Arsenic was consistently detected in well CTF-MW2 above the MCL of 0.010 mg/L at concentrations from 0.0532 to 0.0774 (Appendix B, Figure B-20). Concentrations of the other seven RCRA metals and hexavalent chromium did not exceed established MCLs in any of the other wells.

ARSENIC MCL = 0.01 mg/L		
Well	Concentration	Period
CTF-MW2	0.0708 mg/L	October 2002
CTF-MW2	0.0774 mg/L	February 2003
CTF-MW2	0.0774 mg/L	February 2003 (dup)
CTF-MW2	0.0772 mg/L	April 2003
CTF-MW2	0.0532 mg/L	August 2003

mg/L = milligrams per liter MCL = maximum contaminant level
dup = duplicate

Gross Alpha/Beta Activities

Gross alpha/beta samples were collected from the four DSS wells. All results were below the MDA.

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 SNL/NM, data is solicited for the U.S. Air Force (USAF) IRP, the City of Albuquerque, and the USGS wells. In FY03, data from 147 wells were incorporated into the monitor well water level database. Water levels were measured monthly, quarterly, or annually by each agency.

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 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 at about 1 to 2 ft/yr. Most of the City of Albuquerque and KAFB water supply wells are completed in the coarser-grained layers of the upper and middle units of the Santa Fe Group. The regional aquifer is located within these units of the Santa Fe Group.

Water level information, with respect to the regional water table in the KAFB area, can be categorized into three general areas. These areas are delineated by bounding faults, as shown in Figure 7-4. Groundwater levels east of the Tijeras fault complex are approximately 100 to 150 ft below the surface. The water table west of the Tijeras fault complex and the Sandia fault are approximately 500 ft or more below the surface. The aquifer system on the east side of the Tijeras fault complex is not well understood due to the complex geology and the limited number of wells available to characterize the system.

Regional Water Table

The Regional Water Elevation Contour map for SNL/KAFB, FY03 is presented in Figure 7-4. The extent of the contoured map area was constructed using June, July, and August 2003 static water level data from 56 wells. Generally, these 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 aquifer conditions.

The contour lines shown on Figure 7-4 represent lines of equal elevation of the groundwater table. Groundwater flow is perpendicular to these lines in the direction of decreasing elevation. The apparent direction of groundwater flow within the region (west of the Tijeras fault complex) is west and northwest. This contrasts with the southwesterly direction reported in 1961 (Bjorklund and Maxwell 1961). This change in flow direction results from groundwater pumping by KAFB production wells at the northern part of the KAFB and nearby City of Albuquerque production wells. The groundwater withdrawal has created a depression in the water table. This “U” shaped depression with the top of the “U” pointing north, extends south to the 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.

SGWS

A SGWS exists in the northern part of KAFB in the vicinity of SNL/NM TA I, II, and III and extending southward to the location of the former KAFB sewage lagoons. The eastward extent of the SGWS is under the KAFB Landfill and to the southeast the KAFB Golf Course. The elevation data to the first water reached in the SGWS are illustrated in Figure 7-5. The contours indicate a gradient to the east-southeast. The western-most elevation contour is at 5,150 feet above sea level (fasl). This elevation corresponds to a depth to water from the surface of approximately 280 ft, where at the same location, the regional water table is a 530 ft below the ground surface. Along the eastern boundary of the SGWS the elevation of first water is at 5010 fasl. This elevation is approximately the elevation of the regional water table at this location. Because of the eastern dip of the SGWS and the western dip of the regional system, the two systems appear to merge.

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 to the groundwater system is directly related to the amount of precipitation. The regional climate for the Albuquerque basin area is semi-arid. A detailed description of the regional climate and precipitation is included in the FY03 Annual Groundwater Monitoring Report (SNL 2004d).

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 2,000 ft. These units constitute the primary aquifer for the Albuquerque Metropolitan Area. In FY03, KAFB pumped approximately 1.07 billion gallons (3,291 acre-ft) of groundwater from ten water supply wells. In comparison, 1.26 billion gallons (3,860 acre-ft) of water were pumped for the same period of time in FY02. This represents a 13% decline in water production.

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 7-6 shows the contour map of the annual water table elevation changes recorded for the western area of KAFB. Annual water level differences in 56 wells were used to construct the map.

The amount of decline over the FY02 to FY03 period is approximately 1.2 ft/yr, similar to the period of FY01 to FY02. The stabilization in drawdown appears to be a direct consequence of decreasing amount of water being pumped from the aquifer. The largest declines continue to be in the vicinity of McCormick Ranch, which is located along the southeastern border of KAFB with the Isleta Pueblo Reservation. 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 actually rising. This area coincides with a potential recharge area associated with Tijeras Arroyo. The water level trends for the SGWS systems indicate a decrease in water level elevations in the western portion of KAFB (Figure 7-7). The water level elevations in the central part of the system seem to be relatively stable. The water levels in the eastern part appear to be increasing, which is consistent with the apparent rise in water level in the regional system in the northeast portion of KAFB.

Employees Checking Water Levels at SNL/NM.

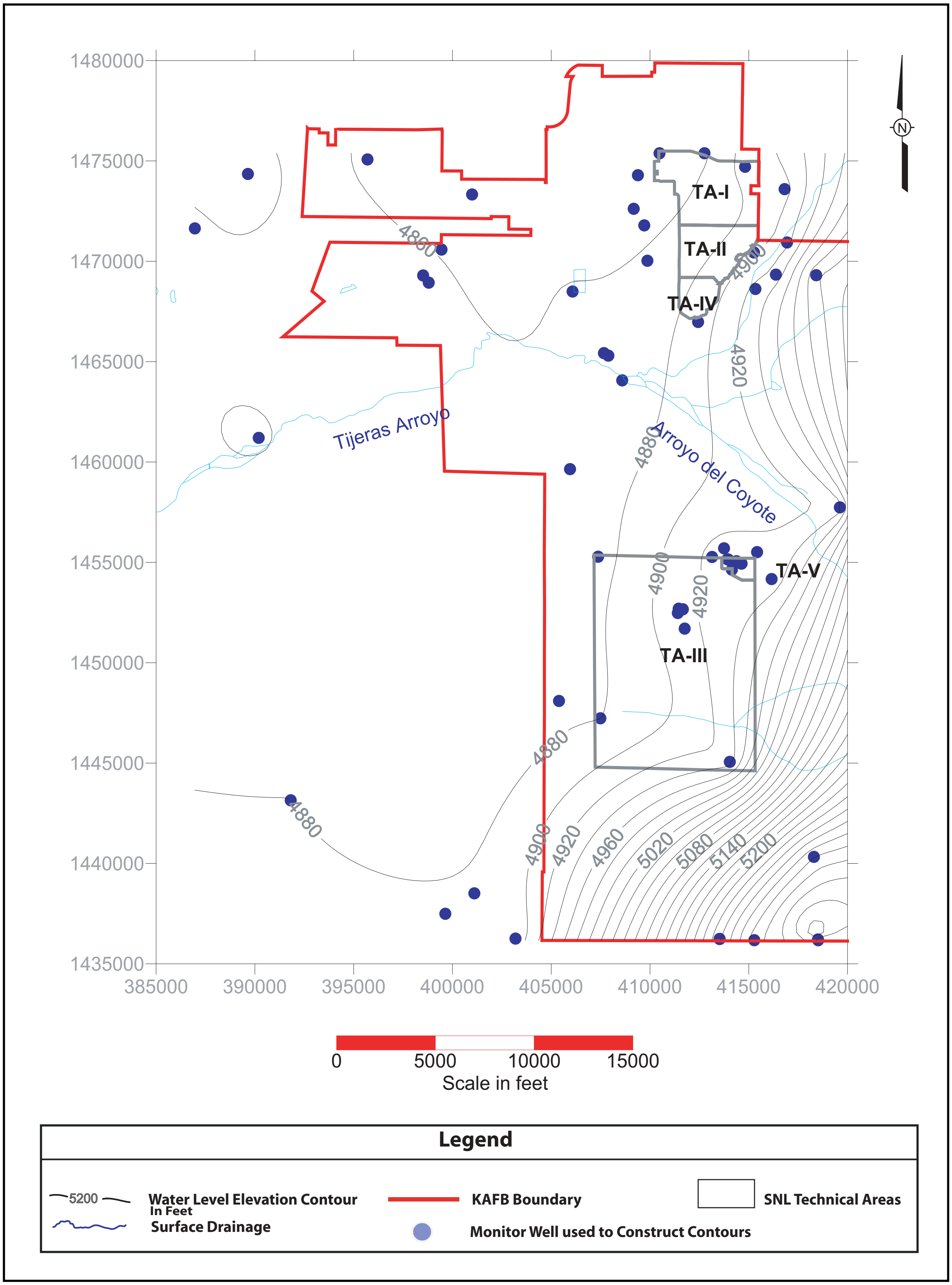

FIGURE 7-4. Regional Groundwater Elevation Map for SNL/KAFB, FY03

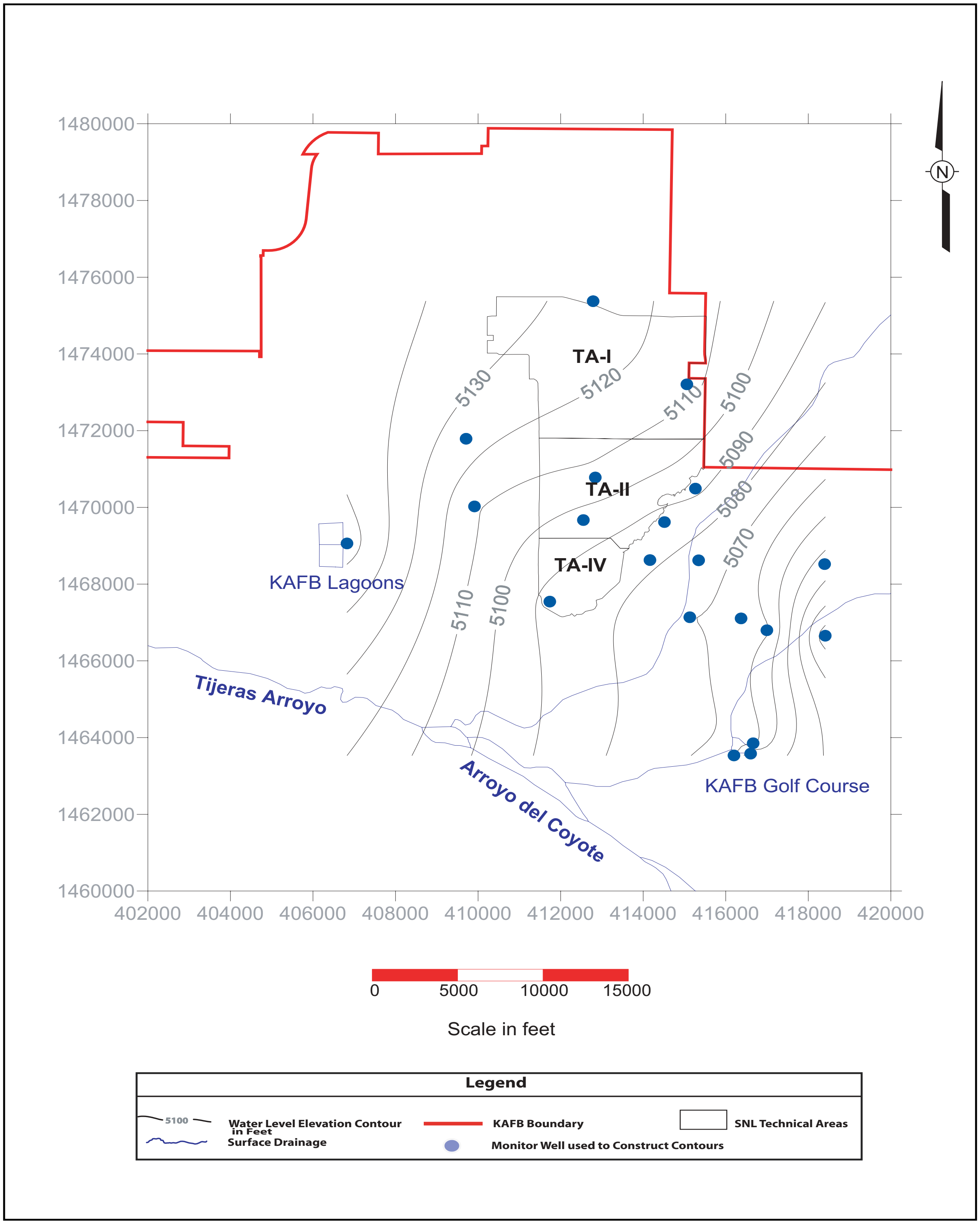

FIGURE 7-5. Shallow Groundwater System Water Elevation Map

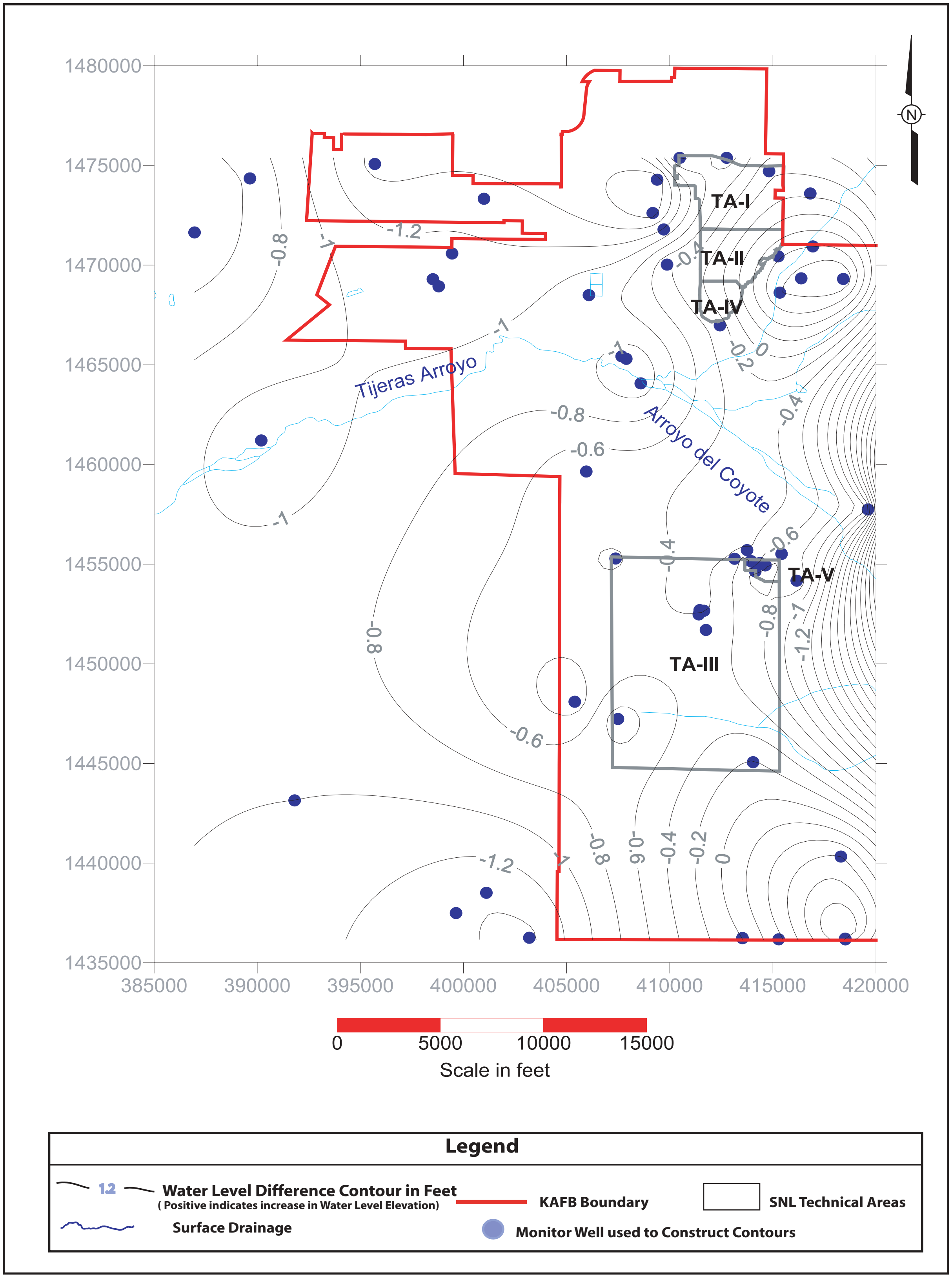

FIGURE 7-6. Annual Regional Groundwater Elevation Difference For SNL/KAFB, FY02-FY03

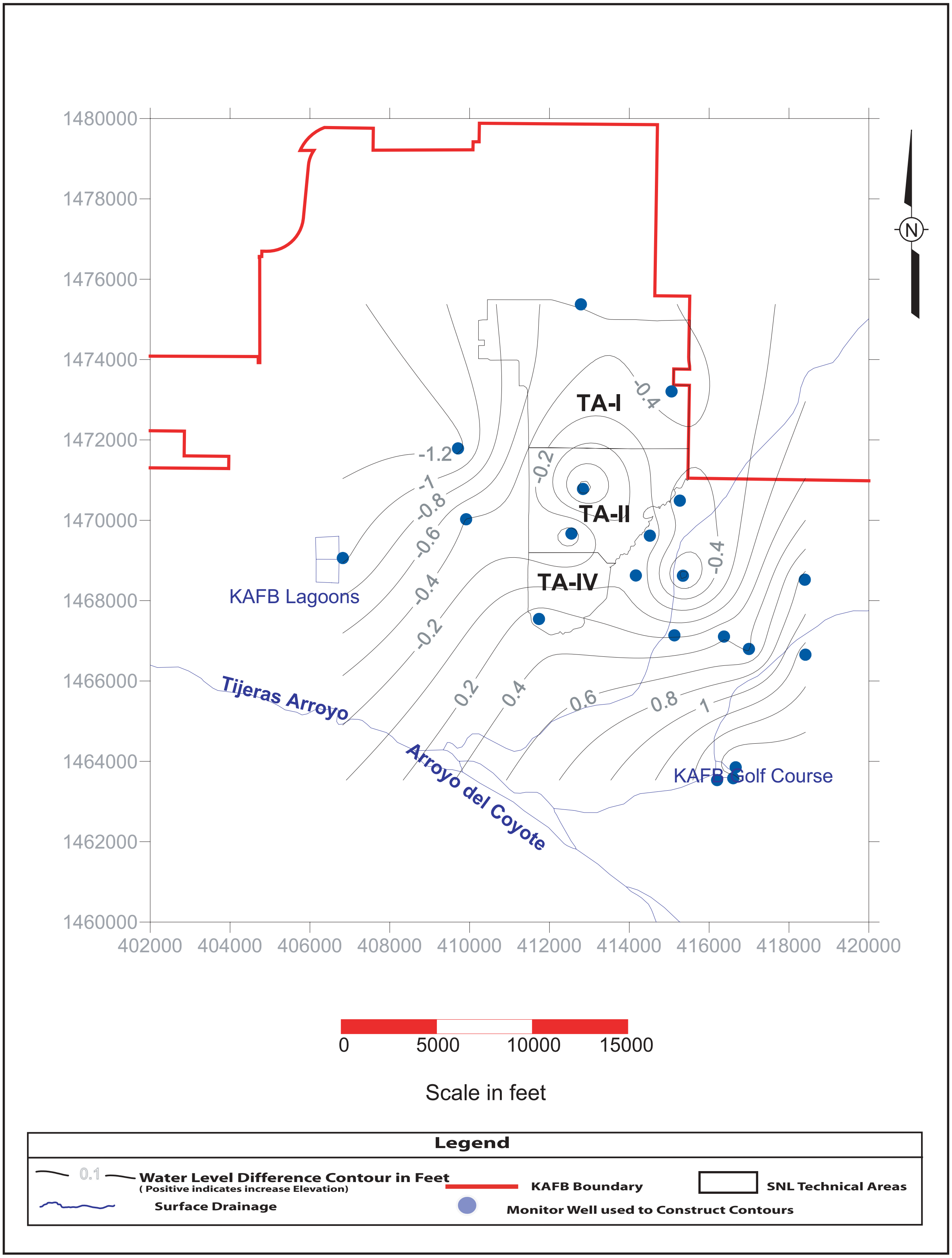

FIGURE 7-7. Shallow Groundwater System Elevation Changes, FY02 - FY03

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Corporate Level QA
Environmental Program QA
Environmental Sampling and Analysis
2003 SMO Activities

Caterpillar at SNL/NM

Environmental Snapshot

- *The Department of Energy Consolidate Audit Program (DOECAP), conducted audits in 2003 at the primary SMO contract laboratories. In 2003, no priority one findings that impacted SMP work were documented during the audits.*
- *The SMO processed 10,551 samples in 2003. Of those, 2,235 samples were for environmental monitoring and surveillance projects.*
- *Field Analytical Quality Control (QC) samples totalled 1,379 in 2003. Of those, 485 were for environmental monitoring and surveillance projects.*

Chapter Eight
Quality Assurance

Chapter Summary

Quality Assurance (QA) principals, elements, and tools are an integral part of Sandia National Laboratories, New Mexico (SNL/NM) activities to assure management, customers, regulators, and the community that SNL/NM is conducting business in a compliant manner, with respect for our employees, the community, and the environment. One of the QA principles used by SNL/NM is the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) Integrated Safety Management System (ISMS) to ensure that work is planned, hazards are analyzed and controlled, work is performed according to approved plans, and lessons learned are communicated. ISMS is a process that continually improves operations and performance.

Environmental programs utilize QA principles to maintain the integrity of program plans, sampling, and analysis. The Sample Management Office (SMO) helps provide environmental programs with guidance and sample management support. The SMO works to ensure that contractor laboratories provide the quality data and labaroratory analysis through validation of laboratory data packets and by conducting audits of contractor laboratories. QA plans ensure that data validation and records management are a key asset to providing quality environmental data.

Bee Relocation Operation at SNL/NM

8.1 Corporate Level QA

The Integrated Laboratory Management System (ILMS) (SNL 2003n) established a common management system for all Sandia Corporation work. ILMS consists of a set of fundamental management principles and a set of constituent elements that represent essential Corporate objectives and requirements. One of the ILMS management principles is formality. SNL/NM manages work with a level of formality that reduces risks to an acceptable level, sets the standard for quality and end results, and enables effective working relationships with our partners.

Sandia Corporation Quality Policy
One of the ILMS constituent elements is the Quality Policy. SNL/NM's strategy is to apply quality principles to all of our work. Our quality principles are:

- Provide the greatest value to our customers by understanding and meeting their expectations with respect to cost, schedule, and performance;
- Focus on prevention rather than correction;
- Measure our progress using data; and
- Continually strive to improve our skills, processes, products, and services.

QA Criteria
The SNL Corporate Quality Assurance Program (SNL 2003i), defines requirements, assigns responsibilities and authorities, and provides criteria for the management, performance, and assessment of work. The QA requirements are taken from the following website:

> *DOE O 414.1A <http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141a.html> "Quality Assurance," and 10 CFR 830, Subpart A <http://tis-nt.eh.doe.gov/enforce/rands/nuclearsafety.html>*

"Quality Assurance Requirements." The following ten criteria are applied to all scope of work and implemented in accordance with the level of formality using the graded approach.

Management criteria:
- Program
- Personnel Training and Qualification
- Quality Improvement
- Documents and Records

Performance criteria:
- Work processes
- Design
- Procurement
- Inspection and Acceptance Testing

Assessment criteria:

- Management assessment
- Independent assessment

SNL/NM's ISMS
SNL/NM is committed to performing work safely and ensuring the protection of Members of the Workforce, the public, and the environment. The five core safety management functions provide the necessary structure for any work activity that could potentially affect the public, the workers, and the environment. The functions are applied as a continuous cycle with the degree of rigor appropriate to address the type of work activity and the hazards involved. The ISMS star is SNL/NM's graphical depiction of the five safety management functions. The ISMS principles are as follows:

Plan work, incorporating safety awareness, protective health practices, pollution prevention (P2), and stewardship

Evaluate and manage risk with effective Environment, Safety, and Health (ES&H) systems;

Implement controls to prevent injuries, hazardous exposures, or releases;

Do quality work while protecting people, the environment, and our nation's security;

Continually improve our ES&H performance and incorporate Lessons Learned; and

Communicate ES&H issues to our employees, the community, regulators, and stakeholders.

8.2 ENVIRONMENTAL PROGRAM QA

Environmental Sampling
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, which are not regulatory driven, are carried out in accordance with DOE Orders.

Samples are tracked, packaged, and shipped to off-site laboratories by the SMO as discussed in Section 8.3. Some samples are processed and analyzed by the SNL/NM Radiation Protection Sample Diagnostics (RPSD) laboratory in accordance with RPSD procedures.

8.3 ENVIRONMENTAL SAMPLING AND ANALYSIS

Environmental Sampling
Environmental sampling is conducted in accordance with program-specific sampling and analysis plans (SAPs) or work plans, each of which contains applicable QA elements. These documents meet appropriate federal, state, and local regulatory guidelines for conducting sampling and analysis activities.

SMO Roles and Responsibilities
The SMO provides 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.

The SMO is responsible for QA and QC once the samples are relinquished to the SMO by field team members.

Program-Specific SAPs
Each program involved in environmental monitoring and sampling develops and follows a relevant SAP. Most project SAPs include the following specific elements: (1) descriptions of sampling procedures (mechanics of the process) applicable to each activity–such as sample handling descriptions, preservation, labeling, and event documentation, (2) a list of U.S. Environmental Protection Agency (EPA) approved sample collection equipment, appropriate sample containers, and equipment decontamination procedures, and (3) a field QC sample collection schedule, at defined frequencies, to estimate sample representativeness and potential contamination acquired during the sampling and handling process.

Selection of a Contract Laboratory
All off-site contract laboratories are selected based on an appraisal (pre-award audit) as described in the Quality Assurance Project Plan (QAPP) for the SMO (SNL 2003t). All laboratories must employ EPA test procedures wherever possible; if not available, other suitable and validated test procedures are used. Laboratory instruments must be calibrated in accordance with established procedures, methods, and statements of work (SOW). All calibrations must be verified before instruments can be used for analysis. Once a laboratory has passed the initial appraisal and has been awarded a contract, the SMO is responsible to ensure laboratories are audited annually.

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

The Project QC process monitors the quality of data generated by each contract laboratory. Various field QC sample methods are used during the sample collection process to assess the quality of the data. Errors that can be introduced into the sampling process include potential sample contamination in the field or the laboratory, some of which are unavoidable. Additionally, the variability present at each sample location can also affect sample results.

QC samples are submitted to contract laboratories in accordance with project-specific Data Quality Objectives (DQOs) and SAPs.

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 to statistically established control criteria for acceptance. 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 data results are included in analytical reports prepared by contract laboratories for SNL/NM.

8.4 2003 SMO Activities

In 2003, the SMO processed a total of 10,551 samples in support of Sandia Corporation projects, including environmental monitoring (air and water), waste characterization, decontamination and demolition (D&D), and Environmental Restoration (ER). Of these, 2,235 were for environmental monitoring and surveillance projects. A total of 1,379 samples were submitted as field and analytical QC samples to assist with data validation and decision-making. Approximately 485 QC samples were for environmental monitoring and surveillance projects.

SMO contract laboratories perform work based on the Sandia Corporation SOW (Puissant 2003).

Inter-Laboratory Comparisons

SMO contract laboratories are required to participate in the EPA's Environmental Monitoring Systems Laboratory (EMSL) inter-laboratory comparison programs. In 2003, all result expectations were met.

The DOE Assessment Programs include the Mixed Analyte Performance Evaluation Program (MAPEP), the inter-laboratory QAPP, and an EPA-approved vendor program with a similar scope as the privatized EPA Water Pollution and Water Supply studies. SMO contract laboratories have a history of achieving a 90 percent or greater success rate during these comparisons. Acceptable results are based on either established control limits as stated in the applicable methods or statistically applied acceptance windows as determined by the MAPEP. Windows are typically two or three standard deviations around the true value.

Laboratory QA

In 2003, the SMO continued on-site data package assessments and validation at the National Environmental Laboratory Accreditation Program (NELAP) accredited laboratories used by Sandia

SMO Sample Processing

The SMO processed the following types of samples in 2003 in support of SNL/NM projects:

- *Radioactive waste*
- *Mixed waste*
- *Hazardous waste*
- *D&D*
- *D&D swipes*
- *D&D materials*
- *Underground Storage Tank (UST)*
- *Sludges and liquids*
- *Soil*
- *Groundwater*
- *Decon water*
- *Solid waste*
- *Air*
- *Wastewater effluent*
- *Surface water*
- *Storm water*
- *Soil gas*
- *Air filters*

Corporation. 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 2003, Sandia Corporation employed the following contract laboratories to perform analysis of SNL/NM samples:

- ***General Engineering Laboratories (GEL)*** **-** Charleston, South Carolina;
- ***Severn Trent*** **-** St. Louis, Missouri; Santa Ana, California; Richland, Washington; and Knoxville, TN;
- ***Southwest Pace Laboratories*** **-** Broken Arrow, Oklahoma; and
- ***Hall Laboratory*** **-** Albuquerque, New Mexico.

QA Audits

The DOECAP, previously Environmental Management Consolidated Audit Program (EMCAP), conducted audits in 2003 at the primary SMO contract laboratories using the 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 the contract laboratories are based on audit findings and unresolved corrective actions. In 2003, no priority one 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. Data were reviewed and validated at a minimum of three levels:

- By the analytical laboratory, where the data were validated according to the laboratory's QA plan, standard operating procedures, and client specific requirements;
- By a qualified member of Sandia Corporation's SMO staff, who reviewed the analytical reports and corresponding sample collection and ARCOC documentation for completeness and laboratory contract compliance; and
- By the Sandia Corporation Project Leader responsible for program objectives, regulatory compliance, and project-specific data quality requirements. The Project Leader determines the decision of data usability.

In addition, a predetermined percentage of data are validated to the methods in accordance with the *Data Validation Procedure for Chemical and Radiochemical Data* (SNL/SMO 2003o).

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In this Chapter ...

Sandia Mountains

Chapter 9

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- 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 (16 U.S.C. §470)
- 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.)

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NOTE: U.S.C. = United States Code

IMPORTANT ENVIRONMENTAL PROGRAM DOCUMENTS

Air Quality

Meteorological Monitoring Program

- *Quality Assurance Project Plan (QAPjP) Meteorological and Ambient Air Monitoring Program* (SNL 2003s)

Ambient Air Surveillance Program

- *Quality Assurance Project Plan (QAPjP) Meteorological and Ambient Air Monitoring Program* (SNL 2003s)

NESHAP Program

- *NESHAP Annual Report for CY03, SNL/NM* (SNL 2004b)
- *Radiological Dose Calculations and Supplemental Dose Assessment Data for NESHAP Compliance, SNL/NM, 2003* (SNL 2004c)
- *Radiological NESHAP Quality Assurance Project Plan (QAPjP*) (SNL 1997a)

Air Quality Compliance Program

- Title V Operating Permit Application # 515 (2002 update; Volume 1for Sandia National Laboratories) (DOE 2002a)
- *Air Quality* (SNL 1999f)
- *Chemical Inventory Report, Calendar Year 2003* (SNL/Outrider Corporation 2004)
- *Corporate Ozone-Depleting Substances Management Program* (SNL 2003c)
- Section 17B, "Air Permits in Bernalillo County," *ES&H Manual* (SNL 1997d)
- Section 17C, "Air Emissions Control Measures," *ES&H Manual* (SNL 1999g)
- Section 17D, "Ozone Depleting Substances," *ES&H Manual* (SNL 1999c)

Water Quality

All Water Quality Programs

- *Water Quality* (SNL 1997b)
- Section 10E, "Chemical Spills," *ES&H Manual* (SNL 2001d)
- *Sandia National Laboratories, New Mexico Emergency Plan, ES&H Manual Supplement* (SNL 2002b)

Wastewater Program

- Section 10H, "Discharges to the Sanitary Sewer System," *ES&H Manual* (SNL 2003q)
- *SNL/NM Wastewater Sampling and Analysis Plan (*SNL 2004e)

Surface Discharge Program

- *Discharge Plan Renewal Application, DP-530, SNL/NM* (SNL 2001b)
- Section 10T, "Surface and Storm Water Discharges," *ES&H Manual* (SNL 2004f)
- Section 10F, "Oils, Greases, and Fuels," *ES&H Manual* (SNL 1999)

Storm Water Program

- *Storm Water Pollution Prevention Plan (SWP3)* (SNL 2001a)
- Section 10T, "Surface and Storm Water Discharges," *ES&H Manual* (SNL 2004f)
- *Sampling and Analysis Plan for the Storm Water Monitoring Program* (SNL 2003u)

Groundwater Protection Program (GWPP)

- *Annual Groundwater Monitoring Report (Fiscal Year 2003) for Sandia National Laboratories/ New Mexico* (SNL 2004d)

<u>**NEPA Program**</u>

- *The National Environmental Policy Act (NEPA), Cultural Resources and Historic Properties Programs (PG470110, Issue E)* (SNL 2003e)
- *Sandia National Laboratories Final Site-Wide Environmental Impact Statement (SWEIS)* (DOE 1999)
- *Environmental Assessment (EA) Rapid Reactivation Project* (DOE 1999a)
- *Sandia National Laboratories/New Mexico Facilities and Safety Information Document (FSID)* (SNL 1999a)
- *Sandia National Laboratories/New Mexico Environmental Information Document (EID*) (SNL 1999b)
- Section 10B, *National Environmental Policy Act* (NEPA), *Cultural Resources, and Historic Properties, ES&H Manual* (SNL 2003e)
- *Quality Assurance Project Plan (QAPjP) for the Preparation of Environmental Assessments at Sandia National Laboratories, New Mexico* (SNL 2003dd)
- *SWEIS Annual Review- CY 2002* (SNL 2003h)

<u>**Various Other Environmental Programs**</u>

Biological Control Activity

- Section 6K, "Hazardous Waste Operations and Emergency Response (HAZWOPER)," *ES&H Manual* (SNL 2001c)
- Section 6D, "Hazard Communication Standard," *ES&H Manual* (SNL 2002d)

<u>**Oil Storage and Spill Containment**</u>

Oil Storage Programs

- *Sandia National Laboratories Spill Prevention Control and Countermeasures (SPCC) Plan* (SNL 1999e)
- Section 10K, "Underground Storage Tanks," *ES&H Manual* (SNL 2003r)
- Section 10F, "Oils, Greases, and Fuels," *ES&H Manual* (SNL 1999)

<u>**Terrestrial Surveillance**</u>

- *The Role of Data Analysis in Sampling Design of Environmental Monitoring* (Shyr, Herrera, Haaker 1998)
- *Environmental Monitoring and Surveillance Program* (SNL 2000c)
- *Environmental ALARA Program* (SNL 1996)
- *Quality Assurance Project Plan (QAPjP) for Terrestrial Surveillance at SNL/NM* (SNL 1998)
- *2003 Data Analysis in Support of the Annual Site Environmental Report* (SNL 2004a)
- *Environmental Monitoring Plan* (SNL 2002g)

<u>**Quality Assurance**</u>

Sample Management Office (SMO)

- *DOE/AL Model Statement of Work* (DOE 2003)
- *Quality Assurance Project Plan (QAPP) for the Sample Management Office (SMO)* (SNL 2003t)

<u>**Waste Management**</u>

All Waste Management Programs

- *Storm Water Pollution Prevention Plan (SWP3)* (SNL 2001a)
- *Programmatic Waste Acceptance Criteria (*SNL 2003k)
- *Waste Management* (SNL 2003b)
- *Waste Characterization Project Overview (*SNL 2002)

ER Project

Multiple documents too numerous to list here.

Hazardous Waste Management Program

- *2001 Hazardous Waste Biennial Report for Sandia National Laboratories/New Mexico and Sandia National Laboratories/Tonopah Test Range* (SNL 2002a)
- Section 19A, “Hazardous Waste Management,” *ES&H Manual* (SNL 2002f)
- Section 10E, “Chemical Spills,” *ES&H Manual* (SNL 2001d)

Solid Waste Program

- Section 19F, “Other Waste,” *ES&H Manual* (SNL 1999d)

Radioactive Waste Management Program

- *Site Treatment Plan for Mixed Waste, Sandia National Laboratories/New Mexico,* Revision 7 (SNL 2003d)
- Section 19B, “Radioactive Waste Management,” *ES&H Manual* (SNL 2003f)
- *Radioactive Waste/Nuclear Materials Disposition Department (RWNMDD) Waste Management Program* (SNL 2003a)
- *Manzano Nuclear Facilities Maintenance Support Program* (SNL 2003j)
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TSCA Waste

- Section 6S, “Toxic Substances Control Act (TSCA),” *ES&H Manual* (SNL 1997c)

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2003

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-6	7/1/03	12/31/07	COA
General	WW006 Station Manhole, at Pennsylvania Ave.	2069 F-6	8/1/03	1/31/08	COA
Microelectronics Development Laboratory (MDL)	WW007 Station Manhole, TA-I	2069 G-5	6/1/02	5/31/05	COA
General	WW008 Station Manhole, south of TA-II at Tijeras Arroyo	2069 I-4 Renewal Submitted	10/14/03	extended	COA
General	WW011 Station Manhole, north of TA-III (includes TAs-III and V, and Coyote Test Field sewer lines)	2069 K-4	3/1/02	10/31/04	COA
SURFACE DISCHARGE					
Pulsed Power Development Facilities (Discharge Plan)	TA-IV, Lagoons I and II	DP-530	9/21/01	9/21/06	NMED
Sandia Corporation/New Mexico Tech Vadose Zone Infiltration Test Facility	Socorro County	Permit transferred to NM Tech 10/28/03	N/A	N/A	N/A
UNDERGROUND STORAGE TANKS					
Emergency generator fuel (9,750 gallon)	TA-I	06383	7/1/03[a]	6/30/04	NMED, UST Bur.
Oil storage tank (20,000 gallons)	TA-I	06384	7/1/03[a]	6/30/04	NMED, UST Bur.
Oil storage tank (20,000 gallons)	TA-I	06385	7/1/03[a]	6/30/04	NMED, UST Bur.
ABOVE GROUND TANKS					
AST/ 1,024,000	605 tank farm	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 508,000	605 tank farm	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 213,898	605 tank farm	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 209, 421	605 tank farm	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 45,490[1]	605 tank farm	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 44,129[1]	605 tank farm	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 10,000	605 east	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 10,000	605 east	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 10,000	605 east	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 75,000	966 outside east	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 75,000	966 outside east	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 75,000	966 outside east	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 250,000	970 outside S-SE	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 250,000	970 outside S	NMED has not issued #	7/1/03[a]	6/30/04	NMED
AST / 250,000	981 outside E	NMED has not issued #	7/1/03[a]	6/30/04	NMED

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2003 (continued)

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
Above Ground Tanks (continued)					
AST / 250,000	981 outside W	NMED has not issued #	7/1/03	6/30/04	NMED
AST / 250,000	983 outside	NMED has not issued #	7/1/03	6/30/04	NMED
AST / 250,000	983 outside sw	NMED has not issued #	7/1/03	6/30/04	NMED
AST / 250,000	983 outside se	NMED has not issued #	7/1/03	6/30/04	NMED
AST / 25,000[1]	Burn site outside north	NMED has not issued #	7/1/03	6/30/04	NMED
STORM WATER					
National Pollution Discharge Elimination System (NPDES) "Multi-sector General" Permit	Storm water discharges from Monitoring Point (MP) 01 and MP 10	NMR05A961	2/01	9/30/05	EPA
Storm Drain, Sanitary Sewer, and Domestic Water System Modernization (SSWM)	9th and 20th Street realignment area	NMR10B507	6/29/99	8/04	EPA
NPDES construction permit for the Joint Computational Engineering Laboratory	South TA-1	NM0002377	4/20/02	3/04	EPA
MESA	TA-1	NM0002376	1/28/02	7/31/09	EPA
Aerial Cable Facilities Renovations	Sol se Mete Canyon	EPA has not issued #	3/04	2/05	EPA
Center for Integrated Nanotechnologies	Eubank	EPA has not issued #	10/03	6/06	EPA
SCA/CUB	South TA-1	EPA has not issued #	9/02	8/03	EPA
ECOLOGICAL					
Permit to take or band birds Bird banding is conducted under a permit granted to Los Alamos National Laboratory (LANL)	Site-Wide Ecological Monitoring Activity	22783 (LANL permit)	4/30/00	6/30/03	U.S Fish and Wildlife Service
New Mexico Department of Game and Fish for Scientific/Educational Purposes Authorization for Taking of Protected Wildlife	Site-Wide Ecological Monitoring Activity	2931	1/1/03	12/31/03	New Mexico Department of Game and Fish
U.S. Fish and Wildlife Service Special Purpose Salvage Permit	Site-Wide Ecological Monitoring	MB040780-0	5/30/01	12/31/03	U.S. Fish and Wildlife Service

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2002 *(continued)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
RCRA *(continued)*					
RCRA Part B Operating Permit for the Hazardous Waste Management Facility (HWMF) Module I - General Permit Conditions Module II - General Facility Conditions Module III - Containers	HWMF, TA-II (storage)	NM5890110518-1	8/6/92	08/06/02 [b] *** (request for renewal submitted 2/6/02, most recent revision submitted 11/12/2003)	NMED
RCRA Part B Operating 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 [b]*** (request for renewal submitted 2/6/02, most recent revision submitted 11/03)	EPA/NMED
Thermal Treatment Facility (TTF) Module I - General Permit Conditions Module II - General Facility Conditions Module III - Containers	TTF, TA-III, Bldg. 6715 (Treatment of explosive waste)	NM5890110518-2	12/4/94	12/4/04[b] *** Class II modification issued 11/25/03. (request for renewal submitted 2/6/02, most recent revision submitted 11/12/03)	NMED
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 [b]*** (request for renewal submitted 2/6/02, most recent revision submitted 12/03)	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); Bldg. 6596 (storage only)	NM5890110518	Application for interim status first submitted 8/90; most recent revision 05/30/02	Under Review [b] (No expiration date)	NMED
RCRA Part B Permit Application for Hazardous Waste Management Units for the hazardous component in mixed waste stored and/or treated at seven waste management areas.	RMWMF (MW treatment and storage); 5 Manzano Bunkers (storage only); Auxiliary Hot Cell Facility (storage and treatment); Bldg. 6596 (storage only)	NM5890110518	Application first submitted in 1992. Most recent revision submitted 11/12/03	Under Review [b]	NMED

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2003 *(continued)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
TSCA					
Risk-Based Approval Request under 40 CFR 761.61(c); Risk-Based Method for Management of PCB Materials; Chemical Waste Landfill and 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; extended storage provision expired 9/30/03.	EPA, Region 6
Open Burn Permits*					
Explosive Testing	Thermite Applications	76-OB-1-2003	1/1/03	12/31/03	COA
Above Ground	Explosive Detonations	76-OB-2-2003	1/2/03	12/30/02	COA
10,000’ Sled Track	Blast Tube Test Series	76-OB-3-2003	2/7/03	12/31/03	COA
Lurance Burn Site	Building 9830, Phase I	76-OB-4-2003	3/19/03	12/31/03	COA
TTF*	Thermal Treatment	76-OB-5-2003	3/21/03	12/31/03	COA
Fire Extinguisher	Fire Training	76-OB-6-2003	3/21/03	12/31/03	COA
Burn Site/Sled Track	Wood Crib Fire Tests	76-OB-7-2003	3/21/03	12/31/03	COA
Lurance Burn Site	Large Pool Fire Tests I	76-OB-8-2003	3/21/03	12/31/03	COA
Lurance Burn Site	Building 9830, Phase II	76-OB-9-2003	4/24/03	12/31/03	COA
Fire Extinguisher	Fire Training	76-OB-10-2003	4/24/03	12/31/03	COA
Above Ground	Triple Detonations	76-OB-11-2003	7/21/02	8/31/03	COA
Lurance Burn Site	Large Pool Fire Tests II	76-OB-12-2003	7/30/03	12/31/03	COA
Explosive Research	Attack Initiated Smoke	76-OB-13-2003	7/31/03	12/31/03	COA
Above Ground	D Test	76-OB-14-2003	8/28/03	12/31/03	COA
AIR (Permits & Registrations)					
Hammermill Facility	TA-III	144	08/28/85	Biennial update	COA
Fire Laboratory (formally SMERF) used for the Authentication of Modeling and Experiments (FLAME)	Burn Site	196	5/19/88	Registration[†]	COA
High Energy Radiation Megavolt Electron Source-III (HERMES-III)	TA-III	NESHAP	6/29/88	Approval[††]	EPA, Region 6
Neutron Generator Facility (NGF)	TA-I	374- M1	9/23/94	Biennial update	COA
Neutron Generator Recertification	TA-I	396	5/7/96	Biennial update	COA
Standby diesel generators (four)	TA-I	402 (old 150)	5/07/96	Biennial update	COA
Radioactive and Mixed Waste Management Facility (RMWMF)	TA-III	415- M1	5/10/97	Biennial update	COA
Isotope Production Facility (HCF)	TA-V	428	7/08/96	Biennial update	COA
Title V Operating Permit	Site-Wide	515 (pending)	Submitted[b] 3/1/96	Pending (5 yr renewal)	COA
Chemical Waste Landfill (CWL) Excavation	TA-III, CWL	540	5/19/99	Registration	COA
Classified Waste Landfill	TA-II, Landfill	560	12/17/96	Biennial update	COA
Classified Waste Landfill	TA-II, Landfill	NESHAP	06/96	Approval[††]	EPA, Region 6
Advanced Manufacturing Processes Laboratory (AMPL)	TA-I	646	1/23/97	Biennial update	COA

See notes at end of table.

TABLE 9-1. Summary of Environmental Permits and Registrations in Effect During 2003 *(concluded)*

Permit Type and/or Facility Name	Location	Permit Number	Issue Date	Expiration Date	Regulatory Agency
AIR (Permits & Registrations) *(concluded)*					
Portable Burn Pools	Burn Site	647	5/5/97	Biennial update	COA
Soil Washing / Soil Stabilization Unit, CAMU	TA-III, CAMU, next to CWL	888-M1	8/21/02	Biennial update	COA
Emergency Generator	TA-I	924	5/5/98	Biennial update	COA
Processing and Environmental Technology Laboratory (PETL)	TA-I	925-M1	3/5/01	Biennial update	COA
Processing and Environmental Technology Laboratory (PETL)	TA-I	936	Pending Registration		COA
Advanced Manufacturing Prototype Facility (AMPF)	TA-I	1406	11/6/00	Registration	COA
Microelectronics Development Laboratory (MDL)	TA-1	1678	12/23/02	Biennial update	COA
SURFACE DISTURBANCE AND DEMOLITION PERMITS (Permits & Registrations)					
JCEL	Engineering Laboratory	02-08-07	7/26/02	9/30/03	
SCF	Scientific Computing	10-86-2986	7/1/02	7/1/03	
Chemical Waste Landfill (CWL)	CWL	Permit # unavailable	3/3/03	10/13/03	
K Avenue	K Avenue Improvement	Permit # unavailable	3/17/03	8/14/04	
Mesa Staging Area	Contractor Laydown	Permit # unavailable	4/7/03	6/1/03	
Rad & Classified	Landfill Remediation	10-326-2573	6/4/03	5/30/04	
MESA MicroFab	MESA Project Phase I	10-328-2600	6/13/03	6/13/04	
Soils Stockpile	Thermal Test Complex	10-326-2616	8/4/03	9/4/03	
MESA MicroLab	MESA Project Phase II	Permit # unavailable	11/17/03	5/31/05	

NOTES: NMED = New Mexico Environment Department
EPA = U.S. Environmental Protection Agency
UST Bur. = Underground Storage Tank
AST = Aboveground Storage Tank
MESA = Microsystems and Engineering Sciences Application
SCA/CUB = Scientific Computing Annex/ Central Utility Building
[a]Applied for permit renewal; not yet received.
[b]Combined with application for permit renewal submitted to NMED on 02/06/2002
[†]Registration = Certificate, no permit required.
[††]Approval = EPA does not issue a permit.
*Open Burn Permits are issued by the City of Albuquerque for no more than a year at any one time.
NESHAP = National Emission Standards for Hazardous Air Pollutants
TA= technical area
COA= City of Albuquerque
*** Sandia submitted a timely application for permit renewal (RCRA Part A and Part B permit applications) to NMED on 02/06/2002. The old permit remains in force until the new one is issued.
[1]Only these three tanks will require registration in 2004
N/A = not applicable
RCRA = Resource Conservation and Recovery Act
TTF = Thermal Treatment Facility
PCB = polychlorinated biphenyl
SMERF = Smoke Emission Reduction Facility
JCEL = Joint Computational Engineering Laboratory
SCF = Scientific Computing Facility

APPLICABLE LAWS AND REGULATIONS FOR ENVIRONMENTAL PROGRAMS

Water Quality

All Water Quality Programs

Clean Water Act (CWA) (Federal Water Pollution Control Act)
20 NMAC 6.2, “Ground and Surface Water Protection”
Clean Air Act (CAA) and CAA Amendments (CAAA) of 1990

Drinking Water

Safe Drinking Water Act (SDWA)
40 CFR 125, “Criteria and Standards for the National Pollutant Discharge Elimination System (NPDES)”
40 CFR 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants”
40 CFR 141, “National Primary Drinking Water Regulations”
20 NMAC 7.10, “Drinking Water”
40 CFR 143, “National Secondary Drinking Water Regulations”

Wastewater Program

City of Albuquerque, “Sewer Use and Wastewater Control Ordinance” (Albuquerque Code of Ordinances Chapter 6, Article 3)
40 CFR 403, “General Pretreatment Regulations for Existing and New Sources of Pollution”
10 CFR 20, “Standards for Protection Against Radiation” (addresses radiological levels in wastewater)
20 NMAC 7.3, “Liquid Waste Disposal” (includes effluents to sewer and septic tanks)

Surface Discharge Program

40 CFR 112, “Oil Pollution Prevention”
20 NMAC 6.4, “Standards for Interstate and Intrastate Streams”

Storm Water Program

40 CFR 122-125 (National Pollutant Discharge Elimination System [NPDES] Regulations)
40 CFR 123, “State Program Requirements”
40 CFR 124, “Procedures for Decisionmaking”
40 CFR 125, “Criteria and Standards for the National Pollutant Discharge Elimination System”
40 CFR 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants”

Groundwater Protection Program (GWPP)

40 CFR 141, “National Primary Drinking Water Regulations”
20 NMAC 7.10, “Drinking Water”
20 NMAC 6.2, “Ground and Surface Water Protection”

Groundwater Monitoring at ER Project Sites

40 CFR 265, Subpart F, “Groundwater Monitoring”
40 CFR 264.101, “Corrective Action for Solid Waste Management Units (SWMU)” (applies to all permitted ER sites, except the CWL)

NEPA

NEPA Program

National Environmental Policy Act (NEPA) of 1969
American Indian Religious Freedom Act (AIRFA) of 1978
Archaeological Resources Protection Act (ARPA) of 1979
Endangered Species Act (ESA)
Migratory Bird Treaty Act (MBTA) of 1918, as amended
National Historic Preservation Act of 1966
10 CFR 1021, “National Environmental Policy Act Implementing Procedures” (General Provisions for DOE)

40 CFR 1500-1508, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act

Air Quality

All Air Quality Programs
Clean Air Act (CAA) and CAA Amendments (CAAA) of 1990

Meteorological Monitoring Program
40 CFR 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans"

Ambient Air Surveillance Program
40 CFR 50, "National Primary and Secondary Ambient Air Quality Standards"
40 CFR 58, "Ambient Air Quality Surveillance"
20 NMAC 11, "Albuquerque/Bernalillo County Air Quality Control Board Regulations"

NESHAP Program
40 CFR 61, "National Emission Standards for Hazardous Air Pollutants (NESHAP)"
40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities"

Risk Management Plans
40 CFR 68, "Chemical Accident Prevention Provisions"

Air Quality Compliance
(See Table 9-2 on page 9-23)

Various Other Environmental Programs

Biological Control Activity
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
New Mexico Pesticide Control Act
21 NMAC 17.50, "Pesticides"

Pollution Prevention (P2) Program
Pollution Prevention Act of 1990
RCRA Section 6002, "Federal Procurement"

EO 13101	"Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition"
EO 13148	"Greening the Government Through Leadership in Environmental Management"
EO 12856	"Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements" (superceded by EO 13148)
EO 13149	"Greening the Government Through Federal Fleet and Transportation Efficiency"
EO 13123	"Greening the Government Through Efficient Energy Management"

Chemical Inventory and Emergency Management Programs
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601 et. seq.)
Superfund Amendments and Reauthorization Act (SARA) of 1986
Emergency Planning and Community Right to Know Act (EPCRA) of 1986 (42 U.S.C. 11001 et seq.)
40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan" (NCP)
40 CFR 302, "Designation, Reportable Quantities, and Notification" (CERCLA Implementing Regulation)
40 CFR 355, "Emergency Planning and Notification (EPCRA)"
40 CFR 370, "Hazardous Chemical Reporting: Community Right-to-Know (EPCRA)"
40 CFR 372, "Toxic Chemical Release Reporting: Community Right-to-Know (EPCRA)"

Oil Storage and Spill Containment

Oil Storage Programs

40 CFR 110, "Discharge of Oil"
40 CFR 112, "Oil Pollution Prevention"
40 CFR 122, "EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES)"
40 CFR 123, "State Program Requirements (NPDES)"
40 CFR 280, "Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks"
40 CFR 281, "Approval of State Underground Storage Tank Programs"
20 NMAC 5, "Environmental Protection Petroleum Storage Tanks"

Waste Management

ER Project

Resource Conservation and Recovery Act (RCRA) of 1976, as amended
Toxic Substances Control Act (TSCA) of 1976
Pollution Prevention Act of 1990
40 CFR 261, "Identification and Listing of Hazardous Waste" (20 4.1 NMAC, Subpart II)
40 CFR 262, "Standards Applicable to the Generators of Hazardous Wastes" (20 4.1 NMAC, Subpart III)
40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" including Subpart F, "Releases from Solid Waste Management Units" and Section 264.101, " Corrective Action for Solid Waste Management Units" (20 4.1 NMAC, Subpart V)
40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" (20 4.1 NMAC, Subpart VI)
40 CFR 268, "Land Disposal Restrictions" (20 4.1 NMAC, Subpart VIII)
40 CFR 270, "EPA-Administered Permit Programs: The Hazardous Waste Permit Program" (20 4.1 NMAC , Subpart IX)
40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions"

Hazardous Waste Management Program

Resource Conservation and Recovery Act (RCRA) of 1976, as amended
Toxic Substances Control Act (TSCA) of 1976
Pollution Prevention Act of 1990
40 CFR 61, Subpart M, "NESHAP, Asbestos"
40 CFR 68, "Chemical Accident Prevention Provisions"
40 CFR 260, "Hazardous Waste Management System: General"
40 CFR 261, "Identification and Listing of Hazardous Waste" (20 4.1 NMAC, Subpart II)
40 CFR 262, "Standards Applicable to Generators of Hazardous Waste" (20 4.1 NMAC, Subpart III)
40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste" (20 4.1 NMAC, Subpart IV)
40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities", (20 4.1 NMAC, Subpart V)
40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"(20 4.1 NMAC, Subpart VI)
40 CFR 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities" (20 4.1 NMAC, Subpart VII)
40 CFR 268, "Land Disposal Restrictions" (20 4.1 NMAC, Subpart VIII)
40 CFR 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program" (20 4.1 NMAC, Subpart IX)
40 CFR 271, "Requirements for Authorization of State Hazardous Waste Programs"
40 CFR 272, "Approved State Hazardous Waste Management Programs"
40 CFR 279, "Standards for the Management of Used Oil"
40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions"
40 CFR 763, "Asbestos"
49 CFR 171–180 (Department of Transportation regulations for hazardous and radioactive waste shipments)

20 NMAC 4.3, “Annual Hazardous Waste Fees”
20 NMAC 9.1, “Solid Waste Management”

Solid Waste Program
20 NMAC 9.1, “Solid Waste Management”

Radioactive Waste Management Program
Atomic Energy Act of 1954
Federal Facility Compliance Act (FFCA) of 1992
10 CFR 835, “Occupational Radiation Protection” (Implements Price Anderson Act)
49 CFR 100-199 (Department of Transportation requirements)
40 CFR 61, “National Emission Standards for Hazardous Air Pollutants (NESHAP)”
Subpart H, “National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities”
40 CFR 260-279, RCRA regulations for hazardous waste (as it pertains to mixed waste)

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 W 40 CFR 93 B	20 NMAC 11.04 20 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 11.01	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	Airborne Particulate Matter (PM)
		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 B	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	202-210 213-219 211	40 CFR 85-86	20 NMAC 11.100	Motor Vehicle Inspection
			20 NMAC 11.101	- Decentralized and Centralized (respectively)
		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	Ozone Protection
VII	113-114	40 CFR 64	20 NMAC 11.90	Administration, Enforcement, Inspection

NOTE: CAA = Clean Air Act
NMAC = New Mexico Administrative Code

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
Oct 1995	Compliance Order Issued	NMED issued a Compliance Order enforcing SNL/NM's STP
Sep 1996	First MW Shipment	First MW shipment made to Perma-Fix/DSSI
Oct 1996	FFCO 1st Amendment	FFCO amended
Dec 1996	Revisions to Proposed Treatment Methods	Re-submitted Part A and B permit application, to reflect revisions to proposed on-site treatment methods
May 1997	FFCO 2nd Amendment	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 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.

See notes at end of table.

TABLE 9-3. Summary of Compliance History with Regard to Mixed Waste (MW) at SNL/NM (concluded)

1998	STP Milestones Met	Treated wastes on site and shipped mixed 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.
1999	STP Milestones Met	Treated wastes on site and shipped mixed 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 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 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.
2001	FFCO Amendment 3	FFCO amended
2002	STP Milestones Met	Treated wastes on site and shipped mixed 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.

NOTE: 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

Waste Category	Volume (m^3)	Preferred Treatment Technology	Description	Status and Plans
TG 1	0.2	Deactivation	Inorganic Debris with Explosive Component	Utilizing on-site treatment and investigating off-site treatment and disposal options.[a]
TG 2	0	Deactivation	Inorganic Debris with a Water Reactive Component	No waste currently in inventory.
TG 3	0.01	Deactivation	Reactive Metals	Utilizing on-site treatment and investigating off-site treatment and disposal options.
TG 4	0.05	Macro-encapsulation	Elemental Lead	Utilizing off-site treatment and disposal options.[a]
TG 5	0	Neutralization followed by Stabilization	Aqueous Liquids (Corrosive)	No waste currently in inventory.
TG 6	0	Amalgamation	Elemental Mercury	No waste currently in inventory.
TG 7	0	Incineration	Organic Liquids I	No waste currently in inventory.
TG 8	3.6	Thermal Desorption	Organic Debris with Organic Contaminants	Utilizing off-site treatment and disposal options.[a]
TG 9	17.6	Macro-encapsulation	Inorganic Debris with TCLP Metals	Utilizing on-site treatment or shipping to off-site treatment and disposal facilities.[a]
TG 10	0.7	Sort followed by Reclassification	Heterogeneous Debris	Sort waste as needed to determine more suitable treatability groups.
TG 11	0.01	Hydrothermal Processing	Organic Liquids II	Utilizing off-site treatment and disposal options.[a]
TG 12	1.15	Macro-encapsulation	Organic Debris with TCLP Metals	Utilizing off-site treatment and disposal options.[a]
TG 13	0.0.3	Deactivation followed by Stabilization	Oxidizers	Utilizing on-site treatment.
TG 14	0	Evaporative Oxidation	Aqueous Liquids with Organic Contaminants	No waste currently in inventory.
TG 15	0.09	Stabilization	Soils <50% Debris & Particulates with TCLP Metals	Utilizing on-site treatment or shipping to off-site treatment and disposal facilities.[a]
TG 16	0	Oxidation	Cyanide Waste	No waste currently in inventory.
TG 17	6.35	Incineration followed by Stabilization	Liquid/Solid with Organic and/or Metal Contaminants	Investigating on-site treatment and off-site treatment and disposal options.[a]
TG 18	0	Incineration	Particulates with Organic Contaminants	No waste currently in inventory.
TG 19	0.004	Stabilization	Liquids with Metals	Utilizing on-site treatment and off-site treatment and disposal options.[a]
TG 20	0.36	Deactivation followed by Stabilization	Propellant with TCLP Metals	Investigating on-site treatment and off-site treatment and disposal options.[a]
TG 21	1.0	Off-Site Shipment / Macro-encapsulation	Sealed Sources with TCLP Metals	Investigating on-site treatment and off-site treatment and disposal options.[a]
TG 22	0	Not Applicable	Reserved	Not Applicable
TG 23	0	Off-Site Shipment / Size Reduction followed by Stabilization	Thermal Batteries	No waste currently in inventory.
TG 24	2.3	Off-Site Shipment / Macro-encapsulation	Spark Gap Tubes with TCLP Metals	Utilizing on-site treatment and off-site treatment options, and investigating off-site disposal options.[a]
TG 25	7.4	Sort followed by Reclassification	Classified Items with TCLP Metals	Sort waste as needed to determine more suitable treatability groups.
TG 26	0.6	Off-Site Shipment / Macro-encapsulation	Debris Items with Reactive Compounds & TCLP Metals	Investigating on-site treatment and off-site treatment and disposal options.[a]
TG 27	0.14	Stabilization	High Mercury Solids & Liquids	Investigating off-site treatment and disposal options.
TRU/MW	0.83	To be determined	TRU/MW	Investigating off-site treatment and disposal options.

NOTE: [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 2003g) and the *Site Treatment Plan for MW, FY03 Update* (SNL 2003d).
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 2003). 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

NOTE: 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. Conversion from microcuries per milliliter (µCi/ml) to micrograms per liter (µg/L) may be made using:

$$\mu g / L = X \, \mu Ci / ml \, \frac{\left[1.48 \, x \, 10^{9} \, \mu g / L\right]}{\left[1 \, \mu Ci / ml\right]}$$

- *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 Corporation calculates doses resulting from all potential air depositions and direct inhalation (e.g., emissions, ground shine, food crops)

NOTE: *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

NOTE: *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	0.05	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) [5]	0.1	mg/L
Nitrate (measured as N)	10	mg/L
Nitrite (measured as N)	1	mg/L
Total Nitrate and Nitrite (measured as N)	10	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

See notes at end of table.

TABLE 9-8. EPA Primary Drinking Water Supply Standards/New Mexico Drinking Water Standards *(concluded)*

Organic Parameter *(continued)*	MCL	Units
Ethylbenzene	0.7	mg/L
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
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

NOTE: *action level concentrations which trigger systems into taking treatment steps if 10% 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

NOTE: 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	MAC	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	0.72	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
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 Dissaolved Solids	1000.0	mg/L
Zinc	10.0	mg/L
pH	Between 6 and 9	

NOTE: mg/L = milligram per liter
pH = potential of hydrogen (acidity)
pCi/L = picocurie per liter
MAC = maximum allowable concentration

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	MAC	Units
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

NOTE: mg/L = milligram per liter
MAC = maximum allowable concentration
pCi/L = picocurie per liter

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CHAPTER 10

Chapter Summaries

Executive Summary

In this Chapter ...

Summaries of the following Environmental Programs:
Waste Management and Pollution Prevention (P2)
Environmental Restoration (ER) Project
Terrestrial Surveillance
Water Quality
Groundwater Protection
Air Quality
National Environmental Policy Act (NEPA) Activities

Plants at the Albuquerque Botanical Gardens

In 2003, SNL/NM received the following P2 awards:

Green Zia, EPA WasteWise, White House Closing the Circle, and other DOE Awards for P2 Accomplishments.

Sandia Corporation received five "Gold Pretreatment Awards" from the City of Albuquerque for 100 percent compliance.

Sandia National Laboratories, New Mexico (SNL/NM) is one of the nation's premier multi-program security laboratories within the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). SNL/NM is operated by Sandia Corporation, owned by the DOE/NNSA, and managed by the Sandia Site Office (SSO). This Annual Site Environmental Report (ASER) was prepared in accordance with and as required by DOE Order 450.1, *Environmental Protection Program* (DOE 2003a) and DOE Order 231.1 Chg 2, *Environment, Safety, and Health Reporting* (DOE 1996).

This ASER summarizes environmental protection, restoration, and monitoring programs in place at SNL/NM for Calendar Year (CY) 2003. It also discusses Sandia Corporation's compliance with environmental statutes, regulations, DOE Orders, permit provisions, and highlights significant environmental program efforts and accomplishments. This ASER is a key component of the DOE's effort to keep the public informed about environmental conditions throughout the DOE/NNSA's Nuclear Weapons Complex.

Environmental Programs

Sandia Corporation's strategy for managing and implementing its Environment, Safety, and Health (ES&H) Program is described in the Integrated Safety Managment System (ISMS). The ISMS program is structured around five safety management functions and provides the processes to assist line management in identifying and controlling hazards. Further information about ISMS can be found in Chapter 8.

All 2003 program activities are performed continuously, but reported in this ASER on a CY basis, unless otherwise noted (programs based on the Fiscal Year (FY) run from October 1st through September 30th annually). The primary environmental programs in place at SNL/NM are summarized below.

Waste Management and Pollution Prevention (P2)

With hundreds of individual research laboratories, SNL/NM generates over 15,000 different waste streams. Waste at SNL/NM is processed at three facilities: the Hazardous Waste Management Facility (HWMF), the Radioactive and Mixed Waste Management Facility (RMWMF), and the Solid Waste Transfer Facility (SWTF). The focus of the P2 Program is to reduce resource use, generated waste, and enhance the overall efficiency of processes and organizations within SNL/NM. In 2003, SNL/NM received several awards for P2 accomplishments (see shaded box).

Environmental Restoration (ER) Project

The goal of finishing the ER Project by the end of FY 2006 continues, with a strong expectation of success. After over a year of negotiations, the New Mexico Environment Department (NMED), DOE and Sandia Corporation have agreed on the content of a Compliance Order on Consent. In addition to specifying milestones, schedules and explicit fines for non-compliance, the existence of the Order enhances the likelihood that funding for the project will be stable. During FY 2003, five sites were remediated and 15 sites were proposed for No Further Action (NFA). At the end of FY 2003, there were 125 sites remaining to be addressed at SNL/NM.

Terrestrial Surveillance

Soil, sediment, and vegetation are collected from on-site, perimeter, and off-site (community locations outside Kirtland Air Force Base [KAFB] boundaries) locations. The terrestrial surveillance sampling objectives are to detect any potential releases or migration of contaminated material to off-site locations. In 2003, there were no terrestrial sample results that indicated a significant level of concern that would trigger actions at locations that are not already being addressed by the ER Project.

Water Quality

- **Wastewater** – Wastewater from SNL/NM is discharged from five on-site outfalls permitted by the City of Albuquerque. Wastewater monitoring is conducted to ensure that all discharges meet the standards set by the City of Albuquerque's publicly-owned treatment works (POTW). All SNL/NM effluent discharge standards were within the City of Albuquerque's established limits except for one fluoride excursion in August of 2003. Equipment problems at one of the City of Albuquerque permitted stations resulted in data loss and a subsequent reportable occurrence for pH monitoring.

- **Surface Discharge** – All water to be discharged to the ground surface, either directly or to lined containments, must meet State of New Mexico surface discharge standards. There were eight requests made for individual discharges to the ground surface in 2003. In 2003, all requests met NMED New Mexico Water Quality Control Commission (NMWQCC) standards and were approved. Additionally, routine surface discharges are made to two evaporation lagoons servicing the Pulsed Power Facility under an existing discharge permit. All permit requirements for both lagoons were met in 2003. In 2003, there were six surface releases reported to NMED. There was no discernible impact to the environment due to any of these surface discharges.

- **Storm Water Runoff** – In FY 2003 analytical monitoring was not required under the National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit for Storm Water discharges. The NPDES permit requires quarterly analytical sampling to be conducted in the second and fourth year of the five year permit, weather permitting. FY 2003 is the third year of the permit. Visual sampling is required every year. No visual samples were collected for the 3rd and 4th quarter of FY 2003 due to the drought. For the samples collected during the 1st and 2nd quarter of FY 2003, no unusual characteristics were noted. The permit is due for renewal again in FY 2005.

Groundwater Protection

- **GWPP** – The GWPP conducts general surveillance of water quality from a network of wells not associated with the ER Project. Annual sampling was conducted in a total of 11 wells and one spring in FY 2003. Analysis was 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. All of the exceedences are attributed to naturally occurring sources.

- **ER** – The ER Project collects groundwater samples at six general project areas: the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), Technical Area V (TA-V), Tijeras Arroyo Groundwater (TAG), Canyons Area, and Drain and Septic Systems (DSS). Water quality results reported by the ER Project were consistent with past years' results.

Air Quality

- **Ambient Air Monitoring –** Sandia Corporation measures ambient air quality at five stations throughout SNL/NM and compares results with National Ambient Air Quality Standards (NAAQS) and local ambient air standards. The network monitors criteria pollutants and VOCs. There were no gaseous pollutant exceedances in 2003. Particulate matter (PM_{10}) short term exceedances were found during dust storms.

- **Air Quality Compliance –** The City of Albuquerque has yet to issue DOE a Title V Operating Permit for SNL/NM as required under the Clean Air Act Amendments (CAAA) of 1990; however, a synthetic minor permit application was submitted in 2003.

- **National Emission Standards for 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 2003, there were 18 SNL/NM facilities reporting NESHAP-regulated emissions. Of these 18 sources, 17 were point sources and one was a diffuse source. In 2003, the primary radionuclides released were tritium and argon-41. The results of the dose assessment showed that the on-site maximally exposed individual (MEI) received an effective dose equivalent (EDE) of 0.00219 millirem per year (mrem/yr). The off-site MEI received an EDE of 0.000872 mrem/yr. Both doses are well below the U.S. Environmental Protection Agency (EPA) standard of 10 mrem/yr.

National Environmental Policy Act (NEPA) Activities

During 2003, NEPA compliance activities at SNL/NM included support to DOE/NNSA/SSO for the completion of two environmental assessments (EAs); one for the Test Capabilities Revitalization (TCR) Program and one for the proposed Center for Integrated Nanotechnologies (CINT) to be built along Eubank Blvd, north of KAFB.

If you are interested in reading chapter highlights, a one-page summary is provided at the beginning of each chapter. All of the chapter summaries are placed in Chapter 10.

Employees conducting project review.

In this Chapter ...

Pinon Jay

Environmental Snapshot

- *The strongest winds occur in the spring when monthly wind speeds average 10.3 miles per hour (mph). Wind gusts can commonly reach up to 50 mph.*
- *The maximum elevation on KAFB is 7,986 feet.*

Chapter One

Introduction

Chapter Summary

This Annual Site Environmental Report (ASER) describes environmental protection programs currently in place at Sandia National Laboratories, New Mexico (SNL/NM). This report was prepared in accordance with the requirements set forth for all large U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) facilities and represents a key component of DOE's effort to keep the public informed about environmental conditions at DOE/NNSA sites.

SNL/NM is located on Kirtland Air Force Base (KAFB) in Albuquerque, New Mexico. The regional setting of SNL/NM provides a diverse range of geological, hydrological, climatic, and ecological settings. The Sandia Mountains, named for the watermelon color seen on the mountains at sunset, and the Manzanita Mountains both provide a beautiful setting at SNL/NM.

Sandia Corporation (a wholly-owned subsidiary of Lockheed Martin Corporation) continues to provide technological innovations since its inception in 1945. The mission of Sandia Corporation is to provide science and engineering support for the nuclear weapons stockpile and stewardship. Most of SNL/NM's activities are conducted within five technical areas (TAs) and several remote locations.

In support of Sandia Corporation's mission, Environment, Safety, and Health (ES&H) issues are addressed through environmental management (EM) programs. These programs include effluent monitoring, environmental surveillance, environmental restoration (ER), pollution prevention (P2), chemical inventory management, oil spill prevention, and quality assurance (QA).

View of the Sandia Mountains from SNL/NM

Chapter Two
Compliance Summary

In this Chapter ...

Electricity-powered trucks at SNL/NM

Environmental Snapshot

SNL/NM's Fleet Services recently purchased 10 new Ford Rangers that are powered by electricity in place of gasoline. These trucks will be used in normal daily routines much like their gasoline guzzling counterparts. Fleet Services plans to increase its number of electrically powered vehicles in the near future.

Chapter Summary

Sandia Corporation conducts operations based on environmental regulations, statutes, and U.S. Department of Energy (DOE) Orders. A variety of programs at Sandia National Laboratories, New Mexico (SNL/NM) work together to strive for 100 percent compliance with applicable regulations. As a part of these federal, state, and locally mandated regulations, SNL/NM adheres to strict reporting and permitting requirements. In 2003, there were no violations issued to SNL/NM.

External audits and appraisals are conducted at SNL/NM to identify issues that may arise from operations. SNL/NM also conducts internal audits and appraisals as a part of quality assurance (QA).

In 2003, there were six environmental releases reported to the New Mexico Environment Department (NMED). Two of these releases also met Occurrence Reporting and Processing System (ORPS) criteria as an occurrence. There were two City of Albuquerque wastewater reportable events. One of these met the ORPS criteria as an occurrence.

Snow Covered Sandia Mountains

In this Chapter ...

Environmental Management System (EMS)
ER Project
Waste Management
Waste Minimization and P2 Programs
Biological Control Activities
Oil Storage and Spill Control
NEPA Compliance Activities
Environmental Education Outreach Program

Collared Lizard

Environmental Snapshot

- *The Environmental Education Outreach Program participated in the following events in 2003:*

  The School to World Conference

  National Atomic Museum Clean Earth Club

  Dia del Rio at the Albuquerque Aquarium

  New Mexico Environmental Health Conference

- *Waste placement into the Corrective Action Management Unit (CAMU) was completed in March 2003, and the facility was closed in October 2003.*

Chapter Three

Environmental Programs Information

Chapter Summary

Sandia Corporation began environmental monitoring of Sandia National Laboratories, New Mexico (SNL/NM) in 1959. Since then, Sandia Corporation established programs in Environmental Restoration (ER), Waste Management, Biological Control, Pollution Prevention (P2), Oil Storage and Spill Control, the National Environmental Policy Act (NEPA), and Environmental Education Outreach. There are also a variety of surveillance and effluent monitoring programs that are discussed in subsequent chapters of this report.

Sandia Corporation continued forward with many environmental initiatives and accomplishments. The ER Program, with recycling initiatives in place, actively remediated five sites in 2003. In anticipation of the closure of the ER Program in 2006, Sandia Corporation and the U.S. Department of Energy (DOE) worked with the public and key stakeholders to develop a draft Long-Term Environmental Stewardship (LTES) Plan (DOE/SNL 2001) to address future environmental responsibilities. A follow-on plan, which will include implementation activities, will be developed by Sandia Corporation and made available for public review. The plan is scheduled for completion in 2006.

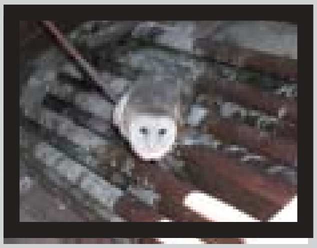
SNL/NM has been recognized for various P2 awards including the U.S. Environmental Protection Agency's (EPA) "2003 Waste-Wise Federal Government Honorable Mention" award.

In 2003, SNL/NM received the following awards:

- The "White House Closing the Circle Award" for success in "Sustainability in SNL Buildings"
- The New Mexico Green Zia Award
- Three DOE P2 Awards

Demonstration of the groundwater model at the 2003 Dia del Rio event at the Albuquerque Biopark.

In this Chapter ...



Barn Owl at SNL/NM

Environmental Snapshot

- *Due to the continuing drought, many of the soil samples collected at SNL/NM had a low moisture content that made meaningful soil moisture measurements difficult.*

- *An objective of the Ecological Surveillance Program is to collect information on plant and animal species present to further the understanding of ecological resources on-site.*

- ***Radiological Results:** The results of the statistical analysis showed no on-site or perimeter soil, sediment, or vegetation locations that were both higher than off-site and with an increasing trend (Priority-1).*

- ***Non-Radiological Results:** One perimeter sampling location for soil (Iron) was noted to be Priority 1 (higher than off-site with an increasing trend). However, the concentrations observed at this location are well within the range of background for surface soils in New Mexico.*

Chapter Four
Terrestrial and Ecological Surveillance

Chapter Summary

Terrestrial and ecological surveillance are conducted at Sandia National Laboratories, New Mexico (SNL/NM) to detect the possible 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 to detect if radiological and non-radiological constituents are present.

In 2003, soil samples were collected from 52 locations, sediment samples were collected from ten locations, and vegetation samples were collected from 17 locations.

Radiological parameters include gamma-emitting radionuclides, tritium (H^3) radioisotopes, and uranium. Non-radiological parameters include metals such as aluminum, iron, silver, and zinc.

Employees Performing Terrestrial Surveillance at an Off-site Location for SNL/NM

In this Chapter ...

Tritium Bubbler Monitor

Environmental Snapshot

- *The Albuquerque regional collective population dose in 2003 was 0.0949 person-rem/yr. For the purpose of calculating the collective dose, all releases 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.*

Chapter Five

Air Quality Compliance and Meteorological Monitoring

Chapter Summary

Sandia National Laboratories, New Mexico (SNL/NM) conducts air quality monitoring and surveillance under three programs: (1) the Clean Air Network (CAN) Program, (2) the National Emission Standards for Hazardous Air Pollutants (NESHAP) Program, and (3) the Air Quality Compliance (AQC) Program.

In 2003, data was collected from eight meteorological towers located throughout Kirtland Air Force Base (KAFB). The data collected from the meteorological towers provided air dispersion and transport modeling information. The ambient air surveillance data is utilized to establish background concentration levels for pollutants of concern and evaluate potential effects of Sandia Corporation's operations on air quality.

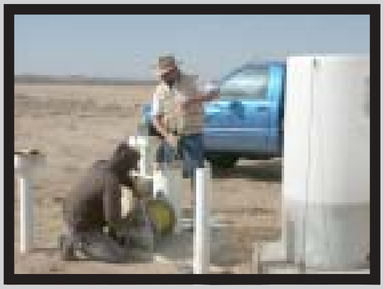
The NESHAP Program monitors radionuclide air emissions at 18 facilities (17 point and one diffuse emission sources). As required by the U.S. Environmental Protection Agency (EPA), the NESHAP Program must assess the dose to the maximally exposed individual (MEI) for radionuclide air emissions.

In 2003, the New Mexico Small Business Assistance (NMSBA) Program, which is managed by SNL/NM, continued assisting a Las Cruces, New Mexico cotton gin cooperative in reaching compliance with air quality requirements.

Meteorological Tower at SNL/NM

In this Chapter ...

Wastewater Discharge Program
Surface Discharge Program
Storm Water Program



Groundwater Measurements

Environmental Snapshot

- *Sandia Corporation received five "Gold Pre-treatment Awards" from the City of Albuquerque for 100 percent compliance to discharge limits set in permits during the 2002-2003 reporting year (November 2002 to November 2003).*
- *SNL/NM reduced its toxic discharges by implementing Toxic Organic Management Plans (TOMPs) and general good housekeeping and engineering practices.*
- *Due to the continuing drought, visual samples were only collected in the 1st and 2nd quarters of 2003.*

Chapter Six

Wastewater, Surface Discharge, and Storm Water Monitoring Programs

Chapter Summary

Sandia National Laboratories, New Mexico (SNL/NM) conducts effluent monitoring through wastewater, surface water, and storm water monitoring and surveillance programs.

The Wastewater Discharge Program currently monitors both sanitary discharges and industrial discharges at five on-site wastewater outfalls that are permitted by the City of Albuquerque. In 2003, there were two wastewater events reported to the City of Albuquerque.

Surface discharges are monitored through an approval and permitting process by the Surface Discharge Program as a domestic potable water source. The Surface Discharge Program also tracks and reports any accidental surface releases or spills. In 2003, six surface discharge releases were reported to the New Mexico Environment Department (NMED). There were eight internal surface discharge requests made and approved after verification that state standards were met.

The Storm Water Program monitors storm water runoff at nine stations throughout SNL/NM. The program strives to maintain compliance with the National Pollutant Discharge Elimination System (NPDES) and protects "Waters of the U.S." At SNL/NM, Tijeras Arroyo is defined as a "Water of the U.S." In 2003, six storm water construction permits were in effect.

Crews repair water line break at SNL/NM

In this chapter ...

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

Groundwater Sampling at SNL/NM

Environmental Snapshot

- *The ER Project and the GWPP sampled 71 groundwater monitoring wells in Fiscal Year (FY) 2003.*

- *Water levels are measured at SNL/NM as a means to assess the physical changes of the groundwater system over time. This included changes in the local water table, the quantity of water available, as well as the direction and speed of groundwater movement.*

Chapter 7 Groundwater Programs

Chapter Summary

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.

The GWPP establishes baseline water quality and groundwater flow information, determines if any impact from SNL/NM operations is affecting the quality of groundwater, and maintains compliance with local, state, and federal regulations. Groundwater sampling is conducted at various locations. The samples are analyzed for a variety of constituents, including Volatile Organic Compounds (VOCs), metals, and radionuclides. Results are described in subsequent sections of this chapter.

The ER Project conducts groundwater monitoring in six project areas. These areas include the Chemical Waste Landfill (CWL), the Mixed Waste Landfill (MWL), Technical Area V (TA-V), Tijeras Arroyo Groundwater (TAG) Investigation, Canyons Area, and Drain and Septic Systems (DSS). The New Mexico Environment Department (NMED) provides oversight for these monitoring activities.

The ER Project utilized the Vapor Extraction Project (VEP) to remove VOCs from the groundwater and vadose zone at the CWL in 1996. This method was effective in the reduction of the concentration of trichloroethene (TCE) in groundwater systems to below the drinking water maximum contaminant level (MCL).

Installation of Groundwater Monitoring Well at SNL/NM

In this Chapter ...

Corporate Level QA
Environmental Program QA
Environmental Sampling and Analysis
2003 SMO Activities

Caterpillar at SNL/NM

Environmental Snapshot

- *The Department of Energy Consolidate Audit Program (DOECAP), conducted audits in 2003 at the primary SMO contract laboratories. In 2003, no priority one findings that impacted SMP work were documented during the audits.*
- *The SMO processed 10,551 samples in 2003. Of those, 2,235 samples were for environmental monitoring and surveillance projects.*
- *Field Analytical Quality Control (QC) samples totalled 1,379 in 2003. Of those, 485 were for environmental monitoring and surveillance projects.*

Chapter Eight
Quality Assurance

Chapter Summary

Quality Assurance (QA) principals, elements, and tools are an integral part of Sandia National Laboratories, New Mexico (SNL/NM) activities to assure management, customers, regulators, and the community that SNL/NM is conducting business in a compliant manner, with respect for our employees, the community, and the environment. One of the QA principles used by SNL/NM is the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) Integrated Safety Management System (ISMS) to ensure that work is planned, hazards are analyzed and controlled, work is performed according to approved plans, and lessons learned are communicated. ISMS is a process that continually improves operations and performance.

Environmental programs utilize QA principles to maintain the integrity of program plans, sampling, and analysis. The Sample Management Office (SMO) helps provide environmental programs with guidance and sample management support. The SMO works to ensure that contractor laboratories provide the quality data and labaroratory analysis through validation of laboratory data packets and by conducting audits of contractor laboratories. QA plans ensure that data validation and records management are a key asset to providing quality environmental data.

Bee Relocation Operation at SNL/NM

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APPENDIX A

2003 Wastewater Monitoring Results

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CONTENTS

TABLES

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TABLE A-1. Permitted Sanitary Outfalls, March 2003

(All Results in milligrams per liter [mg/L] unless otherwise noted.)

Permit Number: Station: Date Collected: Sample ID:	2069-A WW001 3/4/2003 061177	2069F-4 WW006 3/4/2003 061178	2069G-2 WW007 3/4/2003 061179	2069I-3 WW008 3/4/2003 061180	2069K WW011 3/5/2003 061181	Regulatory Limit COA (mg/L)
Analyte						
Aluminum	0.143 B	0.351 BJ	0.106 B	0.223 B	0.358 B	900
Arsenic	0.0109	0.0118	0.00258 J	0.0112	0.0107	0.051
Boron	0.163	0.267	0.0126 J	0.0966	0.164	NE
Cadmium	0.000335 J	0.000594 J	0.000463 J	0.000313 U	0.000471 J	0.5
Chromium	0.00281 J	0.00225 J	0.00164 J	0.00278 J	0.0122	4.1
Copper	0.0817	0.0203	0.00188 J	0.0197	0.0817	5.3
Fluoride	0.761	0.719	8.71	5.51	0.481	36
Lead	0.00175 J	0.00172 U	0.00172 U	0.00172 U	0.00172 U	1
Molybdenum	0.328	0.0403	0.00715 J	0.0383	0.0115	2
Nickel	0.00239 J	0.00301 J	0.000802 J	0.00317 J	0.00839	2
Selenium	0.00281 U	0.00281 U	0.00281 U	0.00281 U	0.0032 J	0.46
Silver	0.00304 BJ	0.0184 B	0.00145 BJ	0.00205 BJ	0.00231 BJ	5
Zinc	0.0764	0.0602	0.00225 J	0.0956	0.477	2.2

Permit Number: Station: Date Collected: Sample ID:	2069-A WW001 3/5/2003 061183	2069F-4 WW006 3/5/2003 061184	2069G-2 WW007 3/5/2003 061185	2069I-3 WW008 3/5/2003 061186	2069K WW011 3/6/2003 061187	Regulatory Limit COA (mg/L)
Analyte						
Aluminum	0.112 B	0.249 B	0.0568 BJ	0.201 B	0.175 B	900
Arsenic	0.00897	0.0217	0.00225 J	0.0103	0.00876	0.051
Boron	0.126	0.259	0.0146 J	0.0873	0.144	
Cadmium	0.000313 U	0.000313 U	0.000313 U	0.000313 U	0.000386 J	0.5
Chromium	0.00305 J	0.0272	0.00247 J	0.00299 J	0.00452 J	4.1
Copper	0.0392	0.0156	0.00245 J	0.0221	0.0748	5.3
Fluoride	0.757	0.695	9.1	5.82	0.482	36
Lead	0.00172 U	0.104	0.00172 U	0.00172 U	0.00276 J	1
Molybdenum	0.117	0.0989	0.00678 J	0.0397	0.0192	2
Nickel	0.00243 J	0.00238	0.000938 J	0.00363 J	0.00509	2
Selenium	0.00281 U	0.00281 U	0.00281 U	0.00281 U	0.00281 U	0.46
Silver	0.00363 BJ	0.00249	0.00153 BJ	0.000973 BJ	0.00176 BJ	5
Zinc	0.0652	0.114	0.0025 J	0.0888	0.222	2.2

Permit Number: Station: Date Collected: Sample ID:	2069-A WW001 3/10/2003 061417	2069F-4 WW006 3/4/2003 061418	2069G-2 WW007 3/5/2003 061419	2069I-3 WW008 3/3/2003 061420	2069K WW011 -- --	Regulatory Limit COA (mg/L)
Analyte						
Cyanide, Total	0.00576	0.0032 J	0.00172 U	0.00277 J	--	0.45

NOTES: COA = City of Albuquerque

"—" = not applicable.

J = Estimated value, the analyte concentration fell above the effective (MDL) minimum detection limit and below the effective (PQL) practical quantitation limit.

U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).

NE = not established.

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TABLE A-2. Summary of Sanitary Outfalls of Radiological Analyses, March 2003

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit No:	2069-A			2069F-4			2069I-3			2069-K			Regulatory Limit 10 CFR 20
Station:	WW001			WW006			WW008			WW011			
Date Collected:	3/4/2003			3/4/2003			3/4/2003			3/5/2003			
Sample ID :	061177			061178			061180			061181			
Analyte	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	
Actinium-228	12.9 ± 7.25	UX	13.6	2.77 ± 15.6	U	13.9	1.26 ± 12.1	U	11.8	12.4 ± 7.21	U	13.7	300,000
Americium-241	-1.09 ± 8.1	U	14.5	6.12 ± 9.56	U	15.4	-1.86 ± 12.8	U	19.3	-4.64 ± 8.4	U	14.5	200
Antimony-124	0.751 ± 1.74	U	3.17	-1.05 ± 2.02	U	3.37	-0.223 ± 1.66	U	2.92	1.6 ± 1.99	U	3.53	NE
Antimony-125	-1.55 ± 4.5	U	7.43	1.9 ± 4.79	U	8.52	0.306 ± 4.39	U	7.41	-0.496 ± 4.79	U	8.34	NE
Barium-133	-0.507 ± 2.31	U	3.44	-4.06 ± 2.39	U	3.83	-0.721 ± 2.06	U	3.43	0.409 ± 2.51	U	3.94	NE
Beryllium-7	9.27 ± 13.3	U	24.6	-5.28 ± 16.2	U	27.7	0.0132 ± 12.9	U	23.1	-3.17 ± 15.2	U	26.2	NE
Bismuth-211	5.63 ± 22	U	15.6	0 ± 11.9	UX	21.8	0 ± 10.1	UX	17.9	7.57 ± 28.3	U	18.5	NE
Bismuth-212	9.96 ± 12.9	U	23.8	0 ± 14.2	UX	26	8.12 ± 11.5	U	21.2	4.97 ± 13.9	U	24.4	NE
Bismuth-214	2.87 ± 9.31	U	7.27	0 ± 7.98	UX	8.1	0 ± 3.65	UX	6.81	0 ± 7.43	UX	7.9	NE
Cadmium-109	8.7 ± 34	U	60.5	27.3 ± 38.7	U	68.1	-26.5 ± 37.8	U	59.7	3.04 ± 37.9	U	66	NE
Cerium-139	-1.25 ± 1.39	U	2.33	-0.18 ± 1.71	U	2.87	0.405 ± 1.25	U	2.21	-0.455 ± 1.6	U	2.68	NE
Cerium-141	3.58 ± 3.38	UX	4.27	0.607 ± 3.45	U	5.89	-0.0114 ± 2.51	U	4.43	2.08 ± 3.02	U	5.21	NE
Cerium-144	3.51 ± 9.71	U	17.1	-6.82 ± 11.2	U	18.8	4.18 ± 8.88	U	15.9	-1.37 ± 11.4	U	19.4	30,000
Cesium-134	0.865 ± 1.82	U	2.93	1.09 ± 1.78	U	3.14	-0.686 ± 1.52	U	2.64	0.203 ± 1.84	U	3.18	9,000
Cesium-137	0.157 ± 1.53	U	2.77	0.0304 ± 1.91	U	3.28	0.348 ± 4.33	U	2.75	-0.8 ± 1.82	U	3.04	10,000
Chromium-51	0.573 ± 15.6	U	26.6	10.3 ± 18.9	U	33.9	6.96 ± 14.7	U	25.4	8.21 ± 16.6	U	29.8	5,000,000
Cobalt-57	-0.414 ± 1.2	U	2.08	0.408 ± 1.43	U	2.47	0.121 ± 1.15	U	2.05	2.44 ± 2.43		2.4	NE
Cobalt-60	0.512 ± 1.85	U	3.48	-1.54 ± 1.85	U	3.02	-1.6 ± 1.62	U	2.71	0.898 ± 2.1	U	3.83	30,000
Europium-152	-0.558 ± 5.06	U	7.59	1.16 ± 4.91	U	8.74	-1.48 ± 4.61	U	7.73	2.28 ± 5	U	8.95	NE
Europium-154	0.827 ± 4.73	U	8.89	-4.32 ± 6.09	U	10.1	-1.49 ± 4.27	U	7.61	-0.74 ± 5.32	U	9.33	NE
Gross Alpha	3.43 ± 1.68		2.26	8.07 ± 4.81		6.7	4.94 ± 1.58		1.87	3.76 ± 1.28		1.31	NE
Gross Beta	32.5 ± 5.06		6.47	55.9 ± 11.2		15.4	14.8 ± 3.29		5	30.4 ± 5.02		4.71	NE
Iron-59	5.2 ± 5.09	U	5.9	0.226 ± 3.96	U	7.09	-2.74 ± 3.78	U	5.22	-0.353 ± 3.52	U	6.25	100,000
Lead-211	5.78 ± 45	U	76.1	13.3 ± 48.1	U	84.1	-10.1 ± 41.2	U	68	-23.1 ± 47.5	U	78	NE
Lead-212	9.32 ± 3.15	X	5.55	1.67 ± 6.91	U	5.34	0 ± 6.49	UX	4.19	2.02 ± 5.98	U	6.1	20,000
Lead-214	1.96 ± 7.65	U	6.87	0 ± 4.19	UX	7.6	0 ± 3.63	UX	6.39	2.63 ± 9.83	U	7.57	1,000,000
Manganese-54	1.22 ± 1.64	U	3.03	0.636 ± 1.7	U	3.12	0.147 ± 1.58	U	2.78	-0.898 ± 1.74	U	3.03	NE
Mercury-203	1.05 ± 1.77	U	3.07	-0.424 ± 2.04	U	3.6	-0.139 ± 1.69	U	2.89	-0.292 ± 1.84	U	3.26	NE
Neptunium-237	9.38 ± 10.6	UX	18.8	6.47 ± 11.9	U	20.7	1.32 ± 11.7	U	19.1	-7.36 ± 11.9	U	20.1	NE
Neptunium-239	-1.81 ± 9.16	U	16	0 ± 10.9	UX	19.1	0.724 ± 8.57	U	15.3	-9.03 ± 12.2	U	18.3	NE
Niobium-95	-0.531 ± 1.82	U	3.17	-2.46 ± 2.21	U	3.72	0.397 ± 1.78	U	3.17	1.25 ± 1.92	U	3.57	NE

See notes at end of table.

TABLE A-2. Summary of Sanitary Outfalls of Radiological Analyses, March 2003 (concluded)

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit No:	2069-A			2069F-4			2069I-3			2069-K			Regulatory Limit 10 CFR 20
Station:	WW001			WW006			WW008			WW011			
Date Collected:	3/4/2003			3/4/2003			3/4/2003			3/5/2003			
Sample ID :	061177			061178			061180			061181			
Analyte	Activity		MDA	Activity		MDA	Activity		MDA	Activity		MDA	
Potassium-40	57.2 ± 48.6		27.3	0 ± 26	UX	51.3	81.9 ± 52.2		27.2	11.4 ± 53	U	32.3	40,000
Protactinium-231	-25.3 ± 71.6	U	120	23.5 ± 81.1	U	145	36 ± 67.9	U	119	51.7 ± 77.9	U	141	NE
Protactinium-233	0.664 ± 3.1	U	5.32	-0.993 ± 3.37	U	5.91	1.11 ± 3.07	U	5.31	-0.582 ± 3.38	U	5.96	NE
Protactinium-234	1.76 ± 13.7	U	24.4	-0.648 ± 13.2	U	23.7	-2.01 ± 11.8	U	20.5	-0.373 ± 14.1	U	25.3	NE
Radium-223	-15 ± 30.9	U	51.3	-2.68 ± 33.9	U	59.8	-1.04 ± 31	U	52.6	-25.7 ± 34.9	U	59.6	NE
Radium-224	-85.1 ± 34.9	U	53.3	0 ± 39.2	UX	61.1	0 ± 73.2	UX	47.3	22.8 ± 67.5	U	59.8	NE
Radium-226	2.87 ± 9.31	U	5.82	0 ± 7.98	UX	8.1	0 ± 3.65	UX	6.81	3.97 ± 7.43	U	6.37	600
Radium-228	12.9 ± 7.25	UX	13.6	2.77 ± 15.6	U	13.9	1.26 ± 12.1	U	11.8	0 ± 7.21	UX	13.7	600
Radon-219	-6.8 ± 19.8	U	32.9	-3.04 ± 20.6	U	35.9	8.01 ± 19.1	U	32.8	12.6 ± 19.7	U	35.4	NE
Rhodium-106	7.74 ± 14.6	U	26.8	-8.78 ± 16.6	U	27.7	-3.87 ± 13.7	U	24	13.7 ± 16.9	U	30.3	NE
Ruthenium-103	2.93 ± 2.91	X	2.87	-0.352 ± 2.02	U	3.48	0.153 ± 1.6	U	2.88	-1.2 ± 1.93	U	3.25	300,000
Ruthenium-106	6.05 ± 14.8	U	26.9	-2.9 ± 16.5	U	28.1	-6.4 ± 13.8	U	23.9	4.04 ± 17.1	U	29.7	30,000
Selenium-75	0.478 ± 1.98	U	3.41	-1.75 ± 2.54	U	4.1	-2.38 ± 1.98	U	3.22	-1.55 ± 2.69	U	3.84	NE
Sodium-22	0.302 ± 1.69	U	3.18	-1.53 ± 2.17	U	3.62	-0.53 ± 1.53	U	2.72	-0.274 ± 1.9	U	3.33	NE
Strontium-85	-16.3 ± 3	U	3.58	-13 ± 3.26	U	4.47	9.42 ± 2.11	X	3.66	0 ± 2.52	UX	4.43	NE
Thallium-208	0.787 ± 3.43	U	3.6	0 ± 4.04	UX	3.8	2.75 ± 1.71	UX	3.21	0 ± 2	UX	3.7	NE
Thorium-227	-11.8 ± 18.5	U	30.6	-10.6 ± 21.9	U	35.6	-7.55 ± 18	U	30.5	-12.1 ± 21.7	U	35.1	NE
Thorium-231	0.422 ± 8.55	U	14.6	-1.08 ± 9.64	U	17.1	6.79 ± 8.55	U	15	3.44 ± 10.7	U	17.1	300
Thorium-232	9.18 ± 3.11	X	5.49	1.65 ± 6.82	U	5.27	2.76 ± 6.43	UX	4.15	2.01 ± 5.93	U	6.04	500,000
Thorium-234	4.4 ± 134	U	115	0 ± 88.5	UX	136	247 ± 256	X	156	0.55 ± 150	U	136	50,000
Tin-113	1.33 ± 2.12	U	3.67	-0.813 ± 2.17	U	3.77	-0.135 ± 1.98	U	3.34	1.08 ± 2.12	U	3.8	NE
Tritium	26.8 ± 90.9	U	158	26.8 ± 90.9	U	158	0 ± 90.7	U	160	0 ± 89.8	U	159	10,000,000
Uranium-235	13.6 ± 13	UX	17.8	0 ± 12.1	UX	20.8	13.2 ± 9.85	UX	17.5	5.36 ± 11.8	U	20.2	3,000
Uranium-238	4.4 ± 134	U	115	171 ± 88.5		136	247 ± 256	X	156	0.55 ± 150	U	118	3,000
Yttrium-88	-0.386 ± 2.04	U	3.66	-0.0905 ± 2.01	U	3.68	-0.791 ± 1.73	U	2.97	1.03 ± 1.97	U	3.81	100,000
Zinc-65	-1.17 ± 3.69	U	6.31	1.72 ± 4.55	U	7.26	0.377 ± 3.78	U	6.55	-1.08 ± 3.96	U	6.9	NE
Zirconium-95	-1.65 ± 2.85	U	4.88	0.147 ± 3.26	U	5.9	1.05 ± 5.79	U	5.12	0.807 ± 3.11	U	5.69	200,000

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less

than the effective (MDL) minimum detection limits. For radiochemical analytes the result is less than the decision level.

X = Presumptive evidence analyte is not present.

NE = not established

MDA = minimum detectable activity

CFR = Code of Federal Regulations

TABLE A-3. Permitted Sanitary Outfalls, September 2003
(All Results in milligrams per liter [mg/L] unless otherwise noted.)

Permit Number:	2069-A		2069F-4		2069G-2		2069I-3		2069K		Regulatory Limit
Station:	WW001		WW006		WW007		WW008		WW011		COA
Date Collected:	9/4/2003		9/4/2003		9/4/2003		9/4/2003		9/4/2003		(mg/L)
Sample ID:	062828		062829		062830		062831		062832		
Analyte											
Aluminum	0.221		0.116		0.0995	J	0.132		0.109		900
Arsenic	0.0246		0.0154		0.00466	J	0.0149		0.00978		0.051
Boron	0.203		0.208		0.0212	J	0.162		0.157		NE
Cadmium	0.00103	J	0.000688	J	0.000313	U	0.000654	J	0.000313	U	0.5
Chromium	0.00344	J	0.00098	J	0.000503	U	0.00174	J	0.00136	J	4.1
Copper	0.0418		0.0176		0.0112		0.0223		0.0266		5.3
Lead	0.00172	U	0.00172	U	0.00172	U	0.00809		0.00172	U	1
Molybdenum	0.291		0.154		0.00518	J	0.064		0.0987		2
Nickel	0.00352	J	0.00165	J	0.00227	J	0.00404	J	0.00361	J	2
Selenium	0.00281	U	0.00332	J	0.00281	U	0.00296	J	0.00281	U	0.46
Silver	0.000835	U	0.0013	J	0.000835	U	0.000835	U	0.000835	U	5
Zinc	0.0818		0.0326		0.00103	J	0.052		0.0862		2.2

Permit Number:	2069-A		2069F-4		2069G-2		2069I-3		2069K		Regulatory Limit
Station:	WW001		WW006		WW007		WW008		WW011		COA
Date Collected:	9/5/2003		9/5/2003		9/5/2003		9/5/2003		9/5/2003		(mg/L)
Sample ID:	062833		062834		062835		062836		062837		
Analyte											
Aluminum	0.0493	J	0.155		0.948		0.354		0.0337	J	900
Arsenic	0.019		0.0157		0.00224	U	0.0166		0.0128		0.051
Boron	0.203		0.238		0.0231	J	0.141		0.16		NE
Cadmium	0.000313	U	0.000313	U	0.000313	U	0.000313	U	0.000359	J	0.5
Chromium	0.0013	J	0.0011	J	0.000503	U	0.00191	J	0.0013	J	4.1
Copper	0.032		0.0209		0.0106		0.0147		0.0189		5.3
Lead	0.00172	U	0.00172	U	0.00172	U	0.00172	U	0.00172	U	1
Molybdenum	0.282		0.118		0.00584	J	0.0573		0.0649		2
Nickel	0.00119	J	0.00211	J	0.00069	U	0.00193	J	0.00238	J	2
Selenium	0.00281	U	0.00281	U	0.00281	U	0.00281	U	0.00281	U	0.46
Silver	0.000891	J	0.000835	U	0.000835	U	0.000835	U	0.000835	U	5
Zinc	0.0334		0.0443		0.00156	J	0.0219		0.0396		2.2

Permit Number:	2069-A		2069F-4		2069G-2		2069I-3		2069K		Regulatory Limit
Station:	WW001		WW006		WW007		WW008		WW011		COA
Date Collected:	--		9/3/2003		9/4/2003		9/3/2003		--		(mg/L)
Sample ID:	--		062839		062840		092841		--		
Analyte											
Cyanide, Total	--		0.00623		0.00172	U	0.00648		--		0.45

NOTES: COA = City of Albuquerque
"—" = Not applicable
J = Estimated value, the analyte concentration fell above the effective (MDL) minimum detection limits and below the effective (PQL) practical quantitation limit.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective (MDL) minimum detection limits. For radiochemical analytes the result is less than the decision level.
B = The analyte was found in the blank above the effective (MDL) minimum detection limits (organics), or the effective (PQL) practical quantitation limit (inorganics).
NE = not established

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TABLE A-4. Summary of Sanitary Outfalls of Radiological Analyses, September 2003
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit No:	2069-A			2069F-4			2069I-3			2069-K			
Station:	WW001			WW006			WW008			WW011			Regulatory
Date Collected:	9/4/2003			9/4/2003			9/4/2003			9/4/2003			Limit
Sample ID :	062828			062829			062831			062832			10 CFR 20
Analyte	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	
Actinium-228	0.663 ± 12.6	U	11	0 ± 13.2	UX	12.2	0 ± 9.26	UX	17	4.13 ± 15.1	U	13.7	300,000
Americium-241	4.89 ± 8.12	U	14	-1.06 ± 11.8	U	19.5	0 ± 2.58	UX	4.54	-1.13 ± 8.04	U	13	200
Antimony-124	1.24 ± 1.95	U	3.44	-1.31 ± 1.7	U	2.91	-0.585 ± 2.31	U	4.09	-0.129 ± 2.13	U	3.29	NE
Antimony-125	0 ± 5.5	UX	7.53	-0.602 ± 4.14	U	6.92	-0.615 ± 4.99	U	8.5	1.79 ± 4.15	U	7.58	NE
Barium-133	-0.0184 ± 2.23	U	3.44	0.937 ± 2.11	U	3.27	1.07 ± 2.38	U	3.77	-1.47 ± 2.33	U	3.33	NE
Beryllium-7	4.63 ± 15.7	U	27.6	4.21 ± 14.4	U	26.2	-10.1 ± 18.5	U	30.5	0.4 ± 14.6	U	26.1	NE
Bismuth-211	0 ± 20.2	UX	16.7	0 ± 22.3	UX	15.7	0 ± 26.5	UX	17.2	0 ± 23.4	UX	16.8	NE
Bismuth-212	2.62 ± 12.9	U	22.5	3.52 ± 11.7	U	21.1	11.2 ± 17.3	U	31.7	17.5 ± 24.4	U	21.5	NE
Bismuth-214	0 ± 3.84	UX	6.96	1.68 ± 8.78	U	7.21	0 ± 9.9	UX	8.98	0 ± 7.8	UX	8.3	NE
Cadmium-109	23 ± 36.9	U	63.1	-1.63 ± 37.4	U	60.7	0.722 ± 43.1	U	43.9	0 ± 32.9	UX	59.7	0
Cerium-139	-0.326 ± 1.53	U	2.52	-0.951 ± 1.32	U	2.26	0.759 ± 1.5	U	2.28	1.82 ± 1.52	U	2.26	NE
Cerium-141	0 ± 3.38	UX	5.74	-0.286 ± 3.13	U	4.96	-6.67 ± 3.2	U	4.75	0 ± 6.23	UX	5.15	NE
Cerium-144	-3.78 ± 10.5	U	17.4	-5.45 ± 8.97	U	15.5	2.02 ± 9.14	U	15.2	-2.43 ± 9.66	U	16.8	30,000
Cesium-134	-1.56 ± 1.68	U	2.77	0.0689 ± 1.58	U	2.49	-1.66 ± 2.23	U	3.35	-1.53 ± 1.81	U	2.62	9,000
Cesium-137	-1.41 ± 1.65	U	2.71	0 ± 2.15	UX	4.07	-0.169 ± 2.16	U	3.84	-0.289 ± 1.9	U	2.9	10,000
Chromium-51	16.3 ± 19.1	U	34.2	-3.48 ± 18.2	U	30.7	-19.5 ± 19.2	U	31.9	-8.87 ± 19.9	U	32.9	5,000,000
Cobalt-57	-0.114 ± 1.33	U	2.22	0.528 ± 1.18	U	2.12	-0.282 ± 1.13	U	1.85	-0.852 ± 1.21	U	2.07	NE
Cobalt-60	0 ± 4.49	UX	3.28	-0.443 ± 1.66	U	2.96	1.06 ± 2.3	U	4.33	1.16 ± 4.57	U	3.21	30,000
Europium-152	1.06 ± 4.58	U	8.09	-1.63 ± 4.27	U	7.14	4.25 ± 4.97	U	8.86	-4.12 ± 4.83	U	7.79	NE
Europium-154	2.82 ± 4.44	U	8.39	-2.08 ± 4.75	U	8.36	0.624 ± 6.05	U	11.2	-1.2 ± 5.01	U	8.92	NE
Gross Alpha	4.43 ± 1.6		1.86	3.52 ± 1.25		1.53	2.68 ± 1.75	U	2.75	2.7 ± 0.859		0.858	NE
Gross Beta	23.1 ± 3.11		4.17	31.8 ± 2.71		2.67	14.1 ± 1.99		2.59	23.5 ± 2.43		2.76	NE
Iron-59	0.917 ± 3.72	U	6.81	-0.684 ± 3.72	U	6.36	0.663 ± 5.42	U	9.49	-0.831 ± 3.82	U	6.87	100,000
Lead-211	9.14 ± 42.4	U	74.1	12.1 ± 42.1	U	70.9	16.1 ± 48.2	U	82.4	-30.5 ± 45.2	U	71.7	0
Lead-212	3.33 ± 6.71	U	4.6	1.27 ± 5.68	U	5.35	2.09 ± 6.81	U	4.57	1.05 ± 4.75	U	5.64	20,000
Lead-214	0 ± 7.04	UX	6.98	0 ± 7.77	UX	6.73	3.71 ± 9.23	U	6.1	0 ± 8.15	UX	6.97	1,000,000
Manganese-54	0.354 ± 1.56	U	2.72	0 ± 2.74	UX	2.75	1.21 ± 2.22	U	4.03	-1.2 ± 1.67	U	2.76	NE
Mercury-203	-1.09 ± 1.91	U	3.3	-0.307 ± 1.81	U	3.09	1.07 ± 1.99	U	3.54	0 ± 2.14	UX	3.74	NE
Neptunium-237	6.38 ± 11.2	U	19.1	-12.4 ± 12.2	U	18.6	0.212 ± 12.6	U	13.1	-4.7 ± 10.1	U	17.5	0
Neptunium-239	-3.9 ± 9.72	U	16.1	-2.11 ± 8.6	U	15.2	-2.83 ± 8.11	U	13.3	-6.24 ± 8.73	U	15	0
Niobium-95	0 ± 3.22	UX	3.72	-1.45 ± 2.09	U	3.51	-1 ± 2.97	U	5.16	-0.692 ± 2.18	U	3.75	NE
Potassium-40	5.19 ± 37.6	U	19.9	55.1 ± 48		26.4	8.33 ± 49.1	U	45.1	29 ± 43	U	34.1	40,000
Protactinium-231	42.7 ± 71.6	U	128	18.6 ± 68.5	U	119	8.46 ± 71.3	U	126	16.1 ± 73.7	U	126	NE
Protactinium-233	-1.84 ± 3.05	U	5.25	1.46 ± 3.01	U	5.23	1.47 ± 3.14	U	5.57	0.666 ± 3.15	U	5.36	0
Protactinium-234	0 ± 14.1	UX	23.7	-4.15 ± 12	U	20.4	1.7 ± 19.2	U	33.7	4.61 ± 9.25	U	22.3	0
Radium-223	-7.18 ± 31.2	U	54.4	-21.4 ± 31.4	U	51.5	7.63 ± 32.9	U	57.6	-11.4 ± 31.8	U	52.8	NE
Radium-224	0 ± 35.3	UX	57.1	0 ± 32.4	UX	51.9	0 ± 31.5	UX	51.9	19.7 ± 35.6	U	55.3	NE
Radium-226	0 ± 3.84	UX	6.96	1.68 ± 8.78	U	5.2	7.62 ± 9.9		6.98	8.12 ± 7.8		5.31	600
Radium-228	0.663 ± 12.6	U	11	0 ± 13.2	UX	12.2	0 ± 9.26	UX	17	4.13 ± 15.1	U	13.7	600
Radon-219	-1.32 ± 18.7	U	32.7	0.108 ± 17.8	U	30.1	-10.4 ± 21.6	U	36.1	4.92 ± 18.1	U	32.9	NE
Rhodium-106	-3.77 ± 14.8	U	25.3	5.27 ± 13.9	U	25.1	-12.6 ± 18.9	U	32.8	5.36 ± 14.4	U	25.9	0
Ruthenium-103	-0.102 ± 2.06	U	3.57	-0.921 ± 1.82	U	3.2	-1.37 ± 2.56	U	4.21	-0.18 ± 1.96	U	3.48	300,000
Ruthenium-106	-5.08 ± 14.9	U	25.3	-1.45 ± 13.8	U	24.5	-13.8 ± 19	U	32.8	3.45 ± 14.6	U	26.1	30,000
Selenium-75	-0.915 ± 2.13	U	3.71	-1.82 ± 1.93	U	3.19	0.968 ± 2.06	U	3.67	-0.755 ± 2.15	U	3.62	NE
Sodium-22	1.02 ± 1.59	U	3.01	-0.735 ± 1.7	U	3	0.224 ± 2.17	U	4	-0.44 ± 1.79	U	3.2	NE
Strontium-85	-14 ± 3.06	U	3.96	-15.6 ± 2.99	U	3.74	-20.7 ± 3.85	U	3.92	-17.8 ± 3.29	U	3.88	NE

See notes at end of table.

TABLE A-4. Summary of Sanitary Outfalls of Radiological Analyses, September 2003 (concluded)

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit No:	2069-A			2069F-4			2069I-3			2069-K			Regulatory Limit 10 CFR 20
Station:	WW001			WW006			WW008			WW011			
Date Collected:	9/4/2003			9/4/2003			9/4/2003			9/4/2003			
Sample ID :	062828			062829			062831			062832			
Analyte	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	**Activity**		**MDA**	
Thallium-208	0.161 ± 3.27	U	2.78	0.00152 ± 3.51	U	3.39	0 ± 2.36	UX	4.44	1.71 ± 4.88	U	3.79	NE
Thorium-227	4.25 ± 28.8	U	31.4	-6.04 ± 17.2	U	29.2	-10.3 ± 17.9	U	30.8	-15.7 ± 18.6	U	30.3	NE
Thorium-231	-4.37 ± 8.68	U	15.1	0.263 ± 8.11	U	14	3.26 ± 8.41	U	15	4.12 ± 8.81	U	15.2	300
Thorium-232	3.27 ± 6.59	U	4.52	1.25 ± 5.58	U	4.26	2.06 ± 6.7	U	5.73	1.03 ± 4.67	U	4.46	500,000
Thorium-234	0 ± 87.6	UX	134	0 ± 183	UX	175	0 ± 97	UX	74.2	0 ± 132	UX	119	50,000
Tin-113	-1.55 ± 2.05	U	3.47	0.721 ± 2.02	U	3.47	-1.59 ± 2.35	U	3.91	1.22 ± 2.15	U	3.7	NE
Tritium	58 ± 129	U	220	-59.4 ± 126	U	225	28.1 ± 123	U	213	27.9 ± 122	U	211	10,000,000
Uranium-235	0 ± 12.4	UX	18.8	2.06 ± 18.3	U	15.4	0 ± 10.7	UX	17.5	0 ± 19.6	UX	17.5	3,000
Uranium-238	0 ± 87.6	UX	134	192 ± 183		140	0 ± 97	UX	74.2	164 ± 132		105	3,000
Yttrium-88	0.619 ± 1.79	U	3.33	-2.4 ± 1.96	U	3.04	0.635 ± 2.43	U	4.54	1.28 ± 1.95	U	3.78	100,000
Zinc-65	-1.9 ± 4.09	U	6.11	-3.2 ± 4.14	U	5.68	-2.74 ± 5.16	U	8.59	1.11 ± 3.6	U	5.96	NE
Zirconium-95	-1.67 ± 3.12	U	5.19	-3.86 ± 3.04	U	4.88	2.53 ± 4.28	U	7.82	-2.91 ± 3.13	U	5.12	200,000

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective (MDL) minimum detection limits. For radiochemical analytes the result is less than the decision level.
X = Presumptive evidence analyte is not present.
NE = not established
MDA = minimum detectable activity
CFR = Code of Federal Regulations

TABLE A-5. Permitted Sanitary Outfalls of Volatile Organic Compounds, September 2003

(All Results in micrograms per liter [μg/L] unless otherwise noted.)

Permit Number:	2069-A		2069F-4		2069G-2		2069I-3		2069K	
Station:	WW001		WW006		WW007		WW008		WW011	
Date Collected:	9/4/2003		9/4/2003		9/4/2003		9/4/2003		9/4/2003	
Sample ID:	062828		062829		062830		062831		062832	
Analyte										
1,1,1-Trichloroethane	0.34	U	0.34	U	0.34	U	0.34	U	0.34	U
1,1,2,2-Tetrachloroethane	0.49	U	0.49	U	0.49	U	0.49	U	0.49	U
1,1,2-Trichloroethane	0.44	U	0.44	U	0.44	U	0.44	U	0.44	U
1,1-Dichloroethane	0.41	U	0.41	U	0.41	U	0.41	U	0.41	U
1,1-Dichloroethylene	0.41	U	0.41	U	0.41	U	0.41	U	0.41	U
1,2-Dichloroethane	0.29	U	0.29	U	0.29	U	0.29	U	0.29	U
1,2-Dichloropropane	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
2-Butanone	2.31	U	2.31	U	2.31	U	8.53		2.31	U
2-Hexanone	1.45	U	1.45	U	1.45	U	1.45	U	1.45	U
4-Methyl-2-pentanone	1.78	U	1.78	U	1.78	U	1.78	U	1.78	U
Acetone	14.9		22.8		115		615		19	
Benzene	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U
Bromodichloromethane	0.38	U	0.38	U	0.38	U	0.38	U	0.38	U
Bromoform	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Bromomethane	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Carbon disulfide	1.91	U	1.91	U	1.91	U	1.91	U	1.91	U
Carbon tetrachloride	0.29	U	0.29	U	0.29	U	0.29	U	0.29	U
Chlorobenzene	0.32	U	0.32	U	0.32	U	0.32	U	0.32	U
Chloroethane	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Chloroform	0.36	U	0.36	U	0.36	U	0.408	J	0.647	J
Chloromethane	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
cis-1,2-Dichloroethylene	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
cis-1,3-Dichloropropylene	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Dibromochloromethane	0.29	U	0.29	U	0.29	U	0.29	U	0.29	U
Ethylbenzene	0.21	U	0.21	U	0.21	U	0.21	U	0.21	U
Methylene chloride	3.3	U	3.3	U	3.3	U	3.3	U	3.3	U
Styrene	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U
Tetrachloroethylene	0.33	U	0.33	U	0.33	U	0.33	U	0.33	U
Toluene	0.39	U	0.39	U	0.39	U	0.39	U	0.39	U
trans-1,2-Dichloroethylene	0.37	U	0.37	U	0.37	U	0.37	U	0.37	U
trans-1,3-Dichloropropylene	0.29	U	0.29	U	0.29	U	0.29	U	0.29	U
Trichloroethylene	0.36	U	0.36	U	0.36	U	0.36	U	0.36	U
Vinyl acetate	1.32	U	1.32	U	1.32	U	1.32	U	1.32	U
Vinyl chloride	0.55	U	0.55	U	0.55	U	0.55	U	0.55	U
Xylenes (total)	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U

NOTES: U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective (MDL) minimum detection limits. For radiochemical analytes the result is less than the decision level.

J = Estimated value, the analyte concentration fell above the effective (MDL) minimum detection limits and below the effective (PQL) practical quantitation limit. SNL/NM uses the City of Albuquerque's value of 3.2 mg/L milligrams per liter as the standard (that value has not been exceeded). This value is derived from the summation of all values greater than 0.01 mg/L milligrams per liter for the list of toxic organics as developed by the EPA for each National Categorical Pretreatment Standard. For non-categorical users, the summation of all values above 0.01 mg/L milligrams per liter of those listed in 40 CFR 122, Appendix D, Table II, or as directed by the Industrial Waste Engineer. Based on the Sewer Use and Wastewater Control Table, this value should never exceed 3.2 mg/L milligrams per liter.

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TABLE A-6. Permitted Sanitary Outfalls of Non-radiological Analyses, CY 2003

(All Results in milligrams per liter [mg/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit COA
2069A	**WW001**	Aluminum	4	0.13	0.07	0.0493	0.221	900
		Arsenic	4	0.02	0.01	0.00897	0.0246	0.051
		Boron	4	0.17	0.04	0.126	0.203	NE
		Cadmium	4	0.00	0.00	0.000313	0.00103	0.5
		Chromium	4	0.00	0.00	0.0013	0.00344	4.1
		Copper	4	0.05	0.02	0.032	0.0817	5.3
		Cyanide, Total	4	0.01	0.00	0.0023	0.00975	0.45
		Fluoride	4	0.87	0.13	0.757	1	36
		Lead	4	0.00	0.00	0.00172	0.00175	1
		Molybdenum	4	0.25	0.09	0.117	0.328	2
		Nickel	4	0.00	0.00	0.00119	0.00352	2
		Selenium	4	0.00	0.00	0.00281	0.00281	0.46
		Silver	4	0.00	0.00	0.000835	0.00363	5
		Zinc	4	0.06	0.02	0.0334	0.0818	2.2
2069F-4	**WW006**	Aluminum	4	0.22	0.10	0.116	0.351	900
		Arsenic	4	0.02	0.00	0.0118	0.0217	0.051
		Boron	4	0.24	0.03	0.208	0.267	NE
		Cadmium	4	0.00	0.00	0.000313	0.000688	0.5
		Chromium	4	0.01	0.01	0.00098	0.0272	4.1
		Copper	4	0.02	0.00	0.0156	0.0209	5.3
		Cyanide, Total	8	0.00	0.00	0.0032	0.00711	0.45
		Fluoride	4	0.73	0.03	0.695	0.763	36
		Lead	4	0.03	0.05	0.00172	0.104	1
		Molybdenum	4	0.10	0.05	0.0403	0.154	2
		Nickel	4	0.00	0.00	0.00165	0.00301	2
		Selenium	4	0.00	0.00	0.00281	0.00332	0.46
		Silver	4	0.01	0.01	0.000835	0.0184	5
		Zinc	4	0.06	0.04	0.0326	0.114	2.2
2069G-2	**WW007**	Aluminum	4	0.30	0.43	0.0568	0.948	900
		Arsenic	4	0.00	0.00	0.00224	0.00466	0.051
		Boron	4	0.02	0.01	0.0126	0.0231	NE
		Cadmium	4	0.00	0.00	0.000313	0.000463	0.5
		Chromium	4	0.00	0.00	0.000503	0.00247	4.1
		Copper	4	0.01	0.01	0.00188	0.0112	5.3
		Cyanide, Total	8	0.00	0.00	0.00172	0.00172	0.45
		Fluoride	4	7.26	1.94	5.18	9.1	36
		Lead	4	0.00	0.00	0.00172	0.00172	1
		Molybdenum	4	0.01	0.00	0.00518	0.00715	2
		Nickel	4	0.00	0.00	0.00069	0.00227	2
		Selenium	4	0.00	0.00	0.00281	0.00281	0.46
		Silver	4	0.00	0.00	0.000835	0.00153	5
		Zinc	4	0.00	0.00	0.00103	0.0025	2.2

See notes at end of table.

TABLE A-6. Permitted Sanitary Outfalls of Non-radiological Analyses, CY 2003 (concluded)
(All Results in milligrams per liter [mg/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit COA
2069I-3	**WW008**	Aluminum	4	0.23	0.09	0.132	0.354	900
		Arsenic	4	0.01	0.00	0.0103	0.0166	0.051
		Boron	4	0.12	0.04	0.0873	0.162	NE
		Cadmium	4	0.00	0.00	0.000313	0.000654	0.5
		Chromium	4	0.00	0.00	0.00174	0.00299	4.1
		Copper	4	0.02	0.00	0.0147	0.0223	5.3
		Cyanide, Total	8	0.00	0.00	0.00172	0.00648	0.45
		Fluoride	4	4.42	1.45	3.03	5.82	36
		Lead	4	0.00	0.00	0.00172	0.00809	1
		Molybdenum	4	0.05	0.01	0.0383	0.064	2
		Nickel	4	0.00	0.00	0.00193	0.00404	2
		Selenium	4	0.00	0.00	0.00281	0.00296	0.46
		Silver	4	0.00	0.00	0.000835	0.00205	5
		Zinc	4	0.06	0.03	0.0219	0.0956	2.2
2069K	**WW011**	Aluminum	4	0.17	0.14	0.0337	0.358	900
		Arsenic	4	0.01	0.00	0.00876	0.0128	0.051
		Boron	4	0.16	0.01	0.144	0.164	NE
		Cadmium	4	0.00	0.00	0.000313	0.000471	0.5
		Chromium	4	0.00	0.01	0.0013	0.0122	4.1
		Copper	4	0.05	0.03	0.0189	0.0817	5.3
		Fluoride	4	0.54	0.07	0.481	0.609	36
		Lead	4	0.00	0.00	0.00172	0.00276	1
		Molybdenum	4	0.05	0.04	0.0115	0.0987	2
		Nickel	4	0.00	0.00	0.00238	0.00839	2
		Selenium	4	0.00	0.00	0.00281	0.0032	0.46
		Silver	4	0.00	0.00	0.000835	0.00231	5
		Zinc	4	0.21	0.20	0.0396	0.477	2.2

NOTES: COA = City of Albuquerque
NE = not established
Std Dev = standard deviation

TABLE A-7. Permitted Sanitary Outfalls of Radiological Analyses, CY 2003
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069A	**WW001**	Actinium-228	2	6.782	8.653	0.663	12.9	300,000
		Americium-241	2	1.900	4.228	-1.09	4.89	200
		Antimony-124	2	0.996	0.346	0.751	1.24	NE
		Antimony-125	2	-0.775	1.096	-1.55	0	NE
		Barium-133	2	-0.263	0.345	-0.507	-0.0184	NE
		Beryllium-7	2	6.950	3.281	4.63	9.27	NE
		Bismuth-211	2	2.815	3.981	0	5.63	NE
		Bismuth-212	2	6.290	5.190	2.62	9.96	NE
		Bismuth-214	2	1.435	2.029	0	2.87	NE
		Cadmium-109	2	15.850	10.112	8.7	23	NE
		Cerium-139	2	-0.788	0.653	-1.25	-0.326	NE
		Cerium-141	2	1.790	2.531	0	3.58	NE
		Cerium-144	2	-0.135	5.155	-3.78	3.51	30,000
		Cesium-134	2	-0.348	1.715	-1.56	0.865	9,000
		Cesium-137	2	-0.627	1.108	-1.41	0.157	10,000
		Chromium-51	2	8.437	11.121	0.573	16.3	5,000,000
		Cobalt-57	2	-0.264	0.212	-0.414	-0.114	NE
		Cobalt-60	2	0.256	0.362	0	0.512	30,000
		Europium-152	2	0.251	1.144	-0.558	1.06	NE
		Europium-154	2	1.824	1.409	0.827	2.82	NE
		Gross Alpha	2	3.930	0.707	3.43	4.43	NE
		Gross Beta	2	27.800	6.647	23.1	32.5	NE
		Iron-59	2	3.059	3.029	0.917	5.2	100,000
		Lead-211	2	7.460	2.376	5.78	9.14	NE
		Lead-212	2	6.325	4.236	3.33	9.32	20,000
		Lead-214	2	0.980	1.386	0	1.96	1,000,000
		Manganese-54	2	0.787	0.612	0.354	1.22	NE
		Mercury-203	2	-0.020	1.513	-1.09	1.05	NE
		Neptunium-237	2	7.880	2.121	6.38	9.38	NE
		Neptunium-239	2	-2.855	1.478	-3.9	-1.81	NE
		Niobium-95	2	-0.266	0.375	-0.531	0	NE
		Potassium-40	2	31.195	36.777	5.19	57.2	40,000
		Protactinium-231	2	8.700	48.083	-25.3	42.7	NE
		Protactinium-233	2	-0.588	1.771	-1.84	0.664	NE
		Protactinium-234	2	0.880	1.245	0	1.76	NE
		Radium-223	2	-11.090	5.530	-15	-7.18	NE
		Radium-224	2	-42.550	60.175	-85.1	0	NE
		Radium-226	2	1.435	2.029	0	2.87	600
		Radium-228	2	6.782	8.653	0.663	12.9	600
		Radon-219	2	-4.060	3.875	-6.8	-1.32	NE
		Rhodium-106	2	1.985	8.139	-3.77	7.74	NE
		Ruthenium-103	2	1.414	2.144	-0.102	2.93	300,000
		Ruthenium-106	2	0.485	7.870	-5.08	6.05	30,000
		Selenium-75	2	-0.219	0.985	-0.915	0.478	NE
		Sodium-22	2	0.661	0.508	0.302	1.02	NE
		Strontium-85	2	-15.150	1.626	-16.3	-14	NE

See notes at end of table.

TABLE A-7. Permitted Sanitary Outfalls of Radiological Analyses, CY 2003 (continued)

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069A	**WW001**	Thallium-208	2	0.474	0.443	0.161	0.787	NE
(concluded)		Thorium-227	2	-3.775	11.349	-11.8	4.25	NE
		Thorium-231	2	-1.974	3.388	-4.37	0.422	300
		Thorium-232	2	6.225	4.179	3.27	9.18	500,000
		Thorium-234	2	2.200	3.111	0	4.4	50,000
		Tin-113	2	-0.110	2.036	-1.55	1.33	NE
		Tritium	2	42.400	22.062	26.8	58	10,000,000
		Uranium-235	2	6.800	9.617	0	13.6	3,000
		Uranium-238	2	2.200	3.111	0	4.4	3,000
		Yttrium-88	2	0.117	0.711	-0.386	0.619	100,000
		Zinc-65	2	-1.535	0.516	-1.9	-1.17	NE
		Zirconium-95	2	-1.660	0.014	-1.67	-1.65	200,000

See notes at end of table.

TABLE A-7. Permitted Sanitary Outfalls of Radiological Analyses, CY 2003 (continued)

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069F-4	**WW006**	Actinium-228	2	1.385	1.959	0	2.77	300,000
		Americium-241	2	2.530	5.077	-1.06	6.12	200
		Antimony-124	2	-1.180	0.184	-1.31	-1.05	NE
		Antimony-125	2	0.649	1.769	-0.602	1.9	NE
		Barium-133	2	-1.562	3.533	-4.06	0.937	NE
		Beryllium-7	2	-0.535	6.710	-5.28	4.21	NE
		Bismuth-211	2	0.000	0.000	0	0	NE
		Bismuth-212	2	1.760	2.489	0	3.52	NE
		Bismuth-214	2	0.840	1.188	0	1.68	NE
		Cadmium-109	2	12.835	20.457	-1.63	27.3	NE
		Cerium-139	2	-0.566	0.545	-0.951	-0.18	NE
		Cerium-141	2	0.161	0.631	-0.286	0.607	NE
		Cerium-144	2	-6.135	0.969	-6.82	-5.45	30,000
		Cesium-134	2	0.579	0.722	0.0689	1.09	9,000
		Cesium-137	2	0.015	0.021	0	0.0304	10,000
		Chromium-51	2	3.410	9.744	-3.48	10.3	5,000,000
		Cobalt-57	2	0.468	0.085	0.408	0.528	NE
		Cobalt-60	2	-0.992	0.776	-1.54	-0.443	30,000
		Europium-152	2	-0.235	1.973	-1.63	1.16	NE
		Europium-154	2	-3.200	1.584	-4.32	-2.08	NE
		Gross Alpha	2	5.795	3.217	3.52	8.07	NE
		Gross Beta	2	43.850	17.041	31.8	55.9	NE
		Iron-59	2	-0.229	0.643	-0.684	0.226	100,000
		Lead-211	2	12.700	0.849	12.1	13.3	NE
		Lead-212	2	1.470	0.283	1.27	1.67	20,000
		Lead-214	2	0.000	0.000	0	0	1,000,000
		Manganese-54	2	0.318	0.450	0	0.636	NE
		Mercury-203	2	-0.366	0.083	-0.424	-0.307	NE
		Neptunium-237	2	-2.965	13.343	-12.4	6.47	NE
		Neptunium-239	2	-1.055	1.492	-2.11	0	NE
		Niobium-95	2	-1.955	0.714	-2.46	-1.45	NE
		Potassium-40	2	27.550	38.962	0	55.1	40,000
		Protactinium-231	2	21.050	3.465	18.6	23.5	NE
		Protactinium-233	2	0.234	1.735	-0.993	1.46	NE
		Protactinium-234	2	-2.399	2.476	-4.15	-0.648	NE
		Radium-223	2	-12.040	13.237	-21.4	-2.68	NE
		Radium-224	2	0.000	0.000	0	0	NE
		Radium-226	2	0.840	1.188	0	1.68	600
		Radium-228	2	1.385	1.959	0	2.77	600
		Radon-219	2	-1.466	2.226	-3.04	0.108	NE
		Rhodium-106	2	-1.755	9.935	-8.78	5.27	NE
		Ruthenium-103	2	-0.637	0.402	-0.921	-0.352	300,000
		Ruthenium-106	2	-2.175	1.025	-2.9	-1.45	30,000
		Selenium-75	2	-1.785	0.049	-1.82	-1.75	NE
		Sodium-22	2	-1.133	0.562	-1.53	-0.735	NE
		Strontium-85	2	-14.300	1.838	-15.6	-13	NE

See notes at end of table.

TABLE A-7. Permitted Sanitary Outfalls of Radiological Analyses, CY 2003 (continued)

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069F-4 (concluded)	**WW006**	Thallium-208	2	0.001	0.001	0	0.00152	NE
		Thorium-227	2	-8.320	3.224	-10.6	-6.04	NE
		Thorium-231	2	-0.409	0.950	-1.08	0.263	300
		Thorium-232	2	1.450	0.283	1.25	1.65	500,000
		Thorium-234	2	0.000	0.000	0	0	50,000
		Tin-113	2	-0.046	1.085	-0.813	0.721	NE
		Tritium	2	-16.300	60.953	-59.4	26.8	10,000,000
		Uranium-235	2	1.030	1.457	0	2.06	3,000
		Uranium-238	2	181.500	14.849	171	192	3,000
		Yttrium-88	2	-1.245	1.633	-2.4	-0.0905	100,000
		Zinc-65	2	-0.740	3.479	-3.2	1.72	NE
		Zirconium-95	2	-1.857	2.833	-3.86	0.147	200,000

See notes at end of table.

TABLE A-7. Permitted Sanitary Outfalls of Radiological Analyses, CY 2003 (continued)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069I-3	**WW008**	Actinium-228	2	0.630	0.891	0	1.26	300,000
		Americium-241	2	-0.930	1.315	-1.86	0	200
		Antimony-124	2	-0.404	0.256	-0.585	-0.223	NE
		Antimony-125	2	-0.155	0.651	-0.615	0.306	NE
		Barium-133	2	0.175	1.266	-0.721	1.07	NE
		Beryllium-7	2	-5.043	7.151	-10.1	0.0132	NE
		Bismuth-211	2	0.000	0.000	0	0	NE
		Bismuth-212	2	9.660	2.178	8.12	11.2	NE
		Bismuth-214	2	0.000	0.000	0	0	NE
		Cadmium-109	2	-12.889	19.249	-26.5	0.722	NE
		Cerium-139	2	0.582	0.250	0.405	0.759	NE
		Cerium-141	2	-3.341	4.708	-6.67	-0.0114	NE
		Cerium-144	2	3.100	1.527	2.02	4.18	30,000
		Cesium-134	2	-1.173	0.689	-1.66	-0.686	9,000
		Cesium-137	2	0.090	0.366	-0.169	0.348	10,000
		Chromium-51	2	-6.270	18.710	-19.5	6.96	5,000,000
		Cobalt-57	2	-0.081	0.285	-0.282	0.121	NE
		Cobalt-60	2	-0.270	1.881	-1.6	1.06	30,000
		Europium-152	2	1.385	4.052	-1.48	4.25	NE
		Europium-154	2	-0.433	1.495	-1.49	0.624	NE
		Gross Alpha	2	3.810	1.598	2.68	4.94	NE
		Gross Beta	2	14.450	0.495	14.1	14.8	NE
		Iron-59	2	-1.039	2.406	-2.74	0.663	100,000
		Lead-211	2	3.000	18.526	-10.1	16.1	NE
		Lead-212	2	1.045	1.478	0	2.09	20,000
		Lead-214	2	1.855	2.623	0	3.71	1,000,000
		Manganese-54	2	0.679	0.752	0.147	1.21	NE
		Mercury-203	2	0.466	0.855	-0.139	1.07	NE
		Neptunium-237	2	0.766	0.783	0.212	1.32	NE
		Neptunium-239	2	-1.053	2.513	-2.83	0.724	NE
		Niobium-95	2	-0.302	0.988	-1	0.397	NE
		Potassium-40	2	45.115	52.022	8.33	81.9	40,000
		Protactinium-231	2	22.230	19.474	8.46	36	NE
		Protactinium-233	2	1.290	0.255	1.11	1.47	NE
		Protactinium-234	2	-0.155	2.623	-2.01	1.7	NE
		Radium-223	2	3.295	6.131	-1.04	7.63	NE
		Radium-224	2	0.000	0.000	0	0	NE
		Radium-226	2	3.810	5.388	0	7.62	600
		Radium-228	2	0.630	0.891	0	1.26	600
		Radon-219	2	-1.195	13.018	-10.4	8.01	NE
		Rhodium-106	2	-8.235	6.173	-12.6	-3.87	NE
		Ruthenium-103	2	-0.609	1.077	-1.37	0.153	300,000
		Ruthenium-106	2	-10.100	5.233	-13.8	-6.4	30,000
		Selenium-75	2	-0.706	2.367	-2.38	0.968	NE
		Sodium-22	2	-0.153	0.533	-0.53	0.224	NE

See notes at end of table.

TABLE A-7. Permitted Sanitary Outfalls of Radiological Analyses, CY 2003 (continued)

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069I-3 (concluded)	**WW008**	Strontium-85	2	-5.640	21.298	-20.7	9.42	NE
		Thallium-208	2	1.375	1.945	0	2.75	NE
		Thorium-227	2	-8.925	1.945	-10.3	-7.55	NE
		Thorium-231	2	5.025	2.496	3.26	6.79	300
		Thorium-232	2	2.410	0.495	2.06	2.76	500,000
		Thorium-234	2	123.500	174.655	0	247	50,000
		Tin-113	2	-0.863	1.029	-1.59	-0.135	NE
		Tritium	2	14.050	19.870	0	28.1	10,000,000
		Uranium-235	2	6.600	9.334	0	13.2	3,000
		Uranium-238	2	123.500	174.655	0	247	3,000
		Yttrium-88	2	-0.078	1.008	-0.791	0.635	100,000
		Zinc-65	2	-1.182	2.204	-2.74	0.377	NE
		Zirconium-95	2	1.790	1.047	1.05	2.53	200,000

See notes at end of table.

TABLE A-7. Permitted Sanitary Outfalls of Radiological Analyses, CY 2003 (continued)
(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069K	**WW011**	Actinium-228	2	8.265	5.848	4.13	12.4	300,000
		Americium-241	2	-2.885	2.482	-4.64	-1.13	200
		Antimony-124	2	0.736	1.223	-0.129	1.6	NE
		Antimony-125	2	0.647	1.616	-0.496	1.79	NE
		Barium-133	2	-0.531	1.329	-1.47	0.409	NE
		Beryllium-7	2	-1.385	2.524	-3.17	0.4	NE
		Bismuth-211	2	3.785	5.353	0	7.57	NE
		Bismuth-212	2	11.235	8.860	4.97	17.5	NE
		Bismuth-214	2	0.000	0.000	0	0	NE
		Cadmium-109	2	1.520	2.150	0	3.04	NE
		Cerium-139	2	0.683	1.609	-0.455	1.82	NE
		Cerium-141	2	1.040	1.471	0	2.08	NE
		Cerium-144	2	-1.900	0.750	-2.43	-1.37	30,000
		Cesium-134	2	-0.664	1.225	-1.53	0.203	9,000
		Cesium-137	2	-0.545	0.361	-0.8	-0.289	10,000
		Chromium-51	2	-0.330	12.077	-8.87	8.21	5,000,000
		Cobalt-57	2	0.794	2.328	-0.852	2.44	NE
		Cobalt-60	2	1.029	0.185	0.898	1.16	30,000
		Europium-152	2	-0.920	4.525	-4.12	2.28	NE
		Europium-154	2	-0.970	0.325	-1.2	-0.74	NE
		Gross Alpha	2	3.230	0.750	2.7	3.76	NE
		Gross Beta	2	26.950	4.879	23.5	30.4	NE
		Iron-59	2	-0.592	0.338	-0.831	-0.353	100,000
		Lead-211	2	-26.800	5.233	-30.5	-23.1	NE
		Lead-212	2	1.535	0.686	1.05	2.02	20,000
		Lead-214	2	1.315	1.860	0	2.63	1,000,000
		Manganese-54	2	-1.049	0.214	-1.2	-0.898	NE
		Mercury-203	2	-0.146	0.206	-0.292	0	NE
		Neptunium-237	2	-6.030	1.881	-7.36	-4.7	NE
		Neptunium-239	2	-7.635	1.973	-9.03	-6.24	NE
		Niobium-95	2	0.279	1.373	-0.692	1.25	NE
		Potassium-40	2	20.200	12.445	11.4	29	40,000
		Protactinium-231	2	33.900	25.173	16.1	51.7	NE
		Protactinium-233	2	0.042	0.882	-0.582	0.666	NE
		Protactinium-234	2	2.119	3.524	-0.373	4.61	NE
		Radium-223	2	-18.550	10.112	-25.7	-11.4	NE
		Radium-224	2	21.250	2.192	19.7	22.8	NE
		Radium-226	2	6.045	2.934	3.97	8.12	600
		Radium-228	2	2.065	2.920	0	4.13	600
		Radon-219	2	8.760	5.431	4.92	12.6	NE
		Rhodium-106	2	9.530	5.897	5.36	13.7	NE
		Ruthenium-103	2	-0.690	0.721	-1.2	-0.18	300,000
		Ruthenium-106	2	3.745	0.417	3.45	4.04	30,000
		Selenium-75	2	-1.153	0.562	-1.55	-0.755	NE
		Sodium-22	2	-0.357	0.117	-0.44	-0.274	NE
		Strontium-85	2	-8.900	12.587	-17.8	0	NE

See notes at end of table.

TABLE A-7. Permitted Sanitary Outfalls of Radiological Analyses, CY 2003 (concluded)

(All Results in picocuries per liter [pCi/L] unless otherwise noted.)

Permit Number	Station	Analyte	Sample Size	Mean	Std Dev	Minimum	Maximum	Regulatory Limit 10 CFR 20
2069K (concluded)	**WW011**	Thallium-208	2	0.855	1.209	0	1.71	NE
		Thorium-227	2	-13.900	2.546	-15.7	-12.1	NE
		Thorium-231	2	3.780	0.481	3.44	4.12	300
		Thorium-232	2	1.520	0.693	1.03	2.01	500,000
		Thorium-234	2	0.275	0.389	0	0.55	50,000
		Tin-113	2	1.150	0.099	1.08	1.22	NE
		Tritium	2	13.950	19.728	0	27.9	10,000,000
		Uranium-235	2	2.680	3.790	0	5.36	3,000
		Uranium-238	2	82.275	115.577	0.55	164	3,000
		Yttrium-88	2	1.155	0.177	1.03	1.28	100,000
		Zinc-65	2	0.015	1.549	-1.08	1.11	NE
		Zirconium-95	2	-1.052	2.628	-2.91	0.807	200,000

NOTES: NE = not established
CFR = Code of Federal Regulations
Std Dev = standard deviation

APPENDIX B

2003 Groundwater Contaminant
Concentration Trends

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CONTENTS

FIGURES

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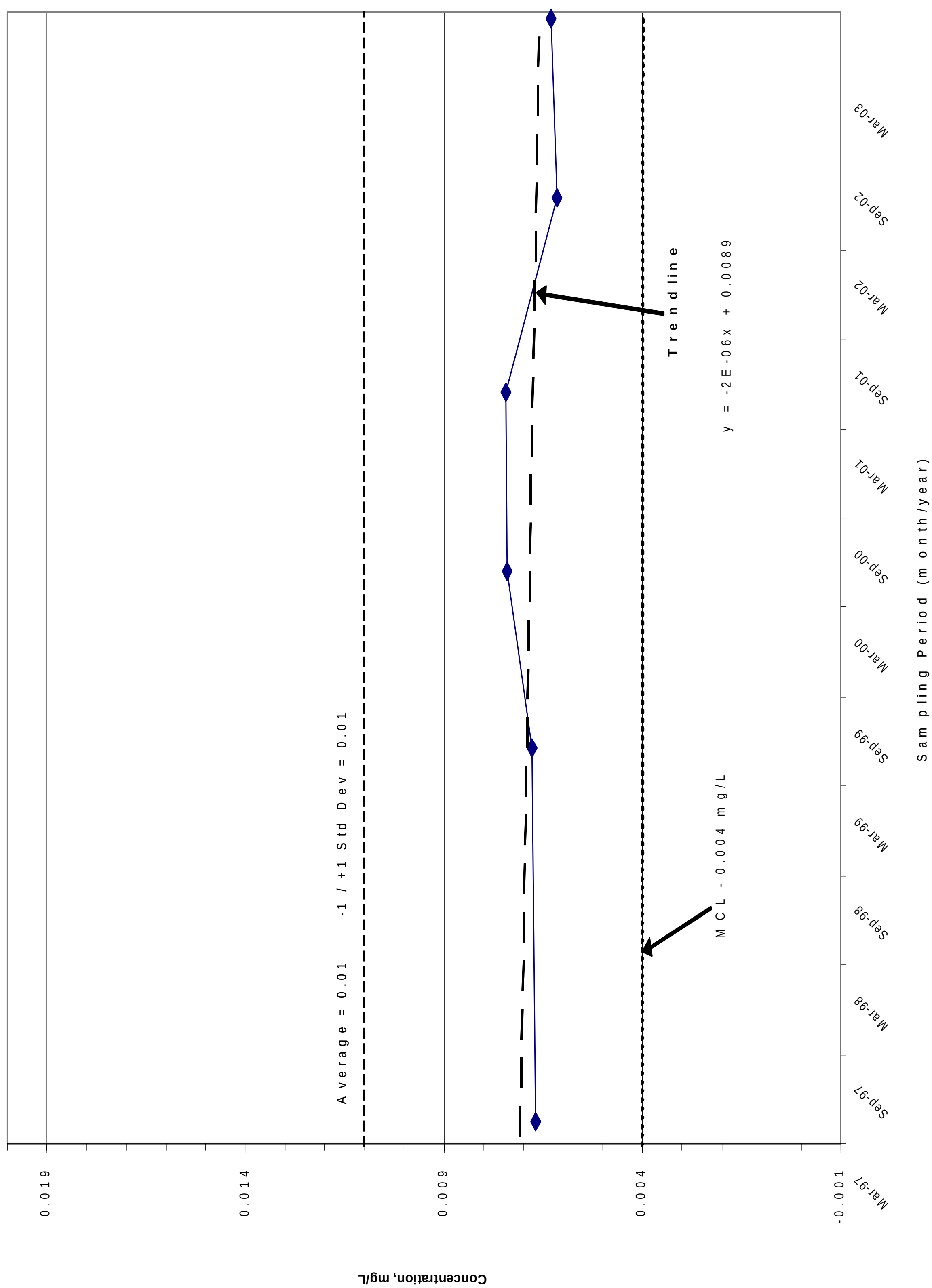

FIGURE B-1. Beryllium Concentrations, Coyote Springs

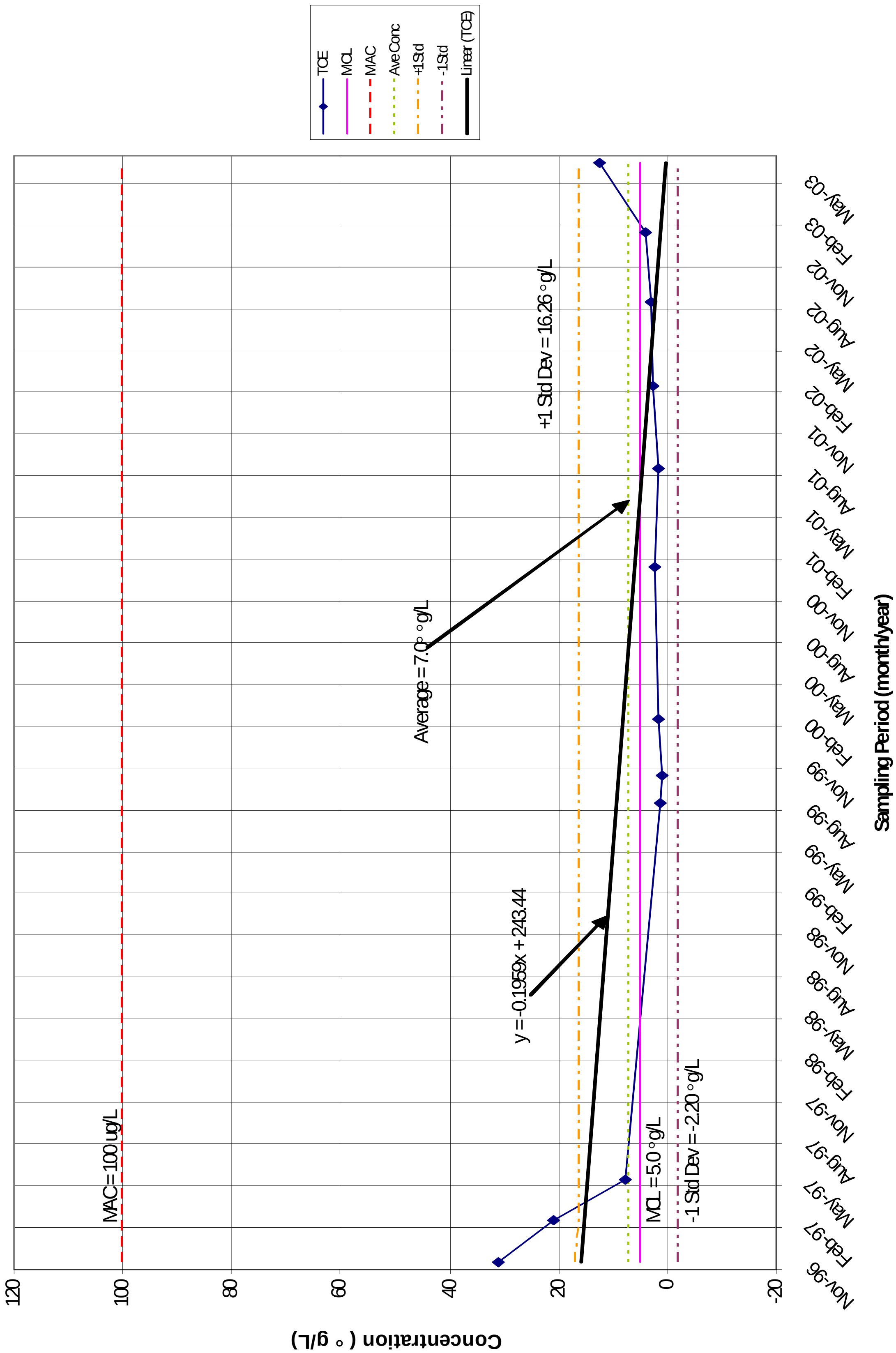

FIGURE B-2. TCE Concentrations, CWL-MW2A

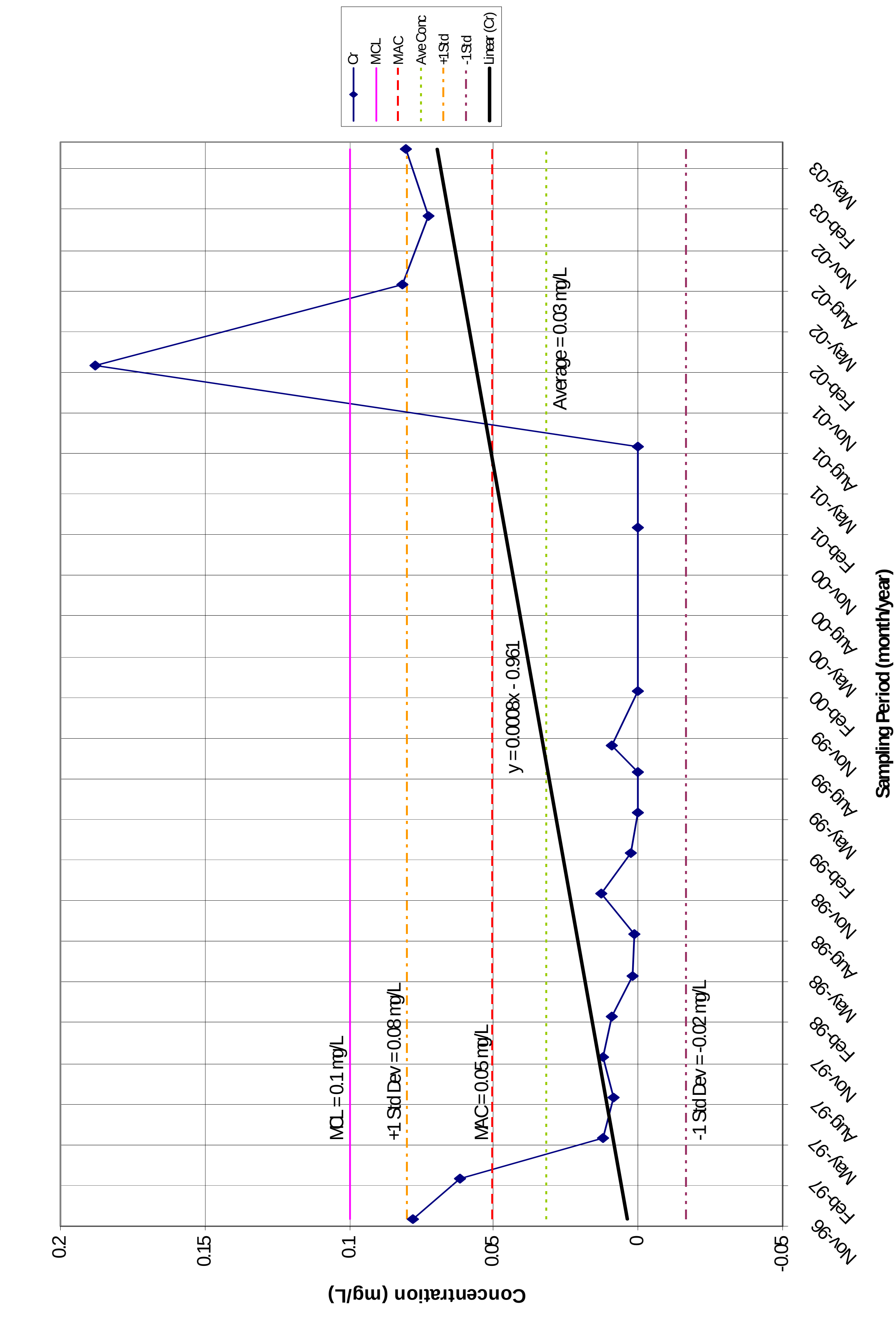

FIGURE B-3. Chromium Concentrations, CWL-BW3

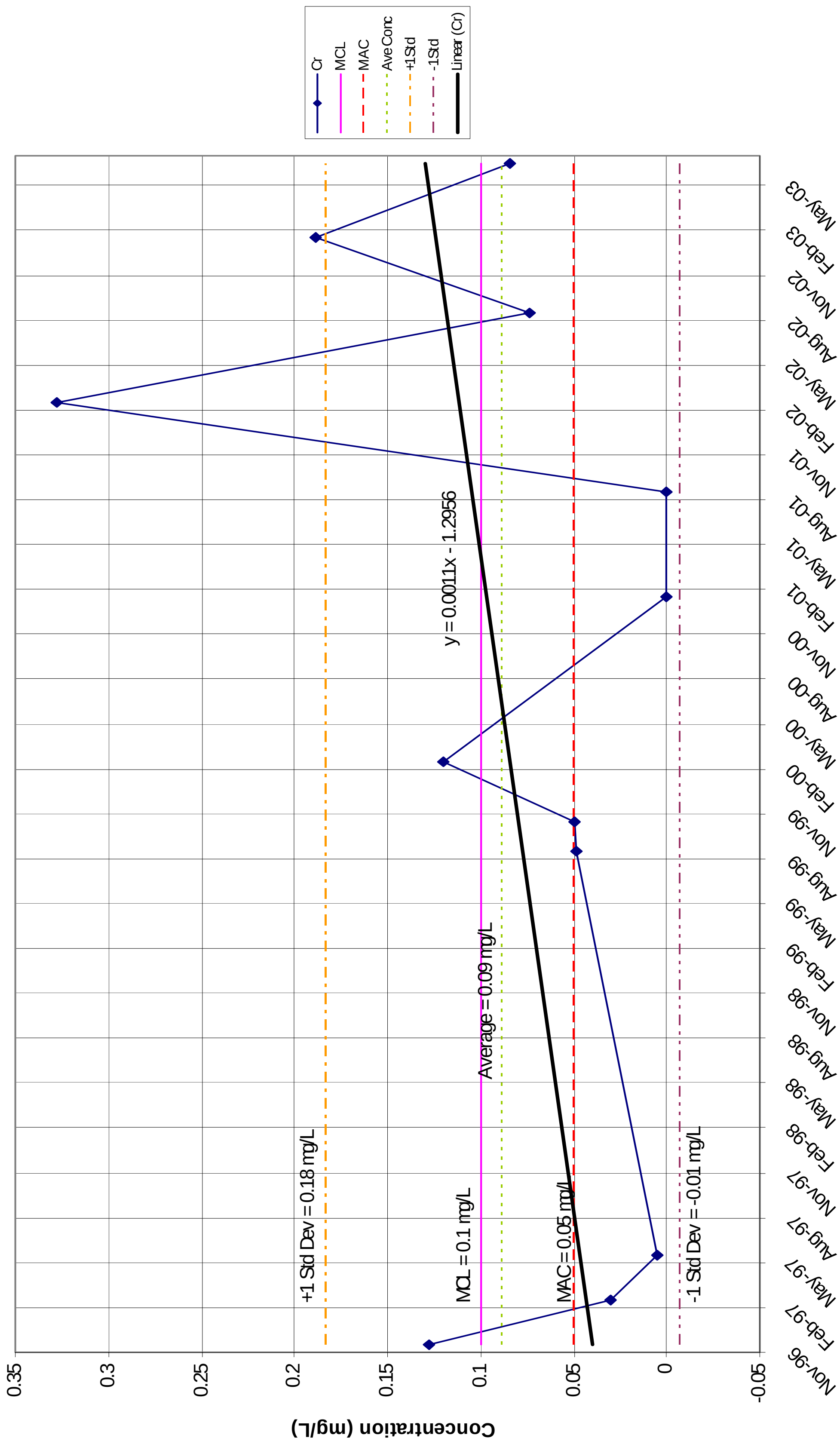

FIGURE B-4. Chromium Concentrations, CWL-MW2A

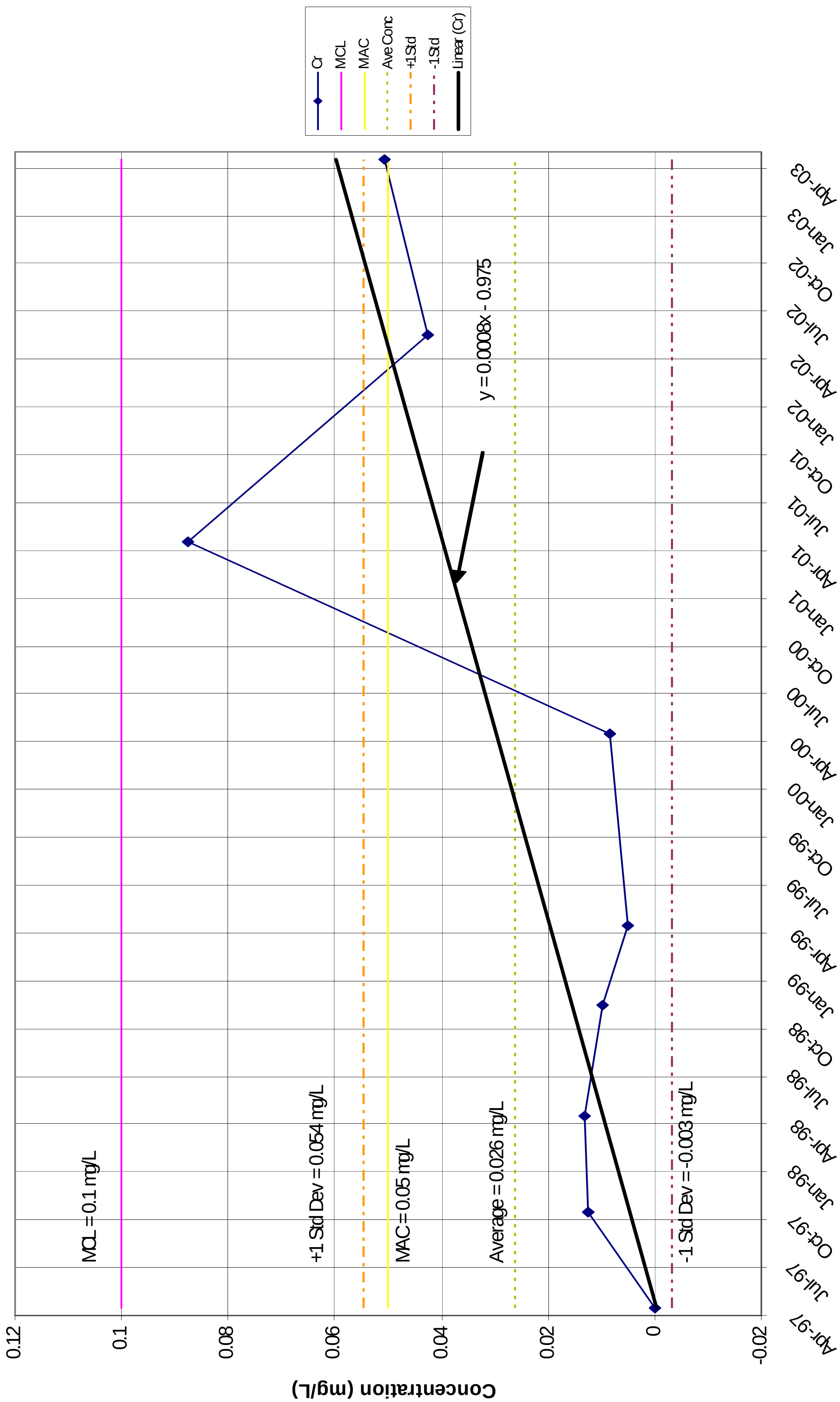

FIGURE B-5. Total Chromium Concentrations, MWL-MW3

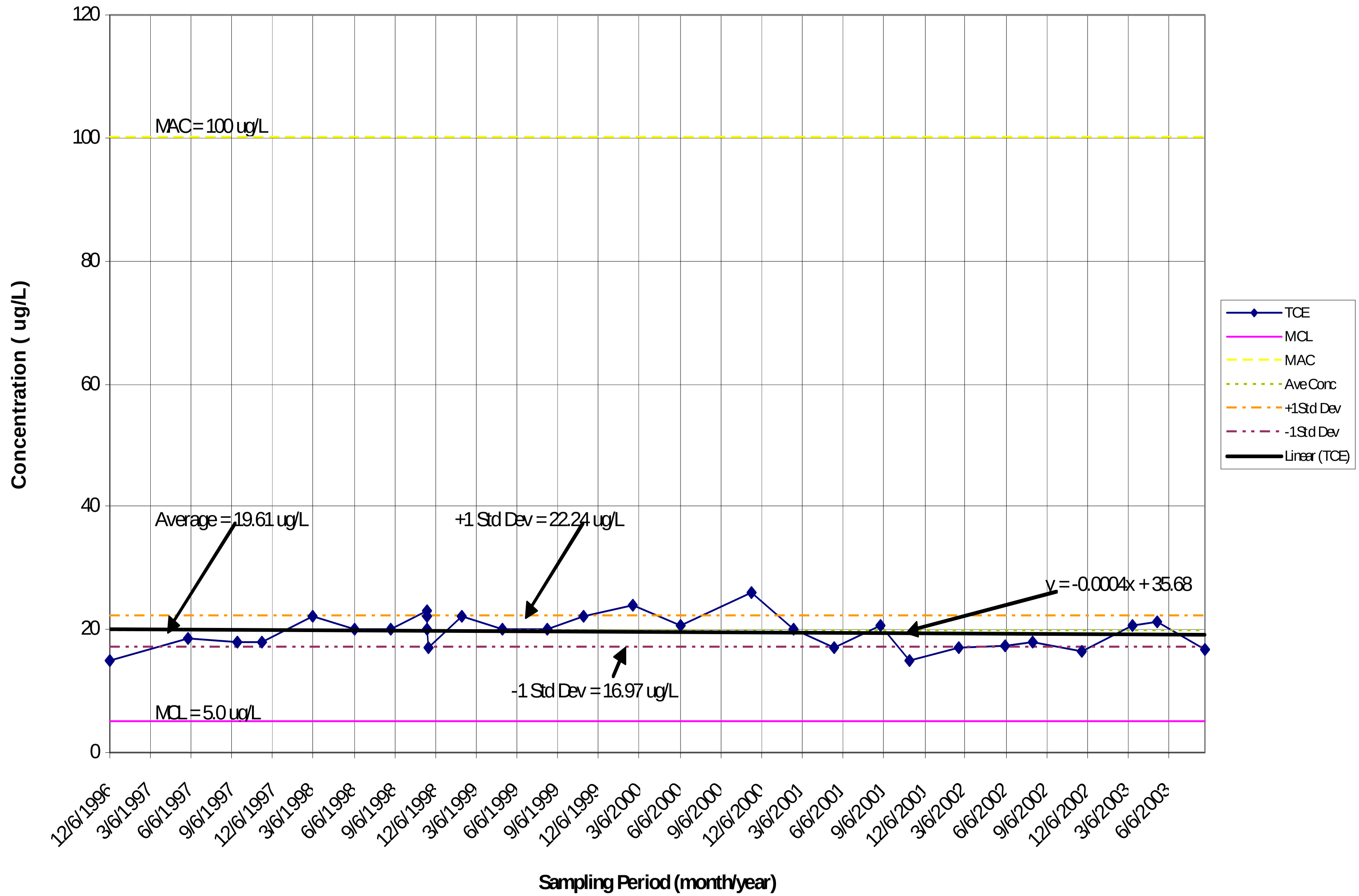

FIGURE B-6. TCE Concentrations, LWDS-MW1

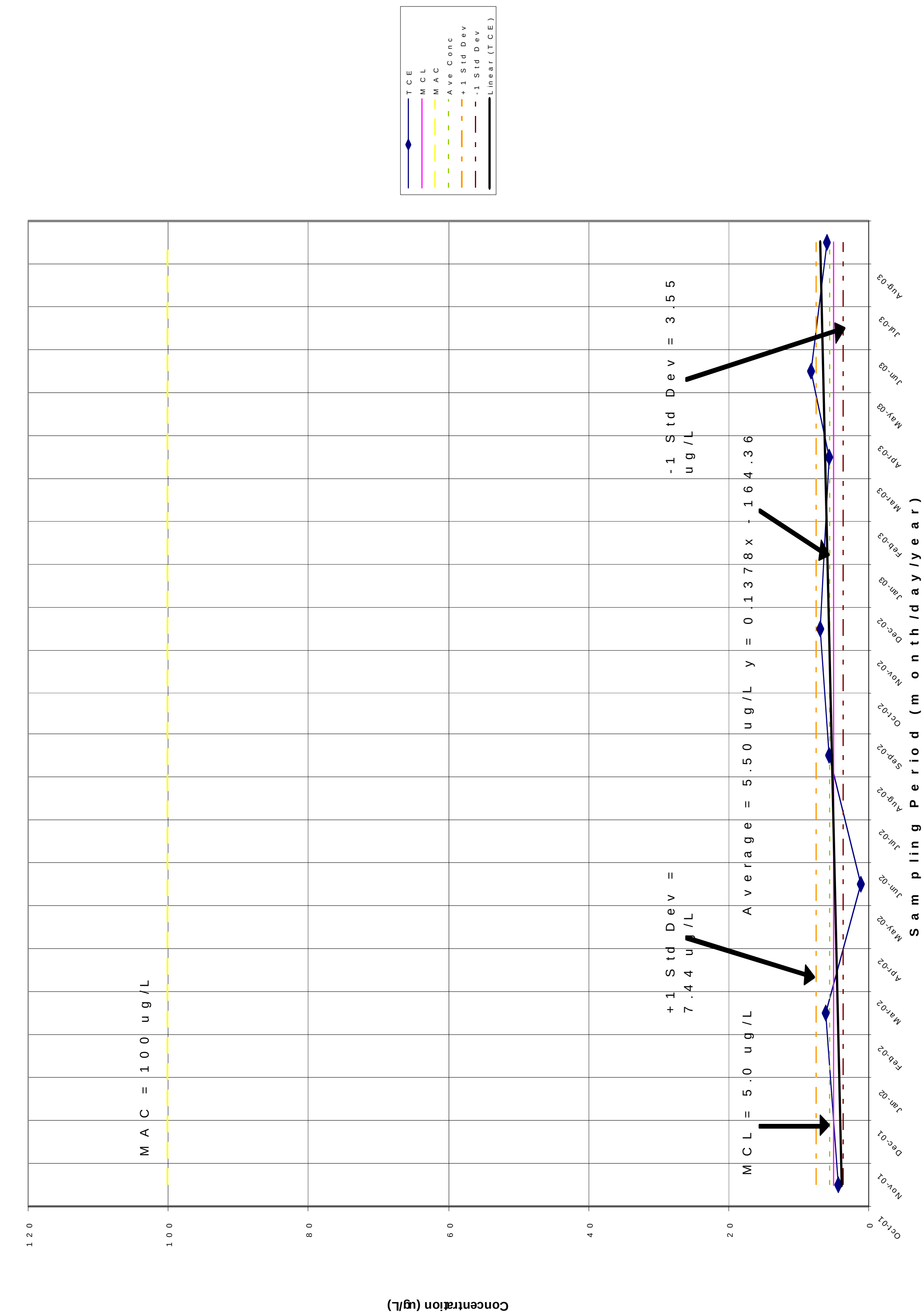

FIGURE B-7. TCE Concentrations, TAV-MW8

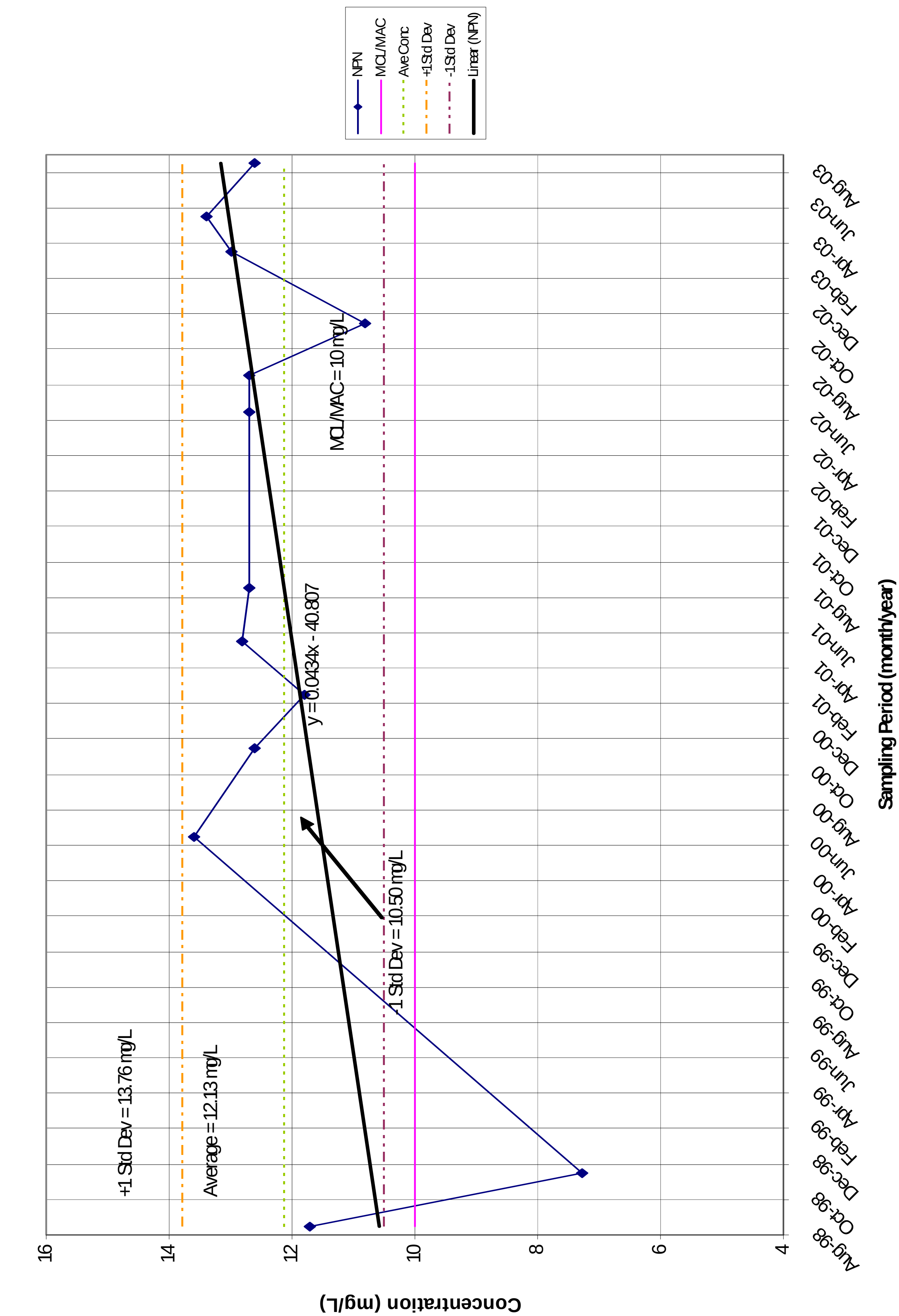

FIGURE B-8. Nitrate plus Nitrite Concentrations, LWDS-MW1

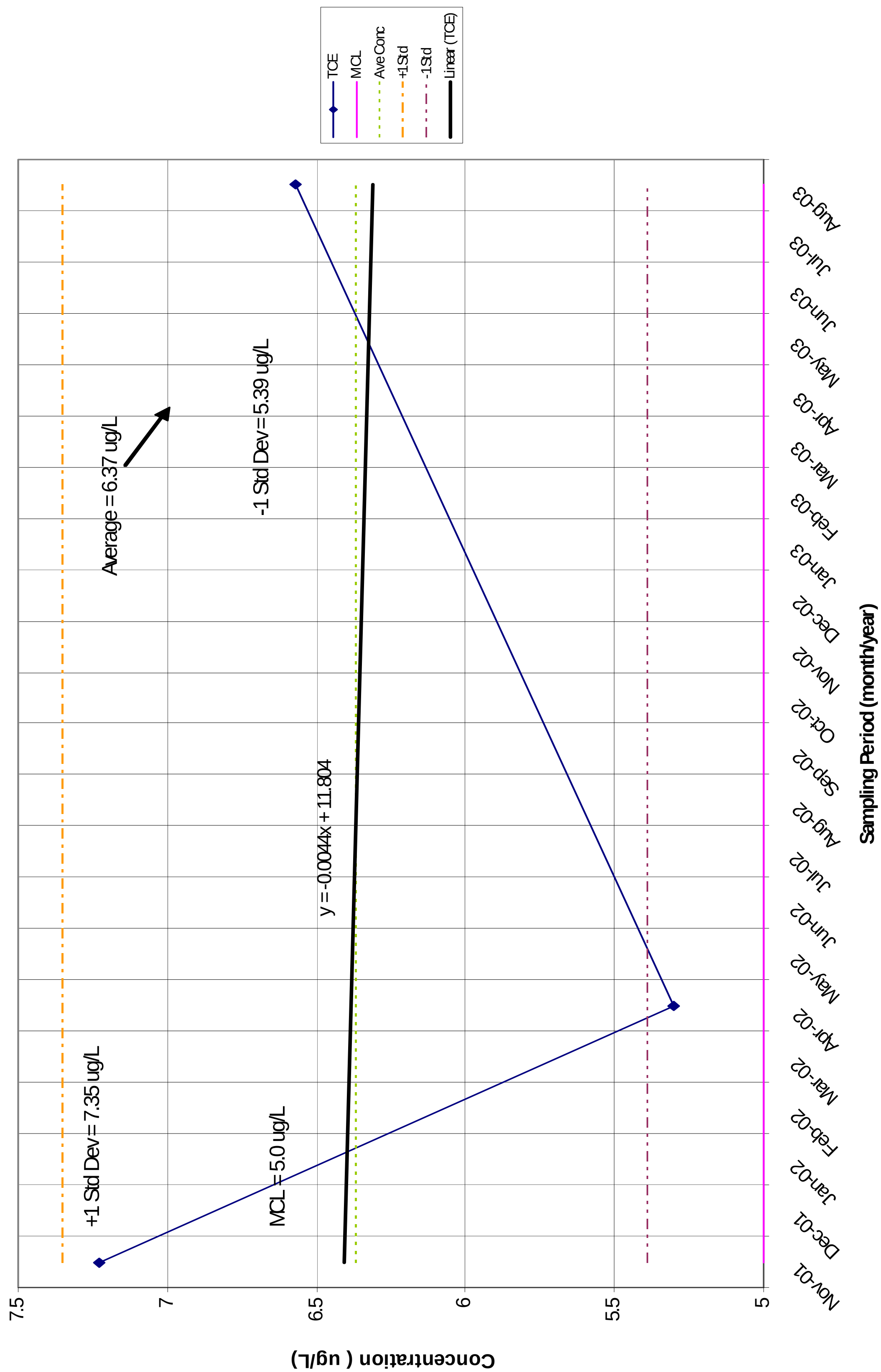

FIGURE B-9. TCE Concentrations, WYO-4

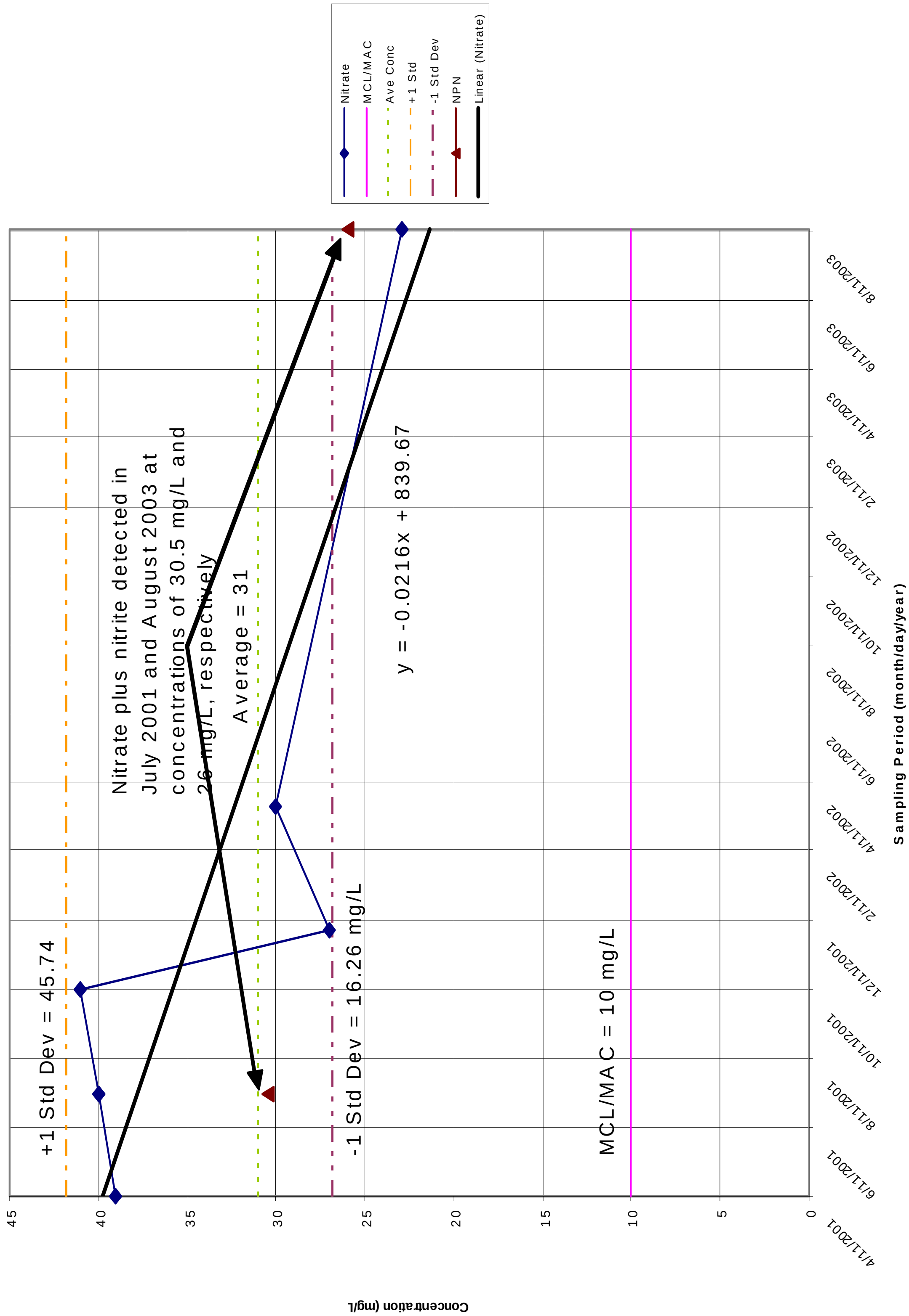

FIGURE B-10. Nitrate Concentrations, TJA-7

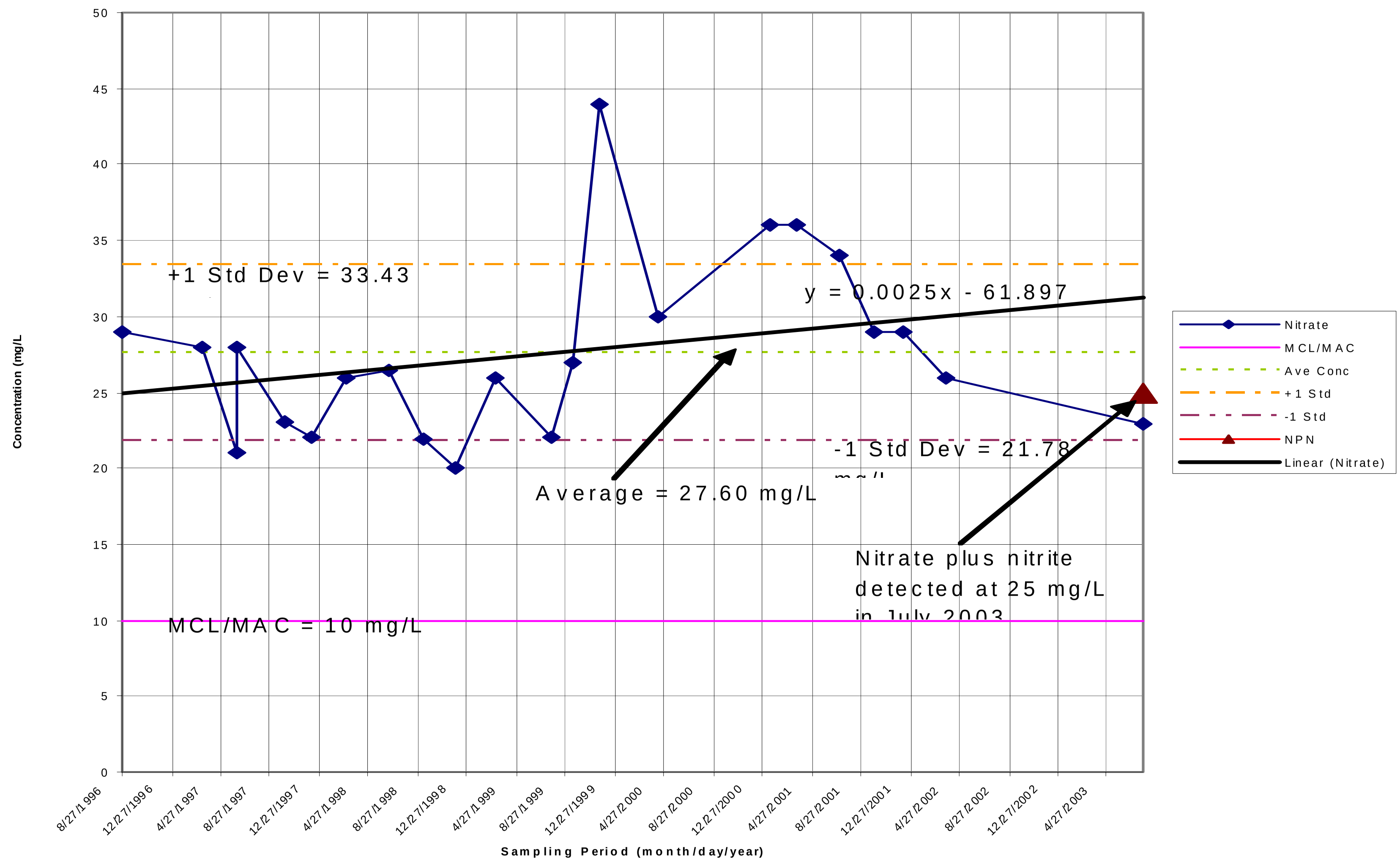

FIGURE B-11. Nitrate Concentrations, TA2-SW1-320

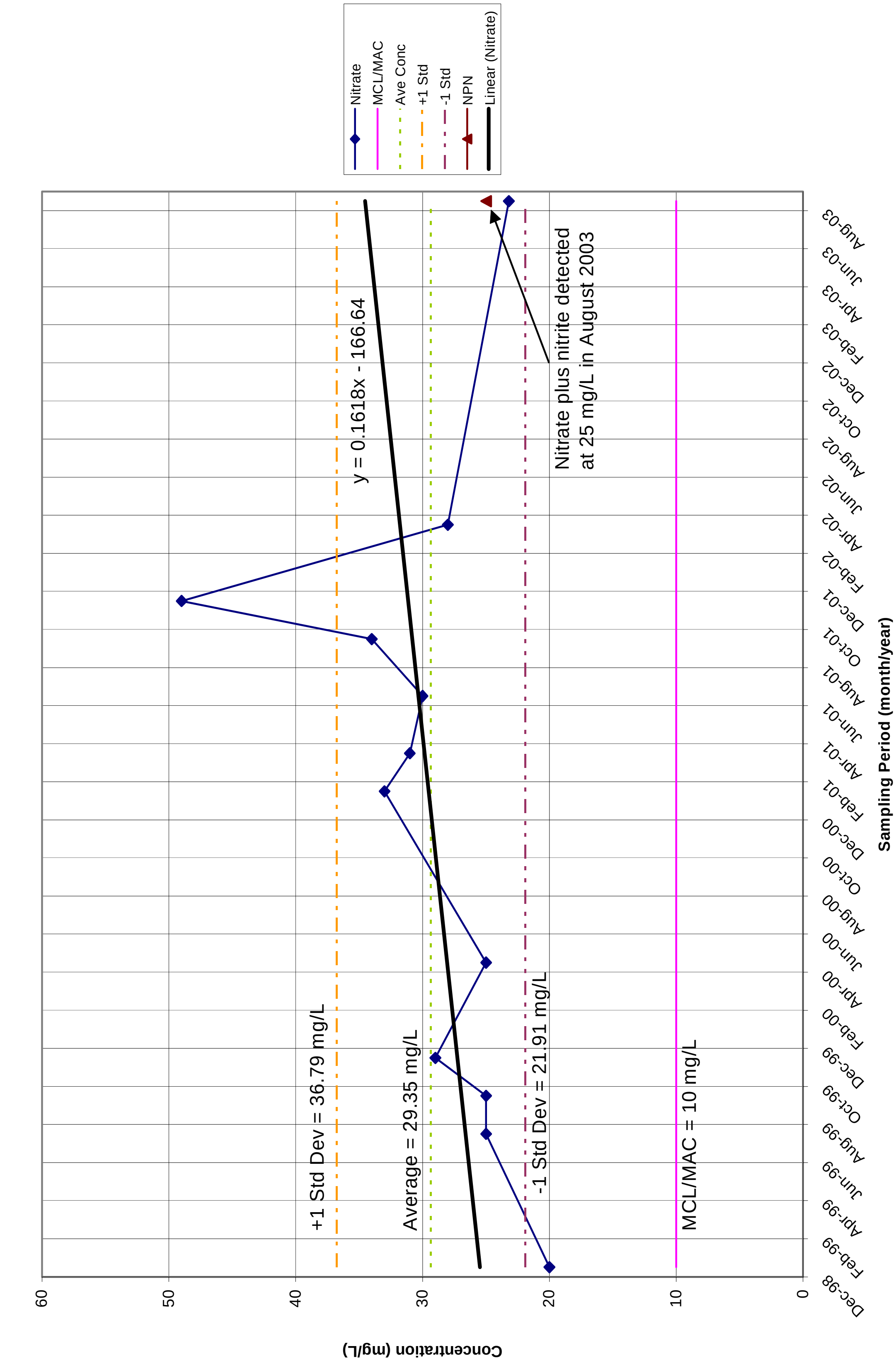

FIGURE B-12. Nitrate Concentrations, TJA-4

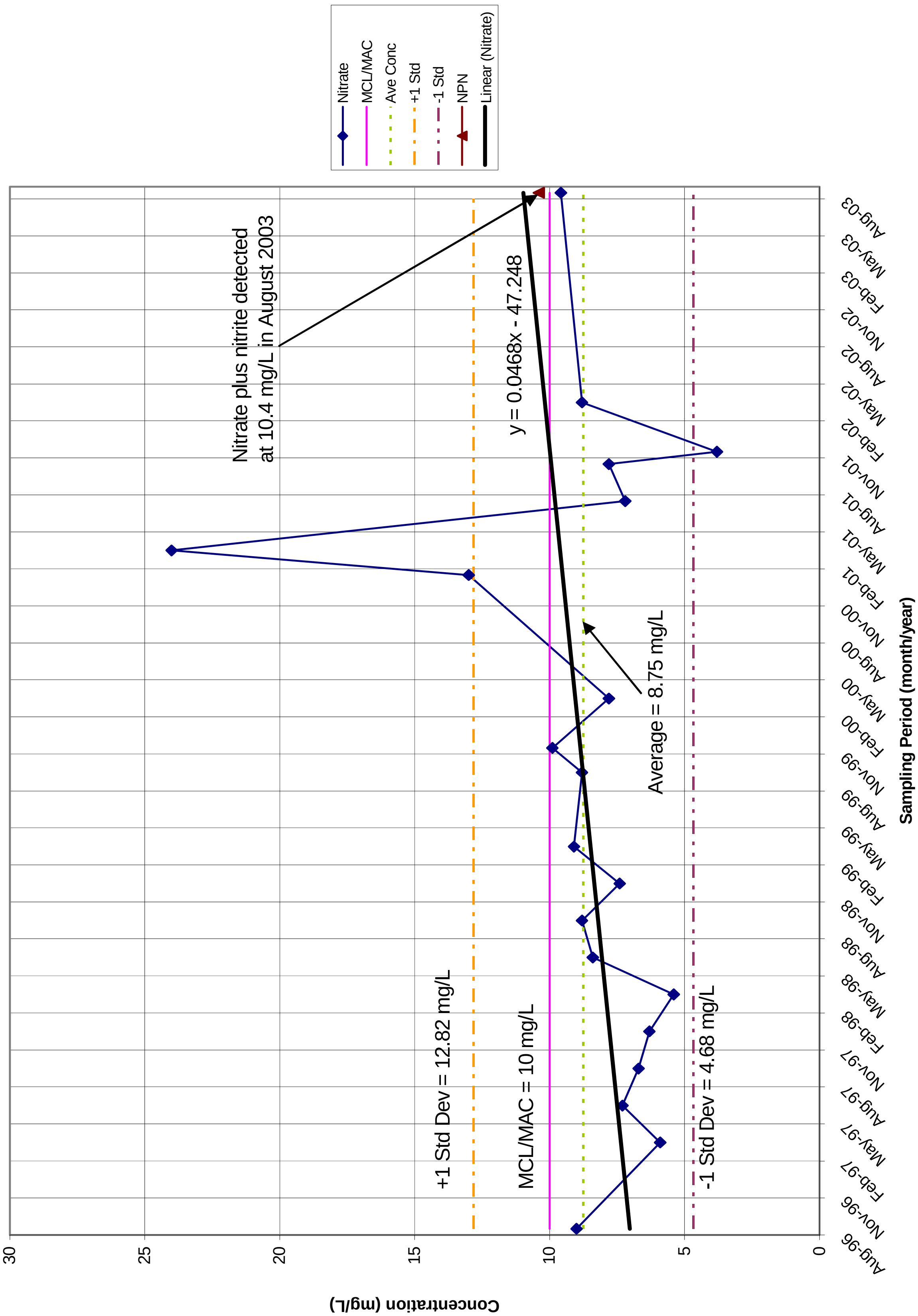

FIGURE B-13. Nitrate Concentrations, TA2-W-19

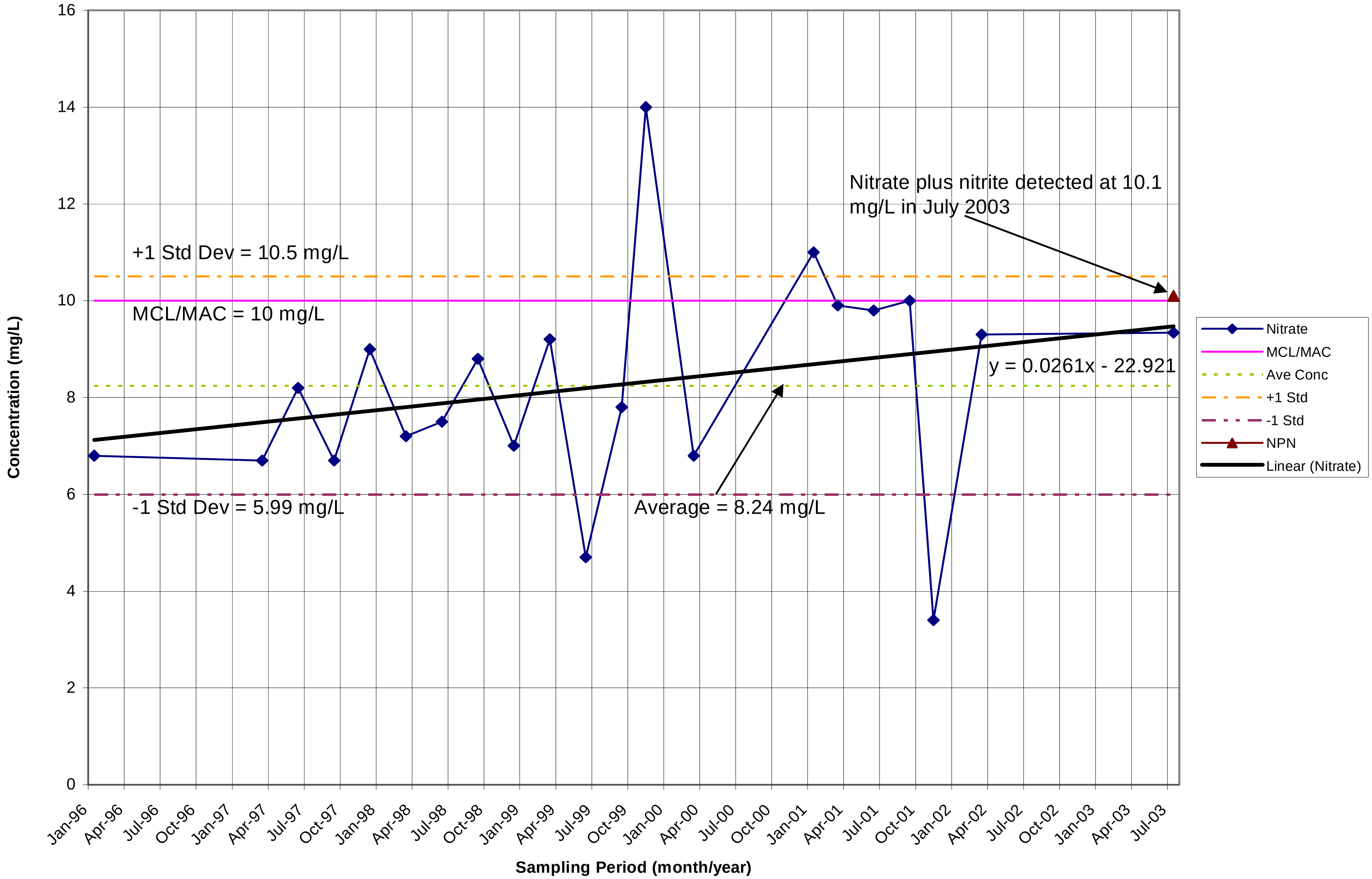

FIGURE B-14. Nitrate Concentrations, TJA-2

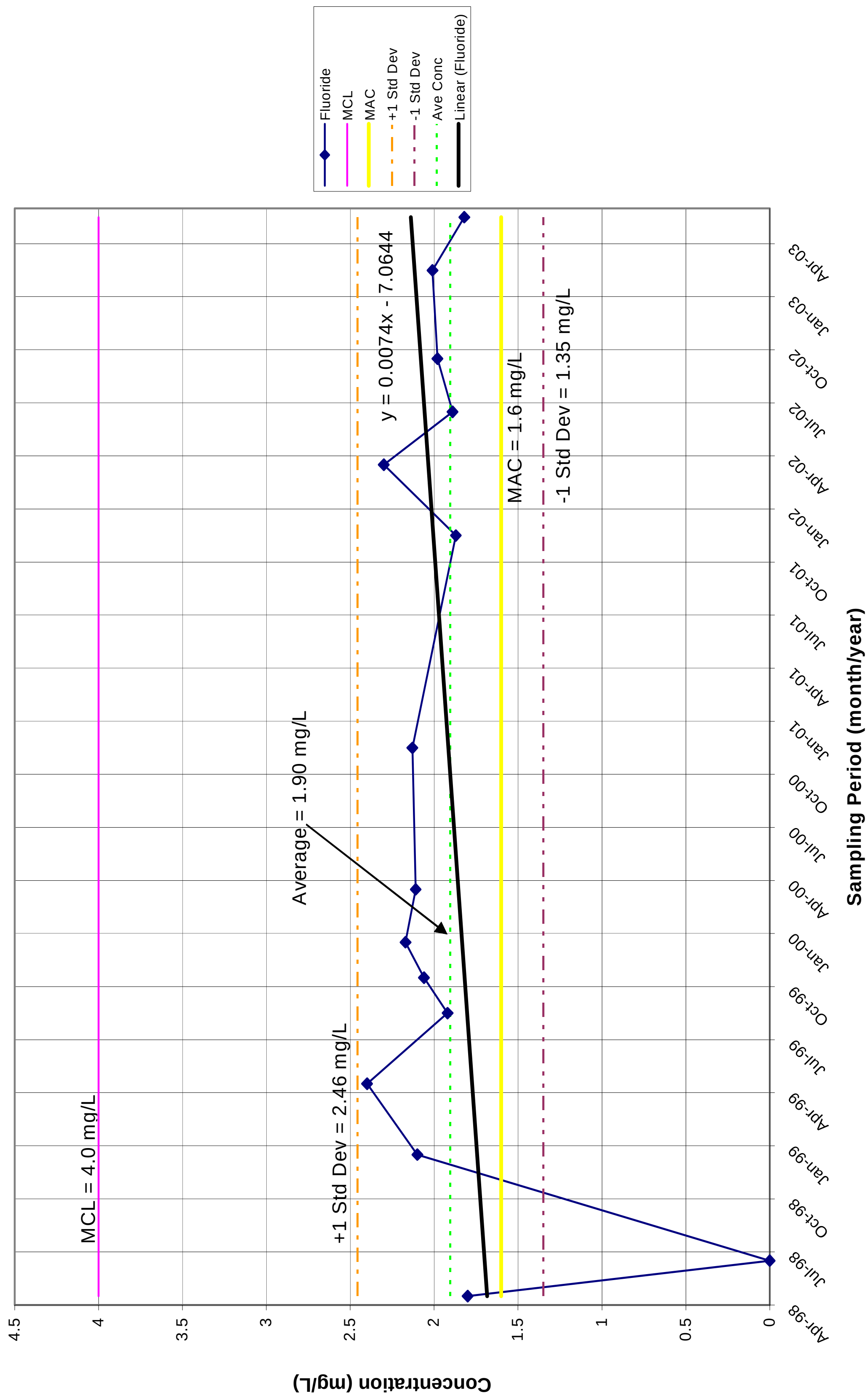

FIGURE B-15. Fluoride Concentrations, CYN-MW1D

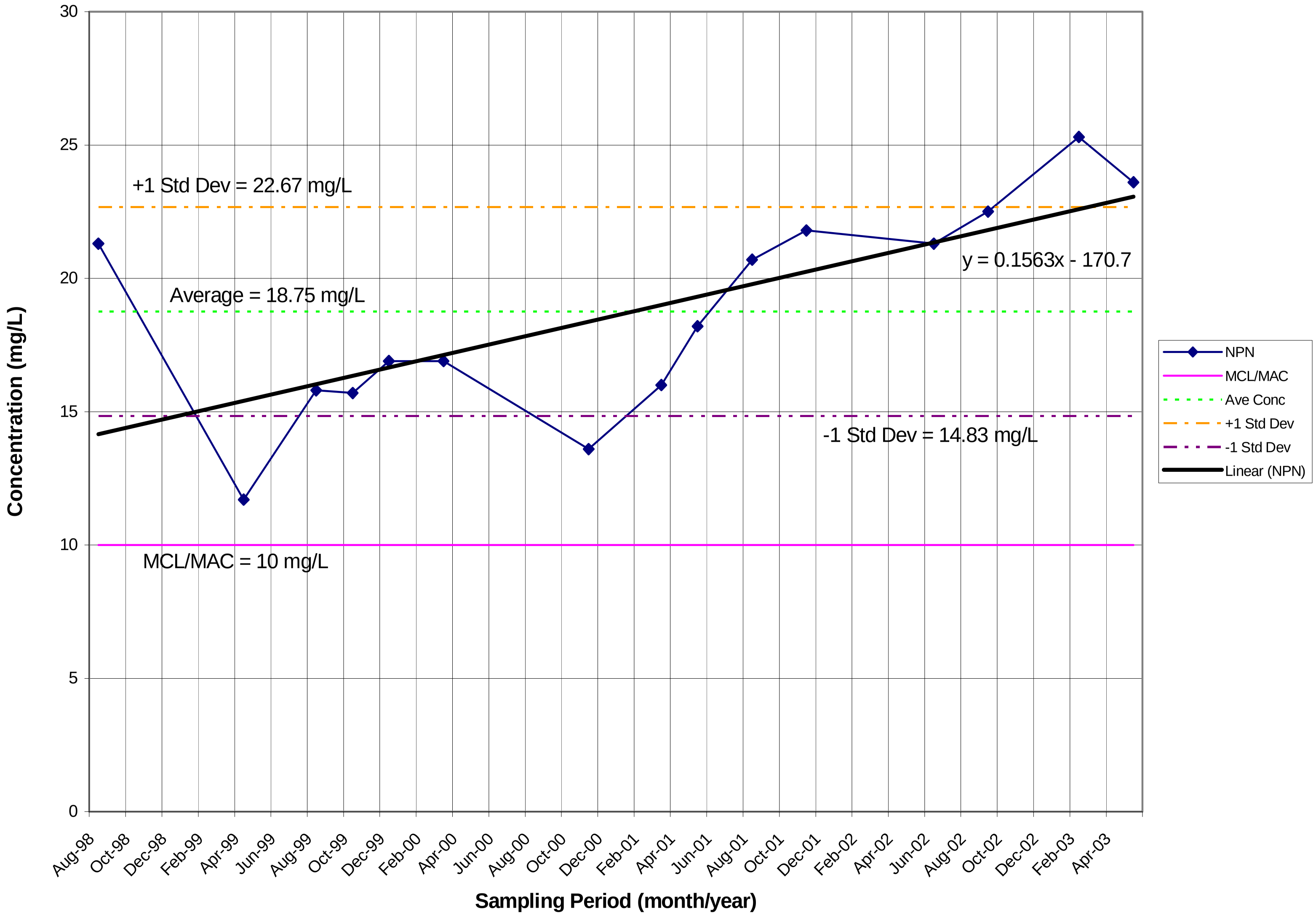

FIGURE B-16. Off-Site Nitrate plus Nitrite Concentrations, CYN-MW1D

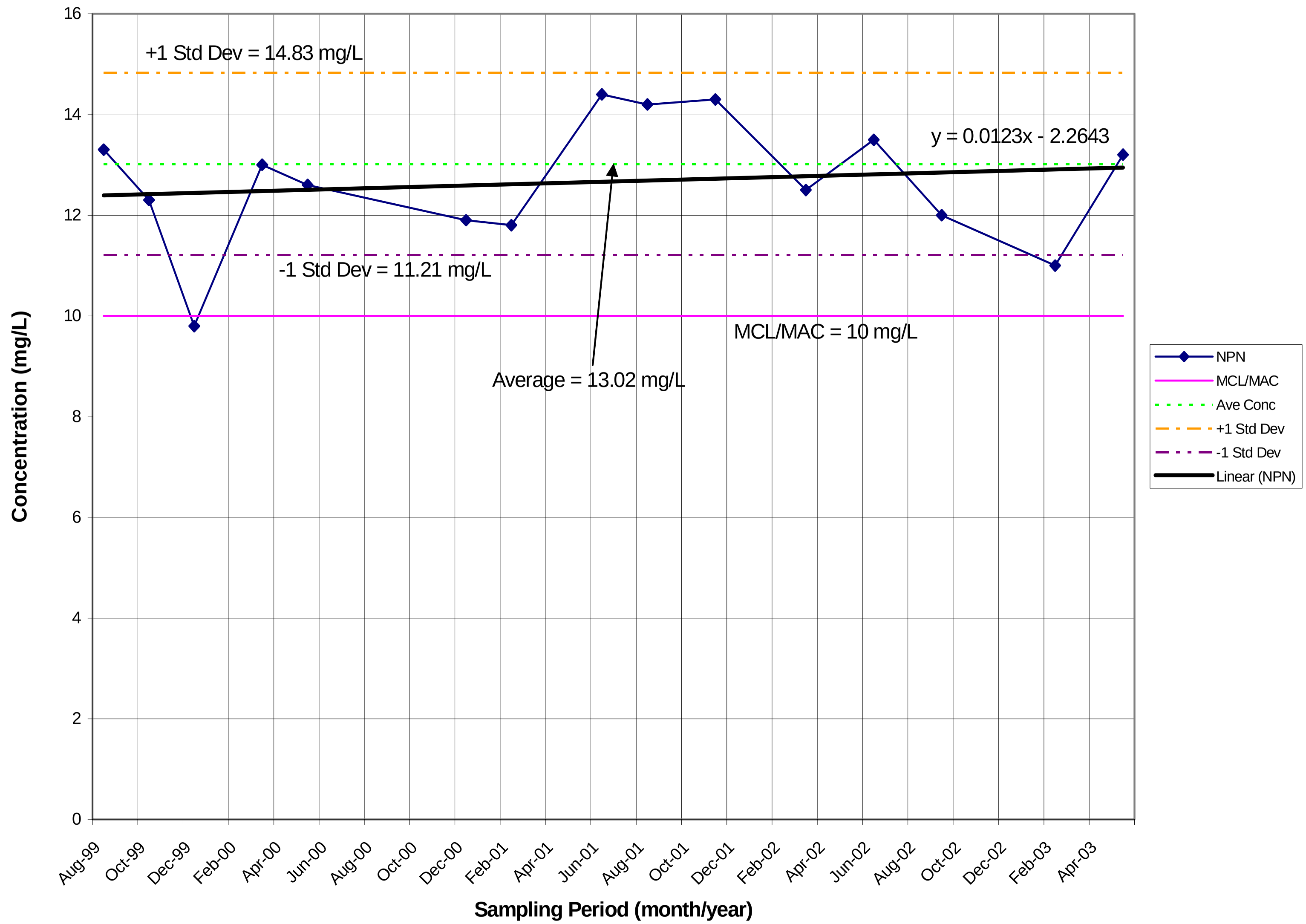

FIGURE B-17. Off-Site Nitrate plus Nitrite Concentrations, CYN-MW3

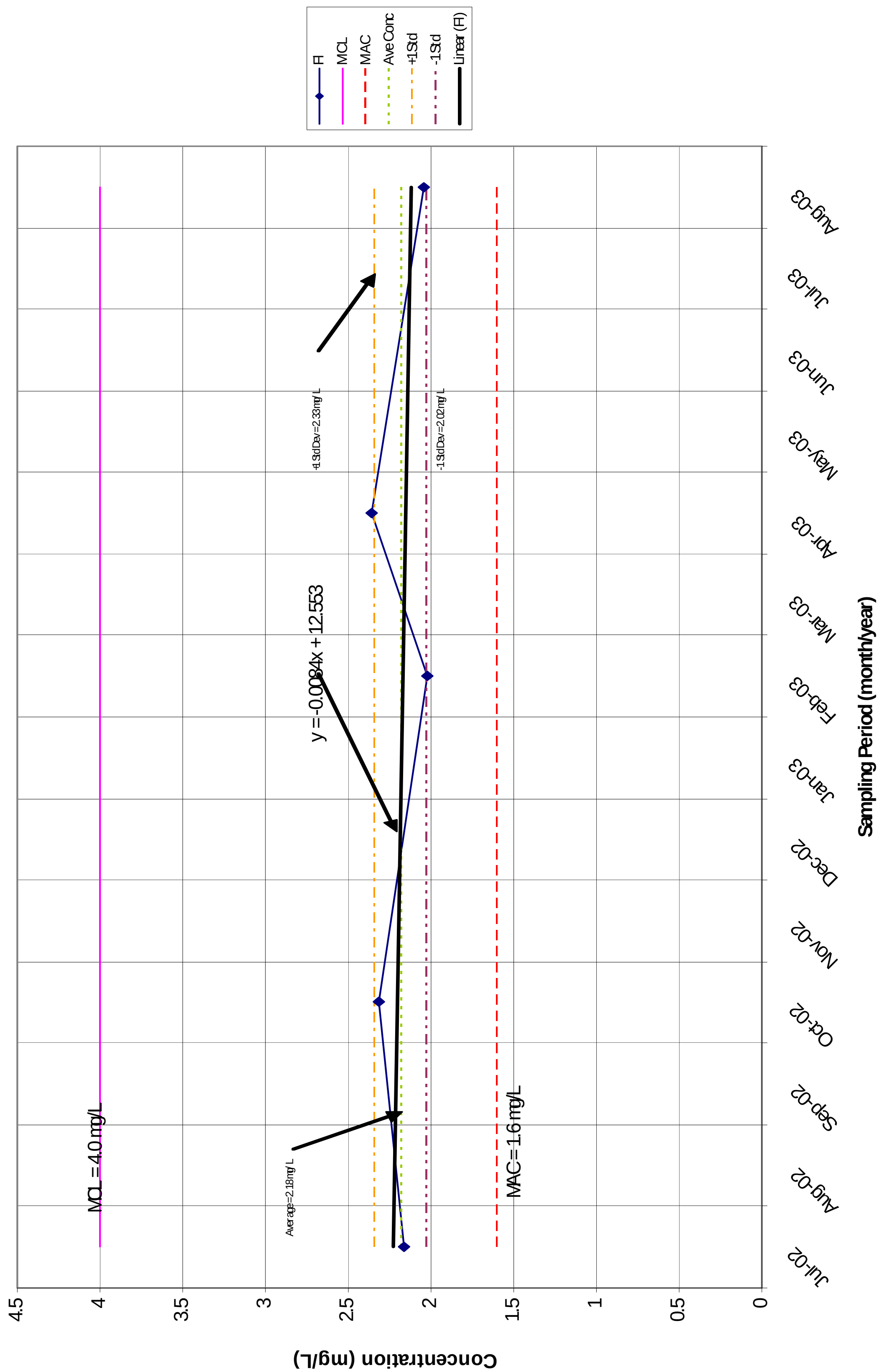

FIGURE B-18. Fluoride Concentrations, CTF-MW2

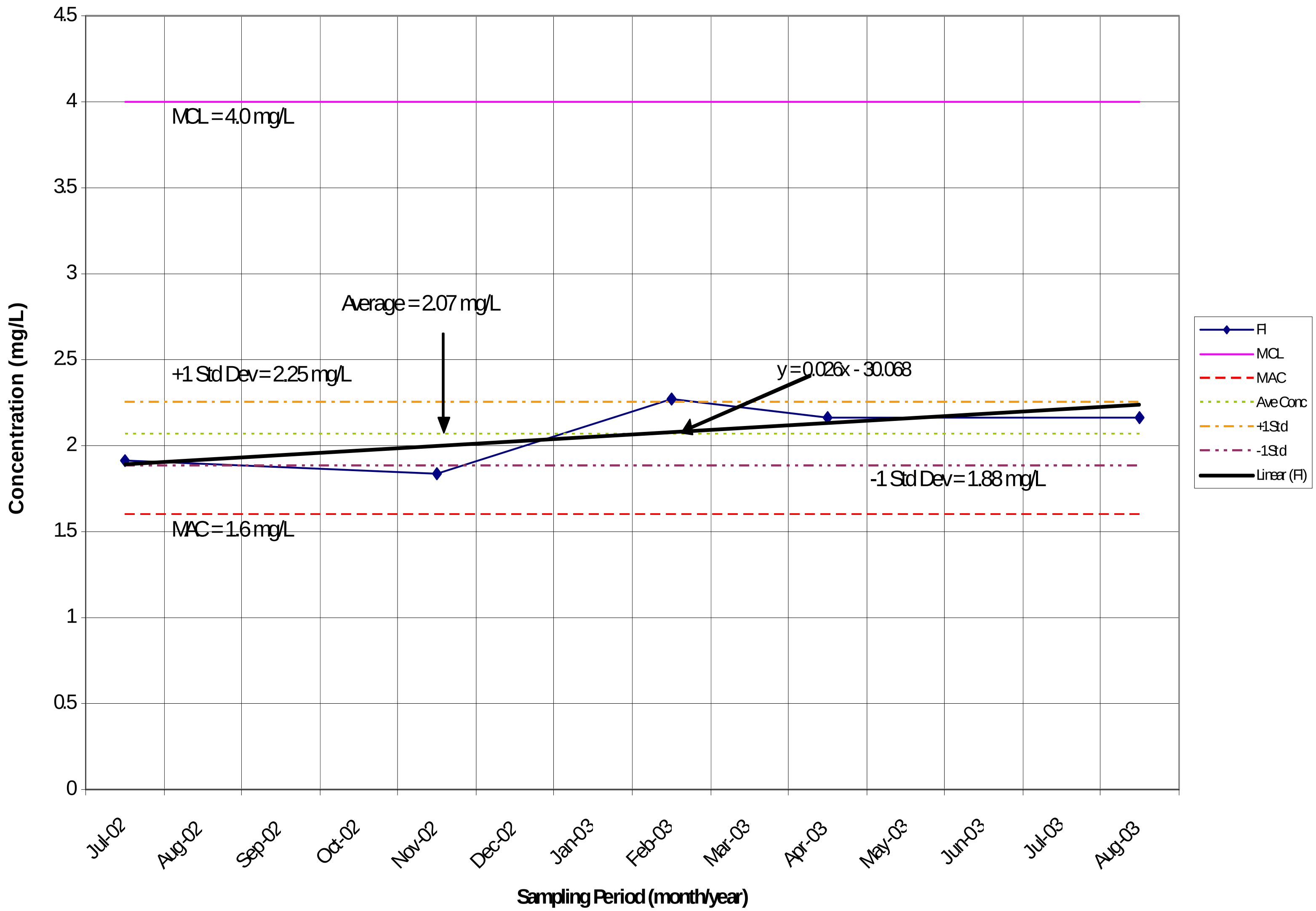

FIGURE B-19. Fluoride Concentrations, CTF-MW3

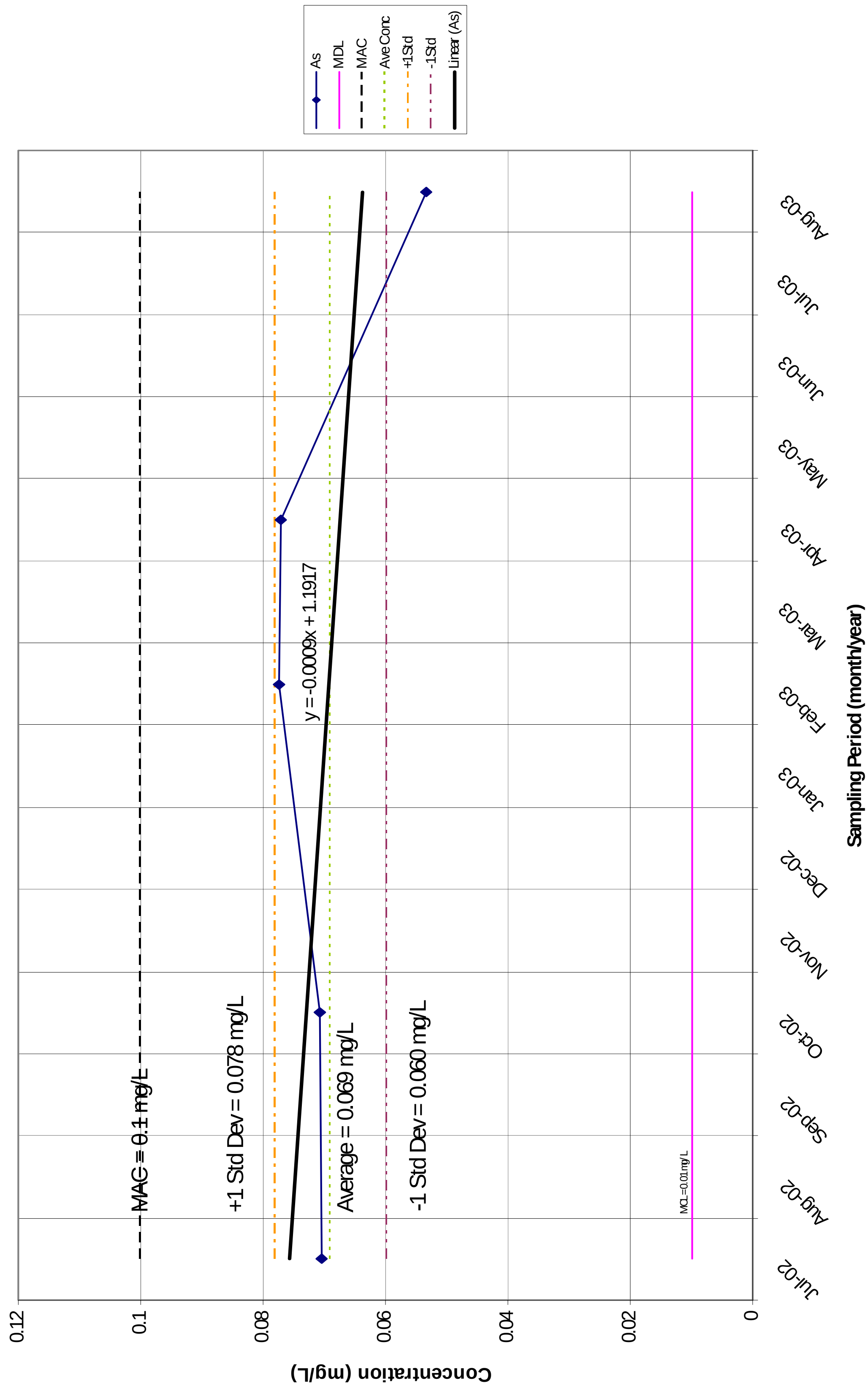

FIGURE B-20. Total Arsenic Concentrations, CTF-MW2

APPENDIX C

2003 Terrestrial Surveillance Results

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CONTENTS

TABLES

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C.1 Radiological Parameters:

Gamma-emitting radionuclides – Gamma spectroscopy is used to detect the emission of gamma radiation from radioactive materials. Radionuclide identification is possible by measuring the spectrum of gamma energies associated with a sample, since each radionuclide has a unique and consistent series of gamma emissions. Cesium–137 (Cs-137) is an example of a long-lived gamma emitter that is prevalent in the environment (as fallout from historical nuclear weapons testing) and is used as a possible indicator of environmental contamination from reactor facilities.

Tritium (H^3) radioisotope - H^3 is a radioactive isotope of hydrogen with a half-life of 12.5 years. Unlike the most common element of hydrogen ($_1H^1$), which has a single proton in its nucleus, H^3 contains one proton and two neutrons. Tritium occurs naturally at low levels in the environment, and as a result of fallout from past atmospheric nuclear weapons testing. It is also a possible contaminant associated with research and development (R&D).

Note on 2003 Tritium Analysis Results: Tritium is determined by distilling the moisture from a sample, and analyzing the extracted moisture by liquid scintillation counting. In 2003, due to insufficient soil moisture in many samples, the analytical laboratory was required to add distilled water to the extracted water to obtain sufficient sample volume to conduct the analysis. This action resulted in significantly higher detection limits for these samples, and per laboratory procedures, the results were reported in different units than normal (pCi/gram of soil rather than pCi/liter extracted moisture). Due to the higher detection limits, none of these samples had detectable tritium. These samples are reported on a different table in this appendix than the samples that were analyzed normally, and the results have not been used in any statistical analyses for CY03.

Uranium – Uranium occurs naturally in soils, and may also be present as a pollutant in the environment, due to past testing conducted at SNL/NM. Total uranium (U_{tot}) analysis is used to measure all uranium isotopes present in a sample. A high U_{tot} measurement may trigger an isotope-specific analysis to determine the possible source of uranium (natural or man-made, enriched or depleted).

External gamma radiation exposure rates - Thermoluminescent dosimeters (TLDs) are used to measure ambient gamma exposure rates. Several natural gamma radiation sources exist, including cosmic radiation and radioactive materials that exist in geologic materials at SNL/NM. Many sources of man-made gamma radiation also exist at SNL/NM, such as reactor and accelerator facilities. The TLD network was established to determine the regional gamma exposure rate due to natural sources and to determine the impact, if any, of SNL/NM's operations on these levels. The dosimeters are placed on aluminum poles at a height of approximately one meter, and are exchanged and measured quarterly (January, April, July, and October) at 36 on-site, perimeter and off-site locations.

Non-Radiological parameters:

All metals, except for mercury, are determined using the Inductively Coupled Plasma-Atomic Emission Spectrum (ICP-AES) method. Mercury is determined by the Cold Vapor Atomic Absorption method.

Definitions:

The following terminology is utilized in the tables in this appendix:

Definitions for Radiological Analysis Tables

Decision Level (or Critical Level): The activity concentration above which a sample is considered to have activity above the instrument background at a prescribed level of confidence. The decision level is calculated such that there is a five percent probability of reporting a false positive result for a sample containing no activity.

Detection Limit (or Minimum Detectable Activity): The true activity concentration in a sample that, if present, can be detected (i.e., above the decision level) at a prescribed level of confidence. The detection limit is calculated such that there is a five percent probability of reporting a false negative result for a sample containing activity at the detection limit.

Definitions for Metals Tables

Decision Level (or Method Detection Limit): The lowest concentration at which a substance can be detected in a sample at a prescribed level of confidence.

Detection Limit (or Practical Quantification Limit): The lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

TABLE C-1A. Radiological Results by Location for Calendar Year 2003, Soil

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
Off -Site	Cesium-137	pCi/g	8	0.0062 ± 0.0106	U	0.00941	0.0196
			9	0.214 ± 0.0344		0.0129	0.0267
			10	0.297 ± 0.0466		0.0131	0.0271
			11	0.0702 ± 0.0301		0.0151	0.0315
			25	0.0123 ± 0.0185	U	0.0095	0.0197
			62	0.394 ± 0.0566		0.0134	0.0278
	Total Uranium	µg/g	8	0.593		0.00589	0.0393
			9	0.427		0.00591	0.0394
			10	0.432		0.00599	0.0399
			11	0.546		0.00592	0.0394
			25	0.504		0.00592	0.0394
			62	1.34		0.006	0.04
	Tritium	pCi/mL	8	0.768 ± 0.225		0.13	0.266
			9	-0.127 ± 0.146	U	0.102	0.21
			10	-0.069 ± 0.14	U	0.12	0.25
			11	1.09 ± 0.233		0.124	0.258
			25	-0.169 ± 0.137	U	0.0963	0.198
			62	-0.144 ± 0.138	U	0.0965	0.198
Perimeter	Cesium-137	pCi/g	4	0.104 ± 0.0319		0.0145	0.0301
			5	0.209 ± 0.0308		0.0117	0.0241
			12	0.498 ± 0.0575		0.0112	0.0231
			16	0.0261 ± 0.0232	U	0.0127	0.0262
			19	0.619 ± 0.0852		0.0167	0.0344
			58	0.0638 ± 0.0261		0.0133	0.0274
			59	0.083 ± 0.0225		0.00975	0.0203
			60	0.0328 ± 0.0158		0.00811	0.0167
			61	0.017 ± 0.0126		0.00813	0.0168
			63	0.691 ± 0.0849		0.0105	0.0216
			64	1.24 ± 0.103		0.0136	0.028
			65E	0.122 ± 0.0224		0.0106	0.0218
			80	0.272 ± 0.0342		0.0106	0.0217
			81	0.489 ± 0.0583		0.0084	0.0173
			82	0.0308 ± 0.029	U	0.0168	0.0348
	Total Uranium	µg/g	4	0.355		0.00592	0.0394
			5	0.282		0.00589	0.0393
			12	0.59		0.00596	0.0398
			16	0.698		0.00598	0.0398
			19	1.35		0.00599	0.0399
			58	0.74		0.00596	0.0398
			59	0.682		0.00598	0.0398
			60	0.765		0.00588	0.0392
			61	0.429		0.00592	0.0394
			63	0.581		0.00593	0.0395
			64	0.814		0.00598	0.0398
			65E	1.3		0.00596	0.0398
			80	0.737		0.00592	0.0394
			81	0.411		0.00591	0.0394
			82	1.03		0.00592	0.0394
	Tritium	pCi/mL	63	0.0321 ± 0.141	U	0.117	0.243
			65E	0.603 ± 0.17		0.11	0.228
			80	0.224 ± 0.152	U	0.117	0.243
			81	0.0982 ± 0.142	U	0.115	0.24
			82	-0.0299 ± 0.132	U	0.112	0.235
On-Site	Cesium-137	pCi/g	1	0.251 ± 0.0425		0.014	0.0291
			3	0.0249 ± 0.0174		0.00984	0.0203
			6	0.34 ± 0.0442		0.0102	0.0214
			7	0.494 ± 0.0588		0.0117	0.0244
			2NE	0.187 ± 0.0235		0.00704	0.0145
			2NW	0.124 ± 0.0293		0.01	0.0206
			2SE	0.22 ± 0.0288		0.00912	0.0188
			2SW	0.208 ± 0.0454		0.0126	0.026
			20	0.466 ± 0.0565		0.00842	0.0173
			32E	0.0286 ± 0.0174		0.00791	0.0163
			32S	0.157 ± 0.0385		0.0113	0.0233
			33	0.141 ± 0.0334		0.0127	0.0263
			34	0.0741 ± 0.0303		0.0121	0.0251
			35	0.69 ± 0.0559		0.0122	0.0252
			41	0.127 ± 0.0401		0.0144	0.0298

See notes at end of table.

TABLE C-1A. Radiological Results by Location for Calendar Year 2003, Soil (concluded)

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
On-Site (concluded)	Cesium-137 (concluded)	pCi/g	42	0.0609 ± 0.0249		0.0119	0.0248
			43	0.0725 ± 0.0379		0.0145	0.0302
			45	0.276 ± 0.0406		0.00804	0.0166
			46	0.123 ± 0.0241		0.00917	0.0189
			49	0.623 ± 0.0786		0.0138	0.0284
			51	0.0345 ± 0.0197		0.0116	0.0241
			52	0.0759 ± 0.0239		0.0112	0.0229
			53	0.139 ± 0.0193		0.00857	0.0176
			54	0.203 ± 0.0339		0.0106	0.0222
			55	0.547 ± 0.0668		0.00862	0.0178
			56	0.0236 ± 0.0142		0.00607	0.0124
			57	0.041 ± 0.0173		0.0123	0.0253
			66	0.104 ± 0.0242		0.00866	0.0179
			76	0.201 ± 0.0303		0.00971	0.02
			77	0.404 ± 0.0639		0.014	0.0288
			78	0.561 ± 0.0645		0.012	0.025
	Total Uranium	μg/g	1	0.672		0.00599	0.0399
			3	0.567		0.00596	0.0398
			6	0.367		0.00593	0.0395
			7	0.435		0.006	0.04
			2NE	0.333		0.00599	0.0399
			2NW	0.248		0.00596	0.0398
			2SE	0.299		0.00596	0.0398
			2SW	0.281		0.00594	0.0396
			20	0.542		0.00599	0.0399
			32E	0.57		0.00596	0.0398
			32S	0.57		0.006	0.04
			33	0.853		0.00589	0.0393
			34	0.597		0.00599	0.0399
			35	0.4		0.00592	0.0394
			41	0.337		0.00591	0.0394
			42	0.459		0.006	0.04
			43	0.375		0.00594	0.0396
			45	0.293		0.00594	0.0396
			46	0.484		0.00593	0.0395
			49	0.623		0.00594	0.0396
			51	0.477		0.00589	0.0393
			52	0.599		0.00591	0.0394
			53	0.334		0.00592	0.0394
			54	0.371		0.00595	0.0397
			55	0.504		0.00599	0.0399
			56	0.795		0.00592	0.0394
			57	0.68		0.00591	0.0394
			66	0.504		0.00598	0.0398
			76	0.475		0.00589	0.0393
			77	0.4		0.00596	0.0398
			78	0.422		0.006	0.04
	Tritium	pCi/mL	32E	0.031 ± 0.123	U	0.102	0.213
			32S	0.0649 ± 0.131	U	0.107	0.223
			34	0.5 ± 0.184		0.128	0.268
			52	-0.615 ± 0.253	U	0.128	0.26
			53	0.0906 ± 0.124	U	0.0993	0.208
			56	-0.524 ± 0.462	U	0.406	0.812

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
μg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.

TABLE C-1B. Radiological Results by Location for Calendar Year 2003, Soil

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
Perimeter	Tritium	pCi/g *	4	-0.0706 ± 0.516	U	0.436	0.871
			5	-0.576 ± 0.625	U	0.549	1.1
			12	-0.0331 ± 0.59	U	0.497	0.993
			16	-0.549 ± 0.544	U	0.48	0.96
			19	-0.548 ± 0.613	U	0.537	1.07
			58	-0.166 ± 0.619	U	0.527	1.05
			59	0.265 ± 0.595	U	0.488	0.976
			60	-0.513 ± 0.453	U	0.398	0.796
			61	-0.513 ± 0.453	U	0.398	0.795
			64	-0.0143 ± 0.594	U	0.499	0.998
On-Site	Tritium	pCi/g *	1	-0.469 ± 0.425	U	0.385	0.771
			20	0.226 ± 0.817	U	0.674	1.35
			2NE	-0.414 ± 0.461	U	0.401	0.802
			2NW	-0.624 ± 0.455	U	0.403	0.806
			2SE	-0.307 ± 0.46	U	0.397	0.794
			2SW	-0.311 ± 0.465	U	0.402	0.803
			3	0.446 ± 0.598	U	0.483	0.965
			33	-0.177 ± 0.589	U	0.502	1
			35	-0.505 ± 0.421	U	0.385	0.77
			41	-0.574 ± 0.443	U	0.407	0.814
			42	-0.204 ± 0.448	U	0.388	0.777
			43	-0.389 ± 0.443	U	0.264	0.792
			45	-0.413 ± 0.389	U	0.352	0.703
			46	0.476 ± 0.821	U	0.665	1.33
			49	-0.166 ± 0.551	U	0.47	0.939
			51	-0.388 ± 0.442	U	0.395	0.79
			54	-0.244 ± 0.46	U	0.401	0.803
			55	-0.136 ± 0.621	U	0.527	1.05
			57	0.608 ± 0.846	U	0.679	1.36
			6	-0.546 ± 0.421	U	0.387	0.775
			66	-0.666 ± 0.45	U	0.419	0.838
			7	-0.183 ± 0.45	U	0.389	0.779
			76	-0.213 ± 0.608	U	0.519	1.04
			77	-0.195 ± 0.558	U	0.476	0.953
			78	-0.0329 ± 0.586	U	0.493	0.986

NOTES: pCi/g = picocurie per gram.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
*Tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.

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TABLE C-2A. Radiological Results by Location for Calendar Year 2003, Sediment

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
Off-site	Cesium-137	pCi/g	8	0.103 ± 0.0341		0.0125	0.026
			11	0.0722 ± 0.0247		0.0121	0.0254
			68	0.0536 ± 0.0182		0.00826	0.0172
	Total Uranium	μg/g	8	0.655		0.00595	0.0397
			11	0.381		0.00591	0.0394
			68	0.875		0.00592	0.0394
	Tritium	pCi/mL	8	-0.0263 ± 0.14	U	0.118	0.246
			11	0.296 ± 0.16		0.12	0.249
			68	-0.228 ± 0.134	U	0.0952	0.196
Perimeter	Cesium-137	pCi/g	60	0.0375 ± 0.0137		0.00717	0.0148
			65E	0.112 ± 0.0211		0.00833	0.0172
			73	0.174 ± 0.0268		0.00951	0.0196
	Total Uranium	μg/g	60	0.756		0.00596	0.0398
			65E	1.08		0.00589	0.0393
			73	0.984		0.00595	0.0397
	Tritium	pCi/mL	60	0 ± 0.146	U	0.122	0.254
			65E	0.423 ± 0.157		0.11	0.229
On-Site	Cesium-137	pCi/g	56	0.0236 ± 0.0142		0.00607	0.0124
			72	0.0169 ± 0.012	U	0.00996	0.0206
			74	0.0129 ± 0.0166	U	0.00989	0.0203
			75	0.191 ± 0.0317		0.0111	0.023
			79	0.0954 ± 0.0295		0.0127	0.0263
	Total Uranium	μg/g	56	0.795		0.00592	0.0394
			72	0.893		0.00599	0.0399
			74	0.604		0.00592	0.0394
			75	0.838		0.00592	0.0394
			79	1.1		0.00592	0.0394

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
μg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level. Tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.

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TABLE C-2B. Radiological Results by Location for Calendar Year 2003, Sediment

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
Perimeter	Tritium	pCi/g *	73	-1.35 ± 0.875	U	0.789	1.58
On-Site	Tritium	pCi/g *	56	-0.524 ± 0.462	U	0.406	0.812
			72	-0.157 ± 0.585	U	0.498	0.995
			74	0.7 ± 0.837	U	0.666	1.33
			75	-0.313 ± 0.476	U	0.419	0.838
			79	0.163 ± 0.624	U	0.517	1.03

NOTES: pCi/g = picocurie per gram

U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.

* Tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.

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TABLE C-3. Radiological Results by Location for Calendar Year 2003, Vegetation

Location Type	Analyte	Units	Location	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit
Off-Site	Cesium-137	pCi/g	8	-0.121 ± 0.111	U	0.0817	0.173
			11	-0.0368 ± 0.0552	U	0.0423	0.0887
			25	0 ± 0.352	UX	0.258	0.528
	Total Uranium	μg/g	8	0.0116	J	0.006	0.04
			11	0.00594	U	0.00594	0.0396
			25	0.00599	U	0.00599	0.0399
	Tritium	pCi/mL	8	0.108 ± 0.121	U	0.0958	0.201
			11	0.192 ± 0.152	U	0.119	0.249
			25	0.112 ± 0.125	U	0.0995	0.209
Perimeter	Cesium-137	pCi/g	4	0.0135 ± 0.0204	U	0.0173	0.0364
			5	0.0111 ± 0.0233	U	0.0194	0.0405
			60	0 ± 0.0498	UX	0.0412	0.0856
			63	-0.00285 ± 0.0308	U	0.0246	0.0508
	Total Uranium	μg/g	4	0.034	J	0.00596	0.0398
			5	0.00599	U	0.00599	0.0399
			60	0.00599	U	0.00599	0.0399
			63	0.00595	U	0.00595	0.0397
	Tritium	pCi/mL	4	0.0335 ± 0.164	U	0.122	0.252
			5	0.237 ± 0.162		0.105	0.217
			60	0.814 ± 0.235		0.142	0.293
			63	0.354 ± 0.175		0.12	0.248
On-Site	Cesium-137	pCi/g	2NE	0.0043 ± 0.0222	U	0.0162	0.034
			2NW	0.0059 ± 0.0204	U	0.0167	0.0351
			33	0 ± 0.0538	UX	0.0449	0.0932
			34	-0.00399 ± 0.0204	U	0.0163	0.0339
			35	0.00881 ± 0.0236	U	0.0197	0.0414
			43	0.00231 ± 0.0189	U	0.0155	0.0324
			51	0 ± 0.0203	UX	0.0177	0.0371
			52	-0.000673 ± 0.0139	U	0.0114	0.0235
			55	0 ± 0.0395	UX	0.0195	0.0409
	Total Uranium	μg/g	2NE	0.00596	U	0.00596	0.0398
			2NW	0.00596	U	0.00596	0.0398
			33	0.00769	J	0.00592	0.0394
			34	0.006	U	0.006	0.04
			35	0.00797	J	0.00598	0.0398
			43	0.00599	U	0.00599	0.0399
			51	0.0111	J	0.00595	0.0397
			52	0.00676	J	0.00596	0.0398
			55	0.00978	J	0.00599	0.0399
	Tritium	pCi/mL	2NE	2.53 ± 0.364		0.132	0.273
			2NW	3 ± 0.325		0.111	0.23
			33	0.051 ± 0.13	U	0.107	0.224
			34	0.334 ± 0.15		0.11	0.23
			35	0.175 ± 0.161	U	0.116	0.239
			43	0.215 ± 0.156		0.102	0.21
			51	0.348 ± 0.173		0.119	0.245
			52	0.257 ± 0.174		0.122	0.253
			55	0.298 ± 0.18		0.125	0.259

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
μg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
X = Presumptive evidence that analyte is not present.
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

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TABLE C-4. Non-radiological Results for Off-site by Location for Calendar Year 2003, Soil
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-site	**8**	Aluminum	5680		0.721	9.09
		Antimony	0.405	J	0.312	0.909
		Arsenic	3.9		0.188	0.455
		Barium	139		0.0606	0.455
		Beryllium	0.358	J	0.0455	0.455
		Cadmium	0.153	J	0.0435	0.455
		Calcium	15800		1.19	9.09
		Chromium	10.9		0.146	0.455
		Cobalt	4.47		0.0725	0.455
		Copper	16.2		0.185	0.455
		Iron	15200		1.42	9.09
		Lead	13.1		0.258	0.455
		Magnesium	3040		0.532	9.09
		Manganese	243		0.119	0.909
		Mercury	0.00489	J	0.000973	0.0099
		Nickel	11.4		0.0776	0.455
		Potassium	1410		3.25	9.09
		Selenium	0.147	U	0.147	0.455
		Silver	0.082	U	0.082	0.455
		Sodium	799		3.3	9.09
		Thallium	0.909	U	0.909	0.909
		Vanadium	20.2		0.0825	0.455
		Zinc	245	B	0.153	0.455
	9	Aluminum	15300		0.721	9.09
		Antimony	0.312	U	0.312	0.909
		Arsenic	4.9		0.188	0.455
		Barium	196		0.0606	0.455
		Beryllium	0.761		0.0455	0.455
		Cadmium	0.177	J	0.0435	0.455
		Calcium	41100		1.19	9.09
		Chromium	17.8		0.146	0.455
		Cobalt	7.92		0.0725	0.455
		Copper	13.8		0.185	0.455
		Iron	15700		1.42	9.09
		Lead	13.2		0.258	0.455
		Magnesium	4770		0.532	9.09
		Manganese	457		0.119	0.909
		Mercury	0.0152		0.000913	0.00929
		Nickel	13.7		0.0776	0.455
		Potassium	2190		3.25	9.09
		Selenium	0.147	U	0.147	0.455
		Silver	0.082	U	0.082	0.455
		Sodium	56.6		3.3	9.09
		Thallium	0.909	U	0.909	0.909
		Vanadium	34.8		0.0825	0.455
		Zinc	43.3	B	0.153	0.455

See notes at end of table.

TABLE C-4. Non-radiological Results for Off-site by Location for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-site (continued)	**10**	Aluminum	12500		0.778	9.8
		Antimony	0.356	J	0.337	0.98
		Arsenic	2.89		0.202	0.49
		Barium	96.5		0.0654	0.49
		Beryllium	0.618		0.049	0.49
		Cadmium	0.195	J	0.0469	0.49
		Calcium	37400		1.28	9.8
		Chromium	14.9		0.158	0.49
		Cobalt	5.66		0.0782	0.49
		Copper	9.53		0.199	0.49
		Iron	13300		1.54	9.8
		Lead	8.59		0.278	0.49
		Magnesium	2990		0.573	9.8
		Manganese	459		0.128	0.98
		Mercury	0.0109		0.000944	0.0096
		Nickel	10.8		0.0837	0.49
		Potassium	2120		3.51	9.8
		Selenium	0.159	U	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	40.1		3.56	9.8
		Thallium	0.98	U	0.98	0.98
		Vanadium	27.2		0.089	0.49
		Zinc	29.8	B	0.165	0.49
	11	Aluminum	4670	B	0.77	9.71
		Antimony	0.333	U	0.333	0.971
		Arsenic	2.57		0.2	0.485
		Barium	172		0.0648	0.485
		Beryllium	0.3	J	0.0485	0.485
		Cadmium	0.0709	J	0.0464	0.485
		Calcium	12500	B	1.27	9.71
		Chromium	6.93		0.156	0.485
		Cobalt	3.31		0.0775	0.485
		Copper	5.25		0.197	0.485
		Iron	8790		1.52	9.71
		Lead	8.41		0.275	0.485
		Magnesium	2320	B	0.568	9.71
		Manganese	283		0.127	0.971
		Mercury	0.00153	J	0.000888	0.00904
		Nickel	5.59	B	0.0829	0.485
		Potassium	1280		3.47	9.71
		Selenium	0.77	J	0.393	1.21
		Silver	0.0876	U	0.0876	0.485
		Sodium	139		3.53	9.71
		Thallium	0.971	U	0.971	1.94
		Vanadium	19.6		0.0882	0.485
		Zinc	22.4		0.163	0.485

See notes at end of table.

TABLE C-4. Non-radiological Results for Off-site by Location for Calendar Year 2003, Soil (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-site (concluded)	**25**	Aluminum	4850		0.721	9.09
		Antimony	0.43	J	0.312	0.909
		Arsenic	4.19		0.188	0.455
		Barium	128		0.0606	0.455
		Beryllium	0.29	J	0.0455	0.455
		Cadmium	0.213	J	0.0435	0.455
		Calcium	42500		1.19	9.09
		Chromium	6.9		0.146	0.455
		Cobalt	3.14		0.0725	0.455
		Copper	7.33		0.185	0.455
		Iron	7720		1.42	9.09
		Lead	9.66		0.258	0.455
		Magnesium	2090		0.532	9.09
		Manganese	213		0.119	0.909
		Mercury	0.00549	J	0.000856	0.00871
		Nickel	6.15		0.0776	0.455
		Potassium	1100		3.25	9.09
		Selenium	0.147	U	0.147	0.455
		Silver	0.082	U	0.082	0.455
		Sodium	176		3.3	9.09
		Thallium	0.909	U	0.909	0.909
		Vanadium	17.5		0.0825	0.455
		Zinc	30.4	B	0.153	0.455
	62	Aluminum	14700		0.741	9.35
		Antimony	0.321	U	0.321	0.935
		Arsenic	3.65		0.193	0.467
		Barium	155		0.0623	0.467
		Beryllium	0.743		0.0467	0.467
		Cadmium	0.263	J	0.0447	0.467
		Calcium	29700		3.05	23.4
		Chromium	18.3		0.151	0.467
		Cobalt	7.39		0.0746	0.467
		Copper	11.9		0.19	0.467
		Iron	15300		1.46	9.35
		Lead	10.2		0.265	0.467
		Magnesium	3920		1.37	23.4
		Manganese	463		0.122	0.935
		Mercury	0.0168		0.000919	0.00935
		Nickel	16.2		0.0798	0.467
		Potassium	3350		8.36	23.4
		Selenium	0.151	U	0.151	0.467
		Silver	0.0843	U	0.0843	0.467
		Sodium	48		3.39	9.35
		Thallium	2.34	U	2.34	2.34
		Vanadium	28.6		0.0849	0.467
		Zinc	43.6	B	0.157	0.467

NOTES: B = The analyte was found in the blank above the effective minimum detection limit (MDL) (organics), or the effective practical quantitation limit (PQL) (inorganics).

J = Estimated value, the analyte concentration fell above the effective minimum detection limit (MDL) and below the effective practical quantitation limit(PQL).

U =The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective minimum detection limit (MDL). For radiochemical

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TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Soil
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter	**4**	Aluminum	8390	B	0.763	9.62
		Antimony	0.362	J	0.33	0.962
		Arsenic	2.67		0.198	0.481
		Barium	81		0.0641	0.481
		Beryllium	0.365	J	0.0481	0.481
		Cadmium	0.046	U	0.046	0.481
		Calcium	18400	B	1.25	9.62
		Chromium	8.2		0.155	0.481
		Cobalt	2.89		0.0767	0.481
		Copper	6.01		0.488	1.2
		Iron	8940		3.77	24
		Lead	6.91		0.273	0.481
		Magnesium	2730		0.562	9.62
		Manganese	124		0.126	0.962
		Mercury	0.00728	J	0.000917	0.00933
		Nickel	6.01	B	0.0821	0.481
		Potassium	2350		3.44	9.62
		Selenium	0.444	J	0.156	0.481
		Silver	0.0867	U	0.0867	0.481
		Sodium	42.7		3.49	9.62
		Thallium	0.962	U	0.962	0.962
		Vanadium	17.7		0.0873	0.481
		Zinc	27.6		0.405	1.2
	5	Aluminum	6680	B	0.77	9.71
		Antimony	0.369	J	0.333	0.971
		Arsenic	1.77		0.2	0.485
		Barium	53.1		0.0648	0.485
		Beryllium	0.309	J	0.0485	0.485
		Cadmium	0.0755	J	0.0464	0.485
		Calcium	1270	B	1.27	9.71
		Chromium	6.79		0.156	0.485
		Cobalt	2.35		0.0775	0.485
		Copper	5.09		0.493	1.21
		Iron	7130		3.8	24.3
		Lead	6.9		0.275	0.485
		Magnesium	1540		0.568	9.71
		Manganese	132		0.127	0.971
		Mercury	0.00758	J	0.000892	0.00908
		Nickel	4.6	B	0.0829	0.485
		Potassium	1430		3.47	9.71
		Selenium	0.253	J	0.157	0.485
		Silver	0.0876	U	0.0876	0.485
		Sodium	23.8		3.53	9.71
		Thallium	0.971	U	0.971	0.971
		Vanadium	12.5		0.0882	0.485
		Zinc	21.9		0.408	1.21

See to notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	**12**	Aluminum	12000	B	0.748	9.43
		Antimony	0.585	J	0.324	0.943
		Arsenic	3.27		0.195	0.472
		Barium	124		0.0629	0.472
		Beryllium	0.527		0.0472	0.472
		Cadmium	0.125	J	0.0451	0.472
		Calcium	5370	B	1.23	9.43
		Chromium	12.7		0.152	0.472
		Cobalt	6.45		0.0753	0.472
		Copper	12		0.479	1.18
		Iron	15800		3.7	23.6
		Lead	11.1		0.268	0.472
		Magnesium	3840		0.552	9.43
		Manganese	293		0.123	0.943
		Mercury	0.0113		0.000902	0.00917
		Nickel	9.56	B	0.0806	0.472
		Potassium	2240		3.37	9.43
		Selenium	0.222	J	0.153	0.472
		Silver	0.0851	U	0.0851	0.472
		Sodium	59.9		3.43	9.43
		Thallium	0.943	U	0.943	0.943
		Vanadium	29.7		0.0857	0.472
		Zinc	40.3		0.397	1.18
	16	Aluminum	10100	B	0.785	9.9
		Antimony	0.372	J	0.34	0.99
		Arsenic	2.29		0.204	0.495
		Barium	86		0.066	0.495
		Beryllium	0.496		0.0495	0.495
		Cadmium	0.108	J	0.0473	0.495
		Calcium	6040	B	1.29	9.9
		Chromium	8.55		0.16	0.495
		Cobalt	6.85		0.079	0.495
		Copper	10.8		0.502	1.24
		Iron	17300		3.88	24.8
		Lead	9.27		0.281	0.495
		Magnesium	4240		0.579	9.9
		Manganese	301		0.13	0.99
		Mercury	0.0105		0.000909	0.00924
		Nickel	7.4	B	0.0846	0.495
		Potassium	2730		3.54	9.9
		Selenium	0.375	J	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	51.7		3.6	9.9
		Thallium	2.48	U	2.48	2.48
		Vanadium	28.9		0.0899	0.495
		Zinc	64.6		0.417	1.24

See to notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	**19**	Aluminum	13500	B	0.793	10
		Antimony	0.343	U	0.343	1
		Arsenic	4.26		0.206	0.5
		Barium	116		0.0667	0.5
		Beryllium	0.565		0.05	0.5
		Cadmium	0.113	J	0.0478	0.5
		Calcium	13600	B	1.3	10
		Chromium	20		0.161	0.5
		Cobalt	6.87		0.0798	0.5
		Copper	15		0.508	1.25
		Iron	16200		3.92	25
		Lead	17.4		0.284	0.5
		Magnesium	4750		0.585	10
		Manganese	298		0.131	1
		Mercury	0.0143		0.000884	0.009
		Nickel	15.4	B	0.0854	0.5
		Potassium	2740		3.58	10
		Selenium	0.162	U	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	67.5		3.63	10
		Thallium	2.5	U	2.5	2.5
		Vanadium	29.3		0.0908	0.5
		Zinc	53.4		0.421	1.25
	58	Aluminum	10900	B	0.778	9.8
		Antimony	0.553	J	0.337	0.98
		Arsenic	3.23		0.202	0.49
		Barium	147		0.0654	0.49
		Beryllium	0.49		0.049	0.49
		Cadmium	0.197	J	0.0469	0.49
		Calcium	33800	B	1.28	9.8
		Chromium	10.8		0.158	0.49
		Cobalt	5.04		0.0782	0.49
		Copper	10.3		0.498	1.23
		Iron	17500		3.84	24.5
		Lead	10.7		0.278	0.49
		Magnesium	4180		0.573	9.8
		Manganese	208		0.128	0.98
		Mercury	0.00769	J	0.000956	0.00972
		Nickel	8	B	0.0837	0.49
		Potassium	2360		3.51	9.8
		Selenium	0.159	U	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	63.7		3.56	9.8
		Thallium	0.98	U	0.98	0.98
		Vanadium	32.8		0.089	0.49
		Zinc	40.8		0.413	1.23

See to notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	**59**	Aluminum	7940	B	0.778	9.8
		Antimony	0.337	U	0.337	0.98
		Arsenic	3.7		0.202	0.49
		Barium	278		0.163	1.23
		Beryllium	0.351	J	0.049	0.49
		Cadmium	0.0501	J	0.0469	0.49
		Calcium	72700	B	3.2	24.5
		Chromium	7.53		0.158	0.49
		Cobalt	3.74		0.0782	0.49
		Copper	7.31		0.498	1.23
		Iron	10300		3.84	24.5
		Lead	10.1		0.278	0.49
		Magnesium	4700		1.43	24.5
		Manganese	121		0.128	0.98
		Mercury	0.00859	J	0.000939	0.00955
		Nickel	5.71	B	0.0837	0.49
		Potassium	1920		8.77	24.5
		Selenium	0.159	U	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	83.6		8.9	24.5
		Thallium	0.98	U	0.98	0.98
		Vanadium	26.2		0.089	0.49
		Zinc	27		0.413	1.23
	60	Aluminum	14200	B	1.8	22.7
		Antimony	0.564	J	0.312	0.909
		Arsenic	4.01		0.469	1.14
		Barium	159		0.0606	0.455
		Beryllium	0.625		0.0455	0.455
		Cadmium	0.119	J	0.0435	0.455
		Calcium	31900	B	2.96	22.7
		Chromium	13.7		0.146	0.455
		Cobalt	6.35		0.0725	0.455
		Copper	12.7		0.185	0.455
		Iron	19500		3.56	22.7
		Lead	8.88		0.258	0.455
		Magnesium	4740		1.33	22.7
		Manganese	352		0.119	0.909
		Mercury	0.0103		0.00097	0.00987
		Nickel	11.3		0.0776	0.455
		Potassium	4040		8.13	22.7
		Selenium	0.147	U	0.147	0.455
		Silver	0.082	U	0.082	0.455
		Sodium	69.3		3.3	9.09
		Thallium	2.27	U	2.27	2.27
		Vanadium	31		0.0825	0.455
		Zinc	42.4		0.153	0.455

See to notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	**61**	Aluminum	6630	B	1.84	23.1
		Antimony	0.318	U	0.318	0.926
		Arsenic	3.51		0.478	1.16
		Barium	171		0.0618	0.463
		Beryllium	0.333	J	0.0463	0.463
		Cadmium	0.232	J	0.0443	0.463
		Calcium	27700	B	1.21	9.26
		Chromium	9.69		0.149	0.463
		Cobalt	2.98		0.0739	0.463
		Copper	11.5		0.188	0.463
		Iron	8590		3.63	23.1
		Lead	20.7		0.263	0.463
		Magnesium	3080		0.541	9.26
		Manganese	145		0.121	0.926
		Mercury	0.00607	J	0.000957	0.00974
		Nickel	4.92		0.0791	0.463
		Potassium	1640		3.31	9.26
		Selenium	0.15	U	0.15	0.463
		Silver	0.0888	J	0.0835	0.463
		Sodium	94.5		3.36	9.26
		Thallium	2.31	U	2.31	2.31
		Vanadium	21.9		0.0841	0.463
		Zinc	34.1		0.156	0.463
	63	Antimony	0.653	J	0.343	1
		Arsenic	3.95		0.206	0.5
		Barium	172		0.0667	0.5
		Beryllium	0.706		0.05	0.5
		Cadmium	0.254	J	0.0478	0.5
		Calcium	24900	B	1.3	10
		Chromium	14.2		0.161	0.5
		Cobalt	6.47		0.0798	0.5
		Copper	11.9		0.203	0.5
		Iron	14900		1.57	10
		Lead	13.7		0.284	0.5
		Magnesium	4250	B	0.585	10
		Manganese	365		0.131	1
		Mercury	0.00683	J	0.000962	0.00979
		Nickel	12.8	B	0.0854	0.5
		Potassium	2490		3.58	10
		Selenium	0.405	U	0.405	1.25
		Silver	0.0902	U	0.0902	0.5
		Sodium	60.3		3.63	10
		Thallium	1	U	1	2
		Vanadium	24.6		0.0908	0.5
		Zinc	45.6		0.168	0.5

See to notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	**64**	Aluminum	14500	B	0.755	9.52
		Antimony	0.413	J	0.327	0.952
		Arsenic	3.27		0.197	0.476
		Barium	127		0.0635	0.476
		Beryllium	0.636		0.0476	0.476
		Cadmium	0.182	J	0.0455	0.476
		Calcium	6150	B	3.11	23.8
		Chromium	10.9		0.153	0.476
		Cobalt	9.35		0.076	0.476
		Copper	16.5		0.483	1.19
		Iron	25500		3.73	23.8
		Lead	16.7		0.27	0.476
		Magnesium	7700		1.39	23.8
		Manganese	590		0.125	0.952
		Mercury	0.0178		0.000945	0.00962
		Nickel	10.1	B	0.0813	0.476
		Potassium	3960		8.52	23.8
		Selenium	0.154	U	0.154	0.476
		Silver	0.0859	U	0.0859	0.476
		Sodium	83.7		3.46	9.52
		Thallium	2.38	U	2.38	2.38
		Vanadium	38.9		0.0865	0.476
		Zinc	85.3		0.401	1.19
	65E	Aluminum	17300	B	0.793	10
		Antimony	0.842	J	0.343	1
		Arsenic	4.93		0.206	0.5
		Barium	215		0.0667	0.5
		Beryllium	0.92		0.05	0.5
		Cadmium	0.258	J	0.0478	0.5
		Calcium	41700	B	6.52	50
		Chromium	14.5		0.161	0.5
		Cobalt	11.4		0.0798	0.5
		Copper	20.6		0.203	0.5
		Iron	26100		1.57	10
		Lead	19.7		0.284	0.5
		Magnesium	10200	B	2.92	50
		Manganese	618		0.131	1
		Mercury	0.0101		0.000948	0.00965
		Nickel	15.5	B	0.0854	0.5
		Potassium	6110		17.9	50
		Selenium	0.811	U	0.811	2.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	98.3		3.63	10
		Thallium	5	U	5	10
		Vanadium	44.1		0.0908	0.5
		Zinc	92.4		0.168	0.5

See to notes at end of table.

TABLE C-5. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Soil (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (concluded)	**80**	Aluminum	11300	B	0.755	9.9
		Antimony	0.364	J	0.327	0.99
		Arsenic	3.69		0.197	1.24
		Barium	156		0.159	0.495
		Beryllium	0.596		0.0476	0.495
		Cadmium	0.319	J	0.0455	0.495
		Calcium	71800	B	3.11	9.9
		Chromium	14.2		0.153	0.495
		Cobalt	5.01		0.076	0.495
		Copper	10.7		0.193	0.495
		Iron	13000		1.49	24.8
		Lead	10.9		0.27	0.495
		Magnesium	5230	B	1.39	9.9
		Manganese	283		0.125	2.48
		Mercury	0.00894	J	0.000907	0.00909
		Nickel	12.4	B	0.0813	0.495
		Potassium	3080		8.52	9.9
		Selenium	0.154	U	0.154	0.495
		Silver	0.0859	U	0.0859	0.495
		Sodium	50.5		8.65	9.9
		Thallium	0.952	U	0.952	0.99
		Vanadium	21.9	B	0.0865	1.24
		Zinc	42.4	J	0.16	0.495
	81	Aluminum	9880	B	0.77	9.71
		Antimony	0.392	J	0.333	0.971
		Arsenic	2.32		0.2	0.485
		Barium	72.6		0.0648	0.485
		Beryllium	0.47	J	0.0485	0.485
		Cadmium	0.118	J	0.0464	0.485
		Calcium	1670	B	1.27	9.71
		Chromium	10		0.156	0.485
		Cobalt	3.67		0.0775	0.485
		Copper	7.25		0.493	1.21
		Iron	11000		3.8	24.3
		Lead	10.8		0.275	0.485
		Magnesium	2420		0.568	9.71
		Manganese	199		0.127	0.971
		Mercury	0.0107		0.000882	0.00897
		Nickel	6.91	B	0.0829	0.485
		Potassium	2210		3.47	9.71
		Selenium	0.157	U	0.157	0.485
		Silver	0.0876	U	0.0876	0.485
		Sodium	47.9		3.53	9.71
		Thallium	0.971	U	0.971	0.971
		Vanadium	19.3		0.0882	0.485
		Zinc	29.8		0.408	1.21

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site	**1**	Aluminum	13500		0.763	9.62
		Antimony	0.552	J	0.33	0.962
		Arsenic	3.23		0.198	0.481
		Barium	157		0.0641	0.481
		Beryllium	0.638		0.0481	0.481
		Cadmium	0.184	J	0.046	0.481
		Calcium	28200		3.13	24
		Chromium	12.9		0.155	0.481
		Cobalt	7.07		0.0767	0.481
		Copper	12.9		0.488	1.2
		Iron	18500		3.77	24
		Lead	12		0.273	0.481
		Magnesium	5570		1.41	24
		Manganese	367		0.126	0.962
		Mercury	0.0139		0.000896	0.00912
		Nickel	11.3		0.0821	0.481
		Potassium	5160		8.6	24
		Selenium	0.236	J	0.156	0.481
		Silver	0.0867	U	0.0867	0.481
		Sodium	71.6		3.49	9.62
		Thallium	2.4	U	2.4	2.4
		Vanadium	31.4		0.0873	0.481
		Zinc	53.7		0.405	1.2
	2NE	Aluminum	5320		0.793	10
		Antimony	0.558	J	0.343	1
		Arsenic	1.76		0.206	0.5
		Barium	49.1		0.0667	0.5
		Beryllium	0.246	J	0.05	0.5
		Cadmium	0.152	BJ	0.0478	0.5
		Calcium	3580	B	1.3	10
		Chromium	5.03		0.161	0.5
		Cobalt	3.74		0.0798	0.5
		Copper	8.25		0.203	0.5
		Iron	7900		1.57	10
		Lead	5.55		0.284	0.5
		Magnesium	2850	B	0.585	10
		Manganese	213		0.131	1
		Mercury	0.000941	U	0.000941	0.00957
		Nickel	5.53		0.0854	0.5
		Potassium	1020	B	3.58	10
		Selenium	0.32	J	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	17.7		3.63	10
		Thallium	1	U	1	1
		Vanadium	11.5		0.0908	0.5
		Zinc	31.3		0.168	0.5

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**2NW**	Aluminum	7300		0.785	9.9
		Antimony	0.582	J	0.34	0.99
		Arsenic	2.14		0.204	0.495
		Barium	64.1		0.066	0.495
		Beryllium	0.358	J	0.0495	0.495
		Cadmium	0.137	BJ	0.0473	0.495
		Calcium	5540	B	1.29	9.9
		Chromium	7.98		0.16	0.495
		Cobalt	2.96		0.079	0.495
		Copper	5.66		0.201	0.495
		Iron	9120		1.55	9.9
		Lead	6.77		0.281	0.495
		Magnesium	1960	B	0.579	9.9
		Manganese	138		0.13	0.99
		Mercury	0.000965	U	0.000965	0.00982
		Nickel	5.31		0.0846	0.495
		Potassium	1650	B	3.54	9.9
		Selenium	0.346	J	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	23.6		3.6	9.9
		Thallium	0.99	U	0.99	0.99
		Vanadium	15.7		0.0899	0.495
		Zinc	28.6		0.167	0.495
	2SE	Aluminum	8810		0.785	9.9
		Antimony	0.511	J	0.34	0.99
		Arsenic	2.35		0.204	0.495
		Barium	77.4		0.066	0.495
		Beryllium	0.433	J	0.0495	0.495
		Cadmium	0.345	BJ	0.0473	0.495
		Calcium	15800	B	1.29	9.9
		Chromium	8.13		0.16	0.495
		Cobalt	3.06		0.079	0.495
		Copper	6.23		0.201	0.495
		Iron	9050		1.55	9.9
		Lead	7.29		0.281	0.495
		Magnesium	2480	B	0.579	9.9
		Manganese	127		0.13	0.99
		Mercury	0.0154		0.000954	0.00971
		Nickel	6.98		0.0846	0.495
		Potassium	1710	B	3.54	9.9
		Selenium	0.601		0.16	0.495
		Silver	0.293	J	0.0893	0.495
		Sodium	29.4		3.6	9.9
		Thallium	0.99	U	0.99	0.99
		Vanadium	16.8		0.0899	0.495
		Zinc	23.8		0.167	0.495

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**2SW**	Aluminum	6320		0.793	10
		Antimony	0.375	J	0.343	1
		Arsenic	1.71		0.206	0.5
		Barium	54.2		0.0667	0.5
		Beryllium	0.32	J	0.05	0.5
		Cadmium	0.15	BJ	0.0478	0.5
		Calcium	3080	B	1.3	10
		Chromium	7.14		0.161	0.5
		Cobalt	2.71		0.0798	0.5
		Copper	5.19		0.203	0.5
		Iron	8230		1.57	10
		Lead	6.76		0.284	0.5
		Magnesium	1650	B	0.585	10
		Manganese	133		0.131	1
		Mercury	0.000875	U	0.000875	0.0089
		Nickel	4.85		0.0854	0.5
		Potassium	1490	B	3.58	10
		Selenium	0.283	J	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	21.1		3.63	10
		Thallium	1	U	1	1
		Vanadium	14.1		0.0908	0.5
		Zinc	20.4		0.168	0.5
	3	Aluminum	9090	B	0.785	9.9
		Antimony	0.462	J	0.34	0.99
		Arsenic	6.32		0.511	1.24
		Barium	313		0.66	4.95
		Beryllium	0.418	J	0.0495	0.495
		Cadmium	0.0473	U	0.0473	0.495
		Calcium	94300	B	12.9	99
		Chromium	8.05		0.16	0.495
		Cobalt	3.51		0.079	0.495
		Copper	6.71		0.201	0.495
		Iron	9090		3.88	24.8
		Lead	6.16		0.281	0.495
		Magnesium	6440		5.79	99
		Manganese	129		0.324	2.48
		Mercury	0.0167		0.000978	0.00995
		Nickel	7.1		0.0846	0.495
		Potassium	2220		35.4	99
		Selenium	0.16	BU	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	132		36	99
		Thallium	0.99	U	0.99	0.99
		Vanadium	27.7		0.225	1.24
		Zinc	22.9	B	0.167	0.495

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**6**	Aluminum	10300		0.778	9.8
		Antimony	0.337	U	0.337	0.98
		Arsenic	2.43		0.202	0.49
		Barium	73.5		0.0654	0.49
		Beryllium	0.476	J	0.049	0.49
		Cadmium	0.237	J	0.0469	0.49
		Calcium	3430		1.28	9.8
		Chromium	11.6		0.158	0.49
		Cobalt	5.83		0.0782	0.49
		Copper	36.6		0.498	1.23
		Iron	11500		3.84	24.5
		Lead	10.2		0.278	0.49
		Magnesium	2350		0.573	9.8
		Manganese	156		0.128	0.98
		Mercury	0.0102		0.000964	0.0098
		Nickel	14		0.0837	0.49
		Potassium	2300		8.77	24.5
		Selenium	0.159	U	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	39.1		3.56	9.8
		Thallium	0.98	U	0.98	0.98
		Vanadium	19.3		0.089	0.49
		Zinc	36		0.413	1.23
	7	Aluminum	8500		0.728	9.17
		Antimony	0.315	U	0.315	0.917
		Arsenic	2.21		0.189	0.459
		Barium	66.7		0.0612	0.459
		Beryllium	0.438	J	0.0459	0.459
		Cadmium	0.0848	J	0.0439	0.459
		Calcium	3000		1.2	9.17
		Chromium	9.2		0.148	0.459
		Cobalt	3.74		0.0732	0.459
		Copper	2.89		0.186	0.459
		Iron	4190		1.44	9.17
		Lead	9.01		0.26	0.459
		Magnesium	2320		0.537	9.17
		Manganese	170		0.12	0.917
		Mercury	0.0131		0.000913	0.00929
		Nickel	6.63		0.0783	0.459
		Potassium	872		3.28	9.17
		Selenium	0.149	U	0.149	0.459
		Silver	0.0828	U	0.0828	0.459
		Sodium	45.6		3.33	9.17
		Thallium	0.917	U	0.917	0.917
		Vanadium	17.3		0.0833	0.459
		Zinc	11.1		0.154	0.459

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**20**	Aluminum	7930		0.734	9.26
		Antimony	989		0.318	0.926
		Arsenic	429		0.191	0.463
		Barium	95.7		0.0618	0.463
		Beryllium	0.385	J	0.0463	0.463
		Cadmium	2.24		0.0443	0.463
		Calcium	22300		1.21	9.26
		Chromium	10.4		0.149	0.463
		Cobalt	4.6		0.0739	0.463
		Copper	12.9		0.188	0.463
		Iron	12600		3.63	23.1
		Lead	53000		6.57	11.6
		Magnesium	3620	B	0.541	9.26
		Manganese	248		0.121	0.926
		Mercury	0.0165		0.00098	0.00997
		Nickel	8.68		0.0791	0.463
		Potassium	2130		3.31	9.26
		Selenium	0.15	U	0.15	0.463
		Silver	2.41		0.0835	0.463
		Sodium	54.2		8.41	23.1
		Thallium	2.31	U	2.31	2.31
		Vanadium	21.1		0.0841	0.463
		Zinc	36.7		0.156	0.463
	32E	Aluminum	6290	B	0.778	9.8
		Antimony	0.404	J	0.337	0.98
		Arsenic	2.79		0.202	0.49
		Barium	71		0.0654	0.49
		Beryllium	0.344	J	0.049	0.49
		Cadmium	0.309	J	0.0469	0.49
		Calcium	16600	B	1.28	9.8
		Chromium	7.38		0.158	0.49
		Cobalt	3.83		0.0782	0.49
		Copper	10.6		0.199	0.49
		Iron	10500		1.54	9.8
		Lead	12.8		0.278	0.49
		Magnesium	2480	B	0.573	9.8
		Manganese	163		0.128	0.98
		Mercury	0.0196		0.000922	0.00938
		Nickel	6.31	B	0.0837	0.49
		Potassium	1510		3.51	9.8
		Selenium	0.159	U	0.159	0.49
		Silver	0.287	J	0.0884	0.49
		Sodium	44.8		3.56	9.8
		Thallium	0.98	U	0.98	1.96
		Vanadium	18.4		0.089	0.49
		Zinc	35.9		0.165	0.49

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**32S**	Aluminum	8280	B	0.763	9.62
		Antimony	0.653	J	0.33	0.962
		Arsenic	3.41		0.198	0.481
		Barium	189		0.0641	0.481
		Beryllium	0.388	J	0.0481	0.481
		Cadmium	0.539		0.046	0.481
		Calcium	36400	B	1.25	9.62
		Chromium	9.62		0.155	0.481
		Cobalt	6.33		0.0767	0.481
		Copper	19.2		0.195	0.481
		Iron	15100		1.51	9.62
		Lead	15		0.273	0.481
		Magnesium	4170	B	0.562	9.62
		Manganese	250		0.126	0.962
		Mercury	0.0102		0.00093	0.00946
		Nickel	8.44	B	0.0821	0.481
		Potassium	1880		3.44	9.62
		Selenium	0.156	U	0.156	0.481
		Silver	0.115	J	0.0867	0.481
		Sodium	55.5		3.49	9.62
		Thallium	2.4	U	2.4	4.81
		Vanadium	33.2		0.0873	0.481
		Zinc	55.9		0.162	0.481
	33	Aluminum	8270	B	0.741	9.35
		Antimony	0.499	J	0.321	0.935
		Arsenic	32.7		0.482	1.17
		Barium	86.6		0.0623	0.467
		Beryllium	1.34		0.0467	0.467
		Cadmium	0.129	J	0.0447	0.467
		Calcium	26300	B	1.22	9.35
		Chromium	9.91		0.151	0.467
		Cobalt	6.51		0.0746	0.467
		Copper	8.97		0.19	0.467
		Iron	15800		3.66	23.4
		Lead	11.2		0.265	0.467
		Magnesium	3750		0.547	9.35
		Manganese	273		0.306	2.34
		Mercury	0.0111		0.000929	0.00945
		Nickel	8.85		0.0798	0.467
		Potassium	1890		3.34	9.35
		Selenium	0.151	BU	0.151	0.467
		Silver	0.0843	U	0.0843	0.467
		Sodium	139		3.39	9.35
		Thallium	4.67	U	4.67	4.67
		Vanadium	35.9		0.212	1.17
		Zinc	48.6	B	0.157	0.467

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**34**	Aluminum	17700	B	0.785	9.9
		Antimony	0.368	J	0.34	0.99
		Arsenic	13.1		0.511	1.24
		Barium	253		0.066	0.495
		Beryllium	0.94		0.0495	0.495
		Cadmium	0.17	J	0.0473	0.495
		Calcium	19300	B	6.46	49.5
		Chromium	18.8		0.16	0.495
		Cobalt	6.47		0.079	0.495
		Copper	12.7		0.201	0.495
		Iron	22700		3.88	24.8
		Lead	13.6		0.281	0.495
		Magnesium	4210		2.9	49.5
		Manganese	342		0.324	2.48
		Mercury	0.0101		0.000954	0.00971
		Nickel	14.9		0.0846	0.495
		Potassium	4090		17.7	49.5
		Selenium	0.165	BJ	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	68.3		3.6	9.9
		Thallium	0.99	U	0.99	0.99
		Vanadium	40.9		0.225	1.24
		Zinc	45	B	0.167	0.495
	35	Aluminum	10100		0.785	9.9
		Antimony	0.429	J	0.34	0.99
		Arsenic	2.64		0.204	0.495
		Barium	77.8		0.066	0.495
		Beryllium	0.484	J	0.0495	0.495
		Cadmium	0.0753	J	0.0473	0.495
		Calcium	2270		1.29	9.9
		Chromium	10.1		0.16	0.495
		Cobalt	3.44		0.079	0.495
		Copper	6.8		0.502	1.24
		Iron	10800		3.88	24.8
		Lead	9.62		0.281	0.495
		Magnesium	2470		0.579	9.9
		Manganese	174		0.13	0.99
		Mercury	0.0171		0.000845	0.0086
		Nickel	7.21		0.0846	0.495
		Potassium	2630		8.85	24.8
		Selenium	0.16	U	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	41.1		3.6	9.9
		Thallium	0.99	U	0.99	0.99
		Vanadium	16.9		0.0899	0.495
		Zinc	30.4		0.417	1.24

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**41**	Aluminum	10100		0.77	9.71
		Antimony	0.333	U	0.333	0.971
		Arsenic	2.8		0.2	0.485
		Barium	75.2		0.0648	0.485
		Beryllium	0.53		0.0485	0.485
		Cadmium	0.0464	U	0.0464	0.485
		Calcium	10900		1.27	9.71
		Chromium	10.3		0.156	0.485
		Cobalt	3.68		0.0775	0.485
		Copper	2.87		0.197	0.485
		Iron	4410		1.52	9.71
		Lead	11.3		0.275	0.485
		Magnesium	2690		0.568	9.71
		Manganese	145		0.127	0.971
		Mercury	0.00881	J	0.000909	0.00924
		Nickel	7.41		0.0829	0.485
		Potassium	1070		3.47	9.71
		Selenium	0.157	U	0.157	0.485
		Silver	0.0876	U	0.0876	0.485
		Sodium	44.1		3.53	9.71
		Thallium	0.971	U	0.971	0.971
		Vanadium	20.3		0.0882	0.485
		Zinc	12.3		0.163	0.485
	42	Aluminum	9760		0.793	10
		Antimony	0.343	U	0.343	1
		Arsenic	4.1		0.206	0.5
		Barium	87.7		0.0667	0.5
		Beryllium	0.585		0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	38500		1.3	10
		Chromium	10.4		0.161	0.5
		Cobalt	4		0.0798	0.5
		Copper	3.17		0.203	0.5
		Iron	4490		1.57	10
		Lead	6.15		0.284	0.5
		Magnesium	3280		0.585	10
		Manganese	145		0.131	1
		Mercury	0.00906	J	0.000896	0.00912
		Nickel	8.59		0.0854	0.5
		Potassium	1120		3.58	10
		Selenium	0.207	J	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	47.4		3.63	10
		Thallium	1	U	1	1
		Vanadium	22.4		0.0908	0.5
		Zinc	11		0.168	0.5

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**43**	Aluminum	9870		0.741	9.35
		Antimony	0.719	J	0.321	0.935
		Arsenic	3.29		0.193	0.467
		Barium	68.9		0.0623	0.467
		Beryllium	0.468		0.0467	0.467
		Cadmium	0.0447	U	0.0447	0.467
		Calcium	9090		1.22	9.35
		Chromium	9.54		0.151	0.467
		Cobalt	3.37		0.0746	0.467
		Copper	2.85		0.19	0.467
		Iron	4370		1.46	9.35
		Lead	6.22		0.265	0.467
		Magnesium	2540		0.547	9.35
		Manganese	128		0.122	0.935
		Mercury	0.00692	J	0.000913	0.00929
		Nickel	6.86		0.0798	0.467
		Potassium	1060		3.34	9.35
		Selenium	0.151	U	0.151	0.467
		Silver	0.0843	U	0.0843	0.467
		Sodium	38.6		3.39	9.35
		Thallium	0.935	U	0.935	0.935
		Vanadium	20.5		0.0849	0.467
		Zinc	11.1		0.157	0.467
	45	Aluminum	8180		0.778	9.8
		Antimony	0.673	J	0.337	0.98
		Arsenic	2.95		0.202	0.49
		Barium	72.1		0.0654	0.49
		Beryllium	0.387	J	0.049	0.49
		Cadmium	0.0469	U	0.0469	0.49
		Calcium	9680		1.28	9.8
		Chromium	8.06		0.158	0.49
		Cobalt	2.64		0.0782	0.49
		Copper	7.45		0.498	1.23
		Iron	8450		3.84	24.5
		Lead	7.11		0.278	0.49
		Magnesium	2390		0.573	9.8
		Manganese	132		0.128	0.98
		Mercury	0.0145		0.00093	0.00946
		Nickel	6.07		0.0837	0.49
		Potassium	2140		8.77	24.5
		Selenium	0.159	U	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	42.1		3.56	9.8
		Thallium	0.98	U	0.98	0.98
		Vanadium	15.9		0.089	0.49
		Zinc	23.6		0.413	1.23

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**46**	Aluminum	9180		0.778	9.8
		Antimony	0.337	U	0.337	0.98
		Arsenic	2.65		0.202	0.49
		Barium	92.6		0.0654	0.49
		Beryllium	0.402	J	0.049	0.49
		Cadmium	0.328	J	0.0469	0.49
		Calcium	23100		1.28	9.8
		Chromium	9.07		0.158	0.49
		Cobalt	5.2		0.0782	0.49
		Copper	8.61		0.199	0.49
		Iron	16800		3.84	24.5
		Lead	11.8		0.695	1.23
		Magnesium	3660	B	0.573	9.8
		Manganese	219		0.128	0.98
		Mercury	0.0117		0.00093	0.00946
		Nickel	7.41		0.0837	0.49
		Potassium	2260		3.51	9.8
		Selenium	0.356	J	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	73.2		8.9	24.5
		Thallium	2.45	U	2.45	2.45
		Vanadium	26		0.089	0.49
		Zinc	42.4		0.165	0.49
	49	Aluminum	11200	B	0.721	9.09
		Antimony	0.372	J	0.312	0.909
		Arsenic	2.68		0.469	1.14
		Barium	102		0.0606	0.455
		Beryllium	0.458		0.0455	0.455
		Cadmium	0.19	J	0.0435	0.455
		Calcium	14600	B	1.19	9.09
		Chromium	11.5		0.146	0.455
		Cobalt	4.88		0.0725	0.455
		Copper	14.4		0.185	0.455
		Iron	14800		3.56	22.7
		Lead	14.9		0.258	0.455
		Magnesium	4380		0.532	9.09
		Manganese	278		0.297	2.27
		Mercury	0.0182		0.000962	0.00979
		Nickel	8.51		0.0776	0.455
		Potassium	2310		3.25	9.09
		Selenium	0.147	BU	0.147	0.455
		Silver	0.082	U	0.082	0.455
		Sodium	86		3.3	9.09
		Thallium	4.55	U	4.55	4.55
		Vanadium	29.1		0.206	1.14
		Zinc	38.8	B	0.153	0.455

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**51**	Aluminum	11300		0.763	9.62
		Antimony	0.434	J	0.33	0.962
		Arsenic	4.07		0.198	0.481
		Barium	125		0.0641	0.481
		Beryllium	0.586		0.0481	0.481
		Cadmium	0.0965	J	0.046	0.481
		Calcium	30900		1.25	9.62
		Chromium	17.7		0.155	0.481
		Cobalt	4.08		0.0767	0.481
		Copper	9.47		0.488	1.2
		Iron	11200		3.77	24
		Lead	9.37		0.273	0.481
		Magnesium	3500		0.562	9.62
		Manganese	156		0.126	0.962
		Mercury	0.0112		0.000909	0.00924
		Nickel	8.74		0.0821	0.481
		Potassium	2870		8.6	24
		Selenium	0.17	J	0.156	0.481
		Silver	0.0867	U	0.0867	0.481
		Sodium	77.8		3.49	9.62
		Thallium	0.962	U	0.962	0.962
		Vanadium	21.2		0.0873	0.481
		Zinc	61.2		0.405	1.2
	52	Aluminum	18300	B	1.84	23.1
		Antimony	0.528	J	0.318	0.926
		Arsenic	5.58		0.478	1.16
		Barium	169		0.0618	0.463
		Beryllium	0.769		0.0463	0.463
		Cadmium	0.195	J	0.0443	0.463
		Calcium	36200	B	3.02	23.1
		Chromium	15.1		0.149	0.463
		Cobalt	5.45		0.0739	0.463
		Copper	14.4		0.188	0.463
		Iron	17300		3.63	23.1
		Lead	12.7		0.263	0.463
		Magnesium	5610		1.35	23.1
		Manganese	243		0.121	0.926
		Mercury	0.0177		0.000981	0.00998
		Nickel	11.6		0.0791	0.463
		Potassium	3450		8.28	23.1
		Selenium	0.223	J	0.15	0.463
		Silver	0.333	J	0.0835	0.463
		Sodium	84		3.36	9.26
		Thallium	2.31	U	2.31	2.31
		Vanadium	29.6		0.0841	0.463
		Zinc	63.9		0.156	0.463

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**53**	Aluminum	4780	B	0.793	10
		Antimony	0.645	J	0.343	1
		Arsenic	1.89		0.206	0.5
		Barium	47.3		0.0667	0.5
		Beryllium	0.268	J	0.05	0.5
		Cadmium	0.114	J	0.0478	0.5
		Calcium	1610	B	1.3	10
		Chromium	5.24		0.161	0.5
		Cobalt	2.27		0.0798	0.5
		Copper	4.64		0.203	0.5
		Iron	6110		1.57	10
		Lead	6.73		0.284	0.5
		Magnesium	1230	B	0.585	10
		Manganese	117		0.131	1
		Mercury	0.000962	U	0.000962	0.00979
		Nickel	3.98	B	0.0854	0.5
		Potassium	1150		3.58	10
		Selenium	0.162	U	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	23.2		3.63	10
		Thallium	1	U	1	2
		Vanadium	10.4		0.0908	0.5
		Zinc	17.4		0.168	0.5
	54	Aluminum	10500		0.793	10
		Antimony	0.664	J	0.343	1
		Arsenic	3.06		0.206	0.5
		Barium	83.5		0.0667	0.5
		Beryllium	0.484	J	0.05	0.5
		Cadmium	0.983		0.0478	0.5
		Calcium	10100		1.3	10
		Chromium	9.66		0.161	0.5
		Cobalt	3.57		0.0798	0.5
		Copper	26.1		0.508	1.25
		Iron	10600		3.92	25
		Lead	9.96		0.284	0.5
		Magnesium	2450		0.585	10
		Manganese	140		0.131	1
		Mercury	0.014		0.000961	0.00977
		Nickel	11.3		0.0854	0.5
		Potassium	2210		8.94	25
		Selenium	0.162	U	0.162	0.5
		Silver	2.2		0.0902	0.5
		Sodium	49.4		3.63	10
		Thallium	1	U	1	1
		Vanadium	19.1		0.0908	0.5
		Zinc	31.3		0.421	1.25

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**55**	Aluminum	11200	B	0.748	9.43
		Antimony	0.324	U	0.324	0.943
		Arsenic	3.08		0.487	1.18
		Barium	92.4		0.0629	0.472
		Beryllium	0.55		0.0472	0.472
		Cadmium	0.0834	J	0.0451	0.472
		Calcium	7330	B	1.23	9.43
		Chromium	11		0.152	0.472
		Cobalt	4		0.0753	0.472
		Copper	8.47		0.192	0.472
		Iron	11800		3.7	23.6
		Lead	11		0.268	0.472
		Magnesium	3510		0.552	9.43
		Manganese	236		0.308	2.36
		Mercury	0.0121		0.000947	0.00963
		Nickel	7.87		0.0806	0.472
		Potassium	2770		3.37	9.43
		Selenium	0.568	B	0.153	0.472
		Silver	0.0851	U	0.0851	0.472
		Sodium	62.5		3.43	9.43
		Thallium	0.943	U	0.943	0.943
		Vanadium	22.5		0.214	1.18
		Zinc	33.9	B	0.159	0.472
	56	Aluminum	4500	B	1.96	24.8
		Antimony	0.34	U	0.34	0.99
		Arsenic	3.52		0.511	1.24
		Barium	56.3		0.066	0.495
		Beryllium	0.219	J	0.0495	0.495
		Cadmium	0.333	J	0.0473	0.495
		Calcium	18700	B	3.23	24.8
		Chromium	8.91		0.16	0.495
		Cobalt	3.6		0.079	0.495
		Copper	10.3		0.201	0.495
		Iron	10200		3.88	24.8
		Lead	11.2		0.281	0.495
		Magnesium	1950		1.45	24.8
		Manganese	132		0.13	0.99
		Mercury	0.00716	J	0.000944	0.0096
		Nickel	6.05		0.0846	0.495
		Potassium	762		8.85	24.8
		Selenium	0.16	U	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	64.8		3.6	9.9
		Thallium	2.48	U	2.48	2.48
		Vanadium	20		0.0899	0.495
		Zinc	101		0.167	0.495

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**57**	Aluminum	7200		0.748	9.43
		Antimony	0.324	U	0.324	0.943
		Arsenic	3.34		0.195	0.472
		Barium	151		0.0629	0.472
		Beryllium	0.327	J	0.0472	0.472
		Cadmium	0.0829	J	0.0451	0.472
		Calcium	33200		1.23	9.43
		Chromium	7.71		0.152	0.472
		Cobalt	3.65		0.0753	0.472
		Copper	8.12		0.192	0.472
		Iron	14100		3.7	23.6
		Lead	9.13		0.669	1.18
		Magnesium	3650	B	0.552	9.43
		Manganese	178		0.123	0.943
		Mercury	0.00916	J	0.000926	0.00942
		Nickel	6.05		0.0806	0.472
		Potassium	1750		3.37	9.43
		Selenium	0.153	U	0.153	0.472
		Silver	0.0851	U	0.0851	0.472
		Sodium	86		8.56	23.6
		Thallium	2.36	U	2.36	2.36
		Vanadium	29		0.0857	0.472
		Zinc	69.3		0.159	0.472
	66	Aluminum	12600		0.728	9.17
		Antimony	0.538	J	0.315	0.917
		Arsenic	4.61		0.189	0.459
		Barium	119		0.0612	0.459
		Beryllium	0.738		0.0459	0.459
		Cadmium	0.0519	J	0.0439	0.459
		Calcium	27900		2.99	22.9
		Chromium	12.4		0.148	0.459
		Cobalt	5.01		0.0732	0.459
		Copper	10.2		0.466	1.15
		Iron	13400		3.59	22.9
		Lead	8.04		0.26	0.459
		Magnesium	4340		1.34	22.9
		Manganese	204		0.12	0.917
		Mercury	0.0101		0.000981	0.00998
		Nickel	9.8		0.0783	0.459
		Potassium	3200		8.2	22.9
		Selenium	0.149	U	0.149	0.459
		Silver	0.0828	U	0.0828	0.459
		Sodium	68.4		3.33	9.17
		Thallium	0.917	U	0.917	0.917
		Vanadium	25.4		0.0833	0.459
		Zinc	34.8		0.386	1.15

See notes at end of table.

TABLE C-6. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Soil (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (concluded)	**78**	Aluminum	9640	B	0.785	9.9
		Antimony	0.34	U	0.34	0.99
		Arsenic	2.75		0.511	1.24
		Barium	83.6		0.066	0.495
		Beryllium	0.463	J	0.0495	0.495
		Cadmium	0.0839	J	0.0473	0.495
		Calcium	3670	B	1.29	9.9
		Chromium	10.6		0.16	0.495
		Cobalt	5		0.079	0.495
		Copper	10.3		0.201	0.495
		Iron	14700		3.88	24.8
		Lead	9.87		0.281	0.495
		Magnesium	3210		0.579	9.9
		Manganese	297		0.324	2.48
		Mercury	0.00812	J	0.000894	0.00909
		Nickel	8.52		0.0846	0.495
		Potassium	2230		3.54	9.9
		Selenium	0.16	BU	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	48.1		3.6	9.9
		Thallium	0.99	U	0.99	0.99
		Vanadium	25.2		0.225	1.24
		Zinc	33.6	B	0.167	0.495

NOTES: B = The analyte was found in the blank above the effective MDL (organics), or the effective PQL (inorganics).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the decision level.

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TABLE C-7. Non-radiological Results for Off-site by Location for Calendar Year 2003, Vegetation

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-site	**8**	Aluminum	77.4		0.763	9.62
		Antimony	0.33	U	0.33	0.962
		Arsenic	0.198	U	0.198	0.481
		Barium	4.33		0.0641	0.481
		Beryllium	0.0481	U	0.0481	0.481
		Cadmium	0.0675	J	0.046	0.481
		Calcium	1540		3.13	24
		Chromium	0.262	J	0.155	0.481
		Cobalt	0.0838	J	0.0767	0.481
		Copper	2.33		0.195	0.481
		Iron	104		1.51	9.62
		Lead	0.273	U	0.273	0.481
		Magnesium	456		1.41	24
		Manganese	38.1		0.126	0.962
		Mercury	0.00236	J	0.000909	0.00924
		Nickel	0.382	J	0.0821	0.481
		Potassium	5840		8.6	24
		Selenium	0.156	U	0.156	0.481
		Silver	0.0867	U	0.0867	0.481
		Sodium	47.7		3.49	9.62
		Thallium	0.962	U	0.962	0.962
		Vanadium	0.22	J	0.0873	0.481
		Zinc	8.68	B	0.162	0.481
	11	Aluminum	19.7	B	0.793	10
		Antimony	0.403	J	0.343	1
		Arsenic	0.215	J	0.206	0.5
		Barium	8.11		0.0667	0.5
		Beryllium	0.05	U	0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	2570	B	1.3	10
		Chromium	0.163	J	0.161	0.5
		Cobalt	0.0798	U	0.0798	0.5
		Copper	1.51		0.203	0.5
		Iron	22.9		1.57	10
		Lead	0.284	U	0.284	0.5
		Magnesium	1570	B	0.585	10
		Manganese	5.9		0.131	1
		Mercury	0.00091	U	0.00091	0.00926
		Nickel	0.356	BJ	0.0854	0.5
		Potassium	1910		3.58	10
		Selenium	0.657	B	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	4.83	J	3.63	10
		Thallium	1	U	1	2
		Vanadium	0.0908	U	0.0908	0.5
		Zinc	25.3		0.168	0.5

See notes at end of table.

TABLE C-7. Non-radiological Results for Community by Location for Calendar Year 2003, Vegetation (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-Site (concluded)	**25**	Aluminum	21.2		0.748	9.43
		Antimony	0.347	J	0.324	0.943
		Arsenic	0.195	U	0.195	0.472
		Barium	4.74		0.0629	0.472
		Beryllium	0.0472	U	0.0472	0.472
		Cadmium	0.0845	J	0.0451	0.472
		Calcium	1250		3.08	23.6
		Chromium	0.262	J	0.152	0.472
		Cobalt	0.0753	U	0.0753	0.472
		Copper	1.58		0.192	0.472
		Iron	39.4		1.48	9.43
		Lead	0.268	U	0.268	0.472
		Magnesium	293		1.38	23.6
		Manganese	30.3		0.123	0.943
		Mercury	0.00373	J	0.000965	0.00982
		Nickel	0.352	J	0.0806	0.472
		Potassium	6540		8.43	23.6
		Selenium	0.305	J	0.153	0.472
		Silver	0.0851	U	0.0851	0.472
		Sodium	11.8		3.43	9.43
		Thallium	0.943	U	0.943	0.943
		Vanadium	0.177	J	0.0857	0.472
		Zinc	13.4	B	0.159	0.472

NOTES: B = The analyte was found in the blank above the effective minimum detection limit (MDL) (organics), or the effective practical quantitation limit (PQL) (inorganics).
J = Estimated value, the analyte concentration fell above the effective minimum detection limit (MDL) and below the effective practical quantitation limit (PQL).
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective minimum detection limit (MDL). For radiochemical analytes the result is less than the decision level.

TABLE C-8. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Vegetation
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter	**4**	Aluminum	447	B	0.793	10
		Antimony	0.479	J	0.343	1
		Arsenic	0.311	J	0.206	0.5
		Barium	15		0.0667	0.5
		Beryllium	0.05	U	0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	4480	B	3.26	25
		Chromium	0.388	J	0.161	0.5
		Cobalt	0.178	J	0.0798	0.5
		Copper	4.36		0.203	0.5
		Iron	358		1.57	10
		Lead	0.452	J	0.284	0.5
		Magnesium	749	B	1.46	25
		Manganese	12.9		0.131	1
		Mercury	0.00188	U	0.00188	0.0192
		Nickel	0.791	B	0.0854	0.5
		Potassium	5310		8.94	25
		Selenium	0.794	B	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	3.63	U	3.63	10
		Thallium	1	U	1	2
		Vanadium	0.763		0.0908	0.5
		Zinc	8.42		0.168	0.5
	5	Aluminum	160	B	0.793	10
		Antimony	0.343	U	0.343	1
		Arsenic	0.206	U	0.206	0.5
		Barium	12.4		0.0667	0.5
		Beryllium	0.05	U	0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	3160	B	6.52	50
		Chromium	0.179	J	0.161	0.5
		Cobalt	0.118	J	0.0798	0.5
		Copper	2.09		0.203	0.5
		Iron	124		1.57	10
		Lead	0.284	U	0.284	0.5
		Magnesium	985	B	2.92	50
		Manganese	13.5		0.131	1
		Mercury	0.00195	U	0.00195	0.0199
		Nickel	0.481	BJ	0.0854	0.5
		Potassium	7390		17.9	50
		Selenium	0.964	B	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	3.63	U	3.63	10
		Thallium	1	U	1	2
		Vanadium	0.202	J	0.0908	0.5
		Zinc	4.61		0.168	0.5

See notes at end of table.

TABLE C-8. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Vegetation (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (continued)	**60**	Aluminum	169	B	0.793	10
		Antimony	0.343	U	0.343	1
		Arsenic	0.548		0.206	0.5
		Barium	14.9		0.0667	0.5
		Beryllium	0.05	U	0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	3700	B	3.26	25
		Chromium	0.312	J	0.161	0.5
		Cobalt	0.0997	J	0.0798	0.5
		Copper	3.55		0.203	0.5
		Iron	164		1.57	10
		Lead	0.284	U	0.284	0.5
		Magnesium	1070	B	1.46	25
		Manganese	54.5		0.131	1
		Mercury	0.00197	U	0.00197	0.02
		Nickel	0.424	BJ	0.0854	0.5
		Potassium	5040		8.94	25
		Selenium	0.603	B	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	3.63	U	3.63	10
		Thallium	1	U	1	2
		Vanadium	0.273	J	0.0908	0.5
		Zinc	17.2		0.168	0.5
	63	Aluminum	30	B	0.793	10
		Antimony	0.343	U	0.343	1
		Arsenic	0.214	J	0.206	0.5
		Barium	7.03		0.0667	0.5
		Beryllium	0.05	U	0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	2850	B	3.26	25
		Chromium	0.161	U	0.161	0.5
		Cobalt	0.0798	U	0.0798	0.5
		Copper	1.66		0.203	0.5
		Iron	33.2		1.57	10
		Lead	0.284	U	0.284	0.5
		Magnesium	460	B	1.46	25
		Manganese	31.3		0.131	1
		Mercury	0.00181	U	0.00181	0.0184
		Nickel	0.37	BJ	0.0854	0.5
		Potassium	4080		8.94	25
		Selenium	0.532	B	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	3.63	U	3.63	10
		Thallium	1	U	1	2
		Vanadium	0.0908	U	0.0908	0.5
		Zinc	10.2		0.168	0.5

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2003, Vegetation

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site	**2NE**	Aluminum	132	B	0.763	9.62
		Antimony	0.33	U	0.33	0.962
		Arsenic	0.456	J	0.198	0.481
		Barium	10.9		0.0641	0.481
		Beryllium	0.0481	U	0.0481	0.481
		Cadmium	0.722		0.046	0.481
		Calcium	3210	B	6.27	48.1
		Chromium	0.171	J	0.155	0.481
		Cobalt	0.0937	J	0.0767	0.481
		Copper	3.72		0.195	0.481
		Iron	108		1.51	9.62
		Lead	0.273	U	0.273	0.481
		Magnesium	1100	B	2.81	48.1
		Manganese	11.6		0.126	0.962
		Mercury	0.00195	U	0.00195	0.0198
		Nickel	0.624	B	0.0821	0.481
		Potassium	8880		17.2	48.1
		Selenium	1.44	B	0.156	0.481
		Silver	0.0867	U	0.0867	0.481
		Sodium	3.49	U	3.49	9.62
		Thallium	0.962	U	0.962	1.92
		Vanadium	0.191	J	0.0873	0.481
		Zinc	14.5		0.162	0.481
	2NW	Aluminum	150	B	0.734	9.26
		Antimony	0.318	U	0.318	0.926
		Arsenic	0.517		0.191	0.463
		Barium	5.01		0.0618	0.463
		Beryllium	0.0463	U	0.0463	0.463
		Cadmium	0.0443	U	0.0443	0.463
		Calcium	3350	B	6.04	46.3
		Chromium	0.207	J	0.149	0.463
		Cobalt	0.0983	J	0.0739	0.463
		Copper	2.78		0.188	0.463
		Iron	115		1.45	9.26
		Lead	0.263	U	0.263	0.463
		Magnesium	1010	B	2.71	46.3
		Manganese	16.5		0.121	0.926
		Mercury	0.00875	U	0.00875	0.089
		Nickel	0.424	BJ	0.0791	0.463
		Potassium	7900		16.6	46.3
		Selenium	0.389	BJ	0.15	0.463
		Silver	0.0835	U	0.0835	0.463
		Sodium	3.36	U	3.36	9.26
		Thallium	0.926	U	0.926	1.85
		Vanadium	0.175	J	0.0841	0.463
		Zinc	7.98		0.156	0.463

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Vegetation (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**33**	Aluminum	58.3	B	0.793	10
		Antimony	0.343	U	0.343	1
		Arsenic	0.516	U	0.516	1.25
		Barium	2.38		0.0667	0.5
		Beryllium	0.05	U	0.05	0.5
		Cadmium	0.0478	U	0.0478	0.5
		Calcium	1430	B	13	100
		Chromium	0.161	U	0.161	0.5
		Cobalt	0.0798	U	0.0798	0.5
		Copper	1.41		0.203	0.5
		Iron	72.5		3.92	25
		Lead	0.284	U	0.284	0.5
		Magnesium	800		5.85	100
		Manganese	21.5		0.327	2.5
		Mercury	0.00399	J	0.000856	0.00871
		Nickel	0.361	J	0.0854	0.5
		Potassium	9430		35.8	100
		Selenium	0.318	BJ	0.162	0.5
		Silver	0.0902	U	0.0902	0.5
		Sodium	2360		3.63	10
		Thallium	1	U	1	1
		Vanadium	0.227	U	0.227	1.25
		Zinc	3.55	B	0.168	0.5
	34	Aluminum	127	B	0.748	9.43
		Antimony	0.324	U	0.324	0.943
		Arsenic	0.195	U	0.195	0.472
		Barium	13.2		0.0629	0.472
		Beryllium	0.0472	U	0.0472	0.472
		Cadmium	0.0451	U	0.0451	0.472
		Calcium	2950	B	6.15	47.2
		Chromium	0.152	U	0.152	0.472
		Cobalt	0.0753	U	0.0753	0.472
		Copper	3.51		0.192	0.472
		Iron	119		1.48	9.43
		Lead	0.268	U	0.268	0.472
		Magnesium	606	B	2.76	47.2
		Manganese	7.81		0.123	0.943
		Mercury	0.00087	U	0.00087	0.00885
		Nickel	0.272	BJ	0.0806	0.472
		Potassium	9940		16.9	47.2
		Selenium	0.524	B	0.153	0.472
		Silver	0.0851	U	0.0851	0.472
		Sodium	3.43	U	3.43	9.43
		Thallium	0.943	U	0.943	1.89
		Vanadium	0.24	J	0.0857	0.472
		Zinc	7.04		0.159	0.472

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Vegetation (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**35**	Aluminum	419	B	0.728	9.17
		Antimony	0.493	J	0.315	0.917
		Arsenic	0.377	J	0.189	0.459
		Barium	13.1		0.0612	0.459
		Beryllium	0.0459	U	0.0459	0.459
		Cadmium	0.0439	U	0.0439	0.459
		Calcium	3100	B	2.99	22.9
		Chromium	0.343	J	0.148	0.459
		Cobalt	0.165	J	0.0732	0.459
		Copper	3.24		0.186	0.459
		Iron	355		1.44	9.17
		Lead	0.372	J	0.26	0.459
		Magnesium	1000	B	1.34	22.9
		Manganese	13.8		0.12	0.917
		Mercury	0.0018	U	0.0018	0.0183
		Nickel	0.643	B	0.0783	0.459
		Potassium	5640		8.2	22.9
		Selenium	0.7	B	0.149	0.459
		Silver	0.0828	U	0.0828	0.459
		Sodium	12		3.33	9.17
		Thallium	0.917	U	0.917	1.83
		Vanadium	0.652		0.0833	0.459
		Zinc	6.53		0.154	0.459
	43	Aluminum	234	B	0.734	9.26
		Antimony	0.442	J	0.318	0.926
		Arsenic	0.438	J	0.191	0.463
		Barium	11.1		0.0618	0.463
		Beryllium	0.0463	U	0.0463	0.463
		Cadmium	0.0443	U	0.0443	0.463
		Calcium	3190	B	6.04	46.3
		Chromium	0.31	J	0.149	0.463
		Cobalt	0.144	J	0.0739	0.463
		Copper	2.78		0.188	0.463
		Iron	203		1.45	9.26
		Lead	0.263	U	0.263	0.463
		Magnesium	1160	B	2.71	46.3
		Manganese	12.2		0.121	0.926
		Mercury	0.00185	U	0.00185	0.0189
		Nickel	0.362	BJ	0.0791	0.463
		Potassium	7630		16.6	46.3
		Selenium	0.845	B	0.15	0.463
		Silver	0.0835	U	0.0835	0.463
		Sodium	22		3.36	9.26
		Thallium	0.926	U	0.926	1.85
		Vanadium	0.436	J	0.0841	0.463
		Zinc	7.11		0.156	0.463

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Vegetation (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (continued)	**51**	Aluminum	284	B	0.748	9.43
		Antimony	0.475	J	0.324	0.943
		Arsenic	0.499		0.195	0.472
		Barium	11.4		0.0629	0.472
		Beryllium	0.0472	U	0.0472	0.472
		Cadmium	0.0559	J	0.0451	0.472
		Calcium	3450	B	3.08	23.6
		Chromium	0.43	J	0.152	0.472
		Cobalt	0.169	J	0.0753	0.472
		Copper	4.14		0.192	0.472
		Iron	304		1.48	9.43
		Lead	0.268	U	0.268	0.472
		Magnesium	960	B	1.38	23.6
		Manganese	17.2		0.123	0.943
		Mercury	0.00189	U	0.00189	0.0192
		Nickel	0.9	B	0.0806	0.472
		Potassium	5810		8.43	23.6
		Selenium	0.962	B	0.153	0.472
		Silver	0.0851	U	0.0851	0.472
		Sodium	11.4		3.43	9.43
		Thallium	0.943	U	0.943	1.89
		Vanadium	0.618		0.0857	0.472
		Zinc	12.8		0.159	0.472
	52	Aluminum	198	B	0.77	9.71
		Antimony	0.333	U	0.333	0.971
		Arsenic	0.413	J	0.2	0.485
		Barium	12		0.0648	0.485
		Beryllium	0.0485	U	0.0485	0.485
		Cadmium	0.075	J	0.0464	0.485
		Calcium	3920	B	6.33	48.5
		Chromium	0.215	J	0.156	0.485
		Cobalt	0.0994	J	0.0775	0.485
		Copper	4.34		0.197	0.485
		Iron	208		1.52	9.71
		Lead	0.275	U	0.275	0.485
		Magnesium	1550	B	2.84	48.5
		Manganese	16.3		0.127	0.971
		Mercury	0.000964	U	0.000964	0.0098
		Nickel	0.745	B	0.0829	0.485
		Potassium	9650		17.4	48.5
		Selenium	3.33	B	0.157	0.485
		Silver	0.0876	U	0.0876	0.485
		Sodium	8.43	J	3.53	9.71
		Thallium	0.971	U	0.971	1.94
		Vanadium	0.27	J	0.0882	0.485
		Zinc	10.6		0.163	0.485

See notes at end of table.

TABLE C-9. Non-radiological Results for On-Site by Location for Calendar Year 2003 , Vegetation (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (concluded)	**55**	Aluminum	274	B	0.734	9.26
		Antimony	0.318	U	0.318	0.926
		Arsenic	0.463		0.191	0.463
		Barium	12.6		0.0618	0.463
		Beryllium	0.0463	U	0.0463	0.463
		Cadmium	0.0443	U	0.0443	0.463
		Calcium	2860	B	3.02	23.1
		Chromium	0.302	J	0.149	0.463
		Cobalt	0.142	J	0.0739	0.463
		Copper	3.07		0.188	0.463
		Iron	271		1.45	9.26
		Lead	0.339	J	0.263	0.463
		Magnesium	716	B	1.35	23.1
		Manganese	11.3		0.121	0.926
		Mercury	0.00187	U	0.00187	0.019
		Nickel	0.364	BJ	0.0791	0.463
		Potassium	5440		8.28	23.1
		Selenium	0.768	B	0.15	0.463
		Silver	0.0835	U	0.0835	0.463
		Sodium	3.36	U	3.36	9.26
		Thallium	0.926	U	0.926	1.85
		Vanadium	0.58		0.0841	0.463
		Zinc	5.91		0.156	0.463

NOTES: B = The analyte was found in the blank above the effective minimum detection limit (MDL) (organics), or the effective practical quantitation limit (PQL) (inorganics).
J = Estimated value, the analyte concentration fell above the effective minimum detection limit (MDL) and below the effective practical quantitation limit (PQL.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective minimum detection limit (MDL). For radiochemical analytes the result is less than the decision level.

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TABLE C-10. Non-radiological Results for Off-site by Location for Calendar Year 2003, Sediment

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-site	**8**	Aluminum	7900		0.755	9.52
		Antimony	0.327	U	0.327	0.952
		Arsenic	3.25		0.197	0.476
		Barium	164		0.0635	0.476
		Beryllium	0.448	J	0.0476	0.476
		Cadmium	0.122	J	0.0455	0.476
		Calcium	21300		1.24	9.52
		Chromium	8.04		0.153	0.476
		Cobalt	3.67		0.076	0.476
		Copper	6.66		0.193	0.476
		Iron	9080		1.49	9.52
		Lead	6.21		0.27	0.476
		Magnesium	4020		0.557	9.52
		Manganese	227		0.125	0.952
		Mercury	0.00807	J	0.000875	0.0089
		Nickel	6.75		0.0813	0.476
		Potassium	1580		3.41	9.52
		Selenium	0.359	J	0.154	0.476
		Silver	0.0859	U	0.0859	0.476
		Sodium	158		3.46	9.52
		Thallium	0.952	U	0.952	0.952
		Vanadium	17.5		0.0865	0.476
		Zinc	25.2	B	0.16	0.476
	11	Aluminum	5830	B	0.748	9.43
		Antimony	0.579	J	0.324	0.943
		Arsenic	2.6		0.195	0.472
		Barium	87.1		0.0629	0.472
		Beryllium	0.332	J	0.0472	0.472
		Cadmium	0.0718	J	0.0451	0.472
		Calcium	11400	B	1.23	9.43
		Chromium	5.63		0.152	0.472
		Cobalt	2.54		0.0753	0.472
		Copper	4.96		0.192	0.472
		Iron	6990		1.48	9.43
		Lead	5.66		0.268	0.472
		Magnesium	2350	B	0.552	9.43
		Manganese	176		0.123	0.943
		Mercury	0.000939	U	0.000939	0.00955
		Nickel	4.9	B	0.0806	0.472
		Potassium	1220		3.37	9.43
		Selenium	0.153	U	0.153	0.472
		Silver	0.0851	U	0.0851	0.472
		Sodium	122		3.43	9.43
		Thallium	0.943	U	0.943	1.89
		Vanadium	13.2		0.0857	0.472
		Zinc	18.4		0.159	0.472

See notes at end of table.

TABLE C-10. Non-radiological Results for Off-site by Location for Calendar Year 2003, Sediment (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Off-site (concluded)	**68**	Aluminum	7450		0.77	9.71
		Antimony	0.482	J	0.333	0.971
		Arsenic	8.01		0.2	0.485
		Barium	192		0.162	1.21
		Beryllium	0.457	J	0.0485	0.485
		Cadmium	0.257	J	0.0464	0.485
		Calcium	58500		3.17	24.3
		Chromium	11.5		0.156	0.485
		Cobalt	4.45		0.0775	0.485
		Copper	7.98		0.197	0.485
		Iron	11800		1.52	9.71
		Lead	11.6		0.275	0.485
		Magnesium	3350		1.42	24.3
		Manganese	290		0.127	0.971
		Mercury	0.0161		0.00097	0.00987
		Nickel	10.3		0.0829	0.485
		Potassium	1510		8.68	24.3
		Selenium	0.157	U	0.157	0.485
		Silver	0.0876	U	0.0876	0.485
		Sodium	61.4		8.81	24.3
		Thallium	2.43	U	2.43	2.43
		Vanadium	23.6		0.0882	0.485
		Zinc	31.2	B	0.163	0.485

NOTES: B = The analyte was found in the blank above the effective minimum detection limit (MDL) (organics), or the effective practical quantitation limit (PQL) (inorganics).
J = Estimated value, the analyte concentration fell above the effective minimum detection limit (MDL) and below the effective practical quantitation limit (PQL).
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective minimum detection limit (MDL). For radiochemical analytes the result is less than the decision level.

TABLE C-11. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Sediment

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter	**60**	Aluminum	9650	B	1.84	23.1
		Antimony	0.318	U	0.318	0.926
		Arsenic	2.93		0.478	1.16
		Barium	148		0.0618	0.463
		Beryllium	0.437	J	0.0463	0.463
		Cadmium	0.0864	J	0.0443	0.463
		Calcium	25700	B	1.21	9.26
		Chromium	10.7		0.149	0.463
		Cobalt	5.51		0.0739	0.463
		Copper	11.4		0.188	0.463
		Iron	17000		3.63	23.1
		Lead	6.66		0.263	0.463
		Magnesium	3980		0.541	9.26
		Manganese	280		0.121	0.926
		Mercury	0.0029	J	0.000944	0.0096
		Nickel	8.61		0.0791	0.463
		Potassium	2120		3.31	9.26
		Selenium	0.15	U	0.15	0.463
		Silver	0.0835	U	0.0835	0.463
		Sodium	120		3.36	9.26
		Thallium	2.31	U	2.31	2.31
		Vanadium	28.7		0.0841	0.463
		Zinc	35.6		0.156	0.463
	65E	Aluminum	10500	B	0.763	9.62
		Antimony	0.886	J	0.33	0.962
		Arsenic	3.22		0.198	0.481
		Barium	134		0.0641	0.481
		Beryllium	0.509		0.0481	0.481
		Cadmium	0.122	J	0.046	0.481
		Calcium	30100	B	6.27	48.1
		Chromium	10.5		0.155	0.481
		Cobalt	9.81		0.0767	0.481
		Copper	14.9		0.195	0.481
		Iron	22000		1.51	9.62
		Lead	11		0.273	0.481
		Magnesium	7150	B	2.81	48.1
		Manganese	434		0.126	0.962
		Mercury	0.00263	J	0.000887	0.00902
		Nickel	10.5	B	0.0821	0.481
		Potassium	4280		17.2	48.1
		Selenium	0.156	U	0.156	0.481
		Silver	0.0867	U	0.0867	0.481
		Sodium	113		3.49	9.62
		Thallium	4.81	U	4.81	9.62
		Vanadium	38.9		0.0873	0.481
		Zinc	69.5		0.162	0.481

See notes at end of table.

TABLE C-11. Non-radiological Results for Perimeter by Location for Calendar Year 2003, Sediment (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
Perimeter (concluded)	**73**	Aluminum	4500	B	0.748	9.43
		Antimony	0.324	U	0.324	0.943
		Arsenic	2.39		0.195	0.472
		Barium	51.4		0.0629	0.472
		Beryllium	0.293	J	0.0472	0.472
		Cadmium	0.0451	U	0.0451	0.472
		Calcium	19200	B	1.23	9.43
		Chromium	5.33		0.152	0.472
		Cobalt	5.19		0.0753	0.472
		Copper	5.83		0.479	1.18
		Iron	12200		3.7	23.6
		Lead	4.11		0.268	0.472
		Magnesium	2210		0.552	9.43
		Manganese	177		0.123	0.943
		Mercury	0.000919	J	0.00087	0.00885
		Nickel	4.4	B	0.0806	0.472
		Potassium	1170		3.37	9.43
		Selenium	0.153	U	0.153	0.472
		Silver	0.0851	U	0.0851	0.472
		Sodium	52.7		3.43	9.43
		Thallium	2.36	U	2.36	2.36
		Vanadium	22.1		0.0857	0.472
		Zinc	25.3		0.397	1.18

NOTES: B = The analyte was found in the blank above the effective minimum detection limit (MDL) (organics), or the effective practical quantitation limit (PQL) (inorganics).
J = Estimated value, the analyte concentration fell above the effective minimum detection limit (MDL) and below the effective practical quantitation limit (PQL).
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective minimum detection limit (MDL). For radiochemical analytes the result is less than the decision level.

TABLE C-12. Non-radiological Results for On-Site by Location for Calendar Year 2003, Sediment

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site	**56**	Aluminum	4500	B	1.96	24.8
		Antimony	0.34	U	0.34	0.99
		Arsenic	3.52		0.511	1.24
		Barium	56.3		0.066	0.495
		Beryllium	0.219	J	0.0495	0.495
		Cadmium	0.333	J	0.0473	0.495
		Calcium	18700	B	3.23	24.8
		Chromium	8.91		0.16	0.495
		Cobalt	3.6		0.079	0.495
		Copper	10.3		0.201	0.495
		Iron	10200		3.88	24.8
		Lead	11.2		0.281	0.495
		Magnesium	1950		1.45	24.8
		Manganese	132		0.13	0.99
		Mercury	0.00716	J	0.000944	0.0096
		Nickel	6.05		0.0846	0.495
		Potassium	762		8.85	24.8
		Selenium	0.16	U	0.16	0.495
		Silver	0.0893	U	0.0893	0.495
		Sodium	64.8		3.6	9.9
		Thallium	2.48	U	2.48	2.48
		Vanadium	20		0.0899	0.495
		Zinc	101		0.167	0.495
	72	Aluminum	13000	B	0.755	9.52
		Antimony	0.327	U	0.327	0.952
		Arsenic	9.65		0.491	1.19
		Barium	152		0.0635	0.476
		Beryllium	1.25		0.0476	0.476
		Cadmium	0.088	J	0.0455	0.476
		Calcium	36300	B	1.24	9.52
		Chromium	12		0.153	0.476
		Cobalt	5.04		0.076	0.476
		Copper	10.7		0.193	0.476
		Iron	13300		3.73	23.8
		Lead	9.03		0.27	0.476
		Magnesium	4910		0.557	9.52
		Manganese	248		0.311	2.38
		Mercury	0.00929		0.000872	0.00888
		Nickel	10.6		0.0813	0.476
		Potassium	2440		3.41	9.52
		Selenium	0.181	BJ	0.154	0.476
		Silver	0.0859	U	0.0859	0.476
		Sodium	201		3.46	9.52
		Thallium	4.76	U	4.76	4.76
		Vanadium	31.5		0.216	1.19
		Zinc	39.2	B	0.16	0.476

See notes at end of table.

TABLE C-12. Non-radiological Results for On-Site by Location for Calendar Year 2003, Sediment (Continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (Continued)	**74**	Aluminum	2280		0.721	9.09
		Antimony	0.312	U	0.312	0.909
		Arsenic	0.607		0.188	0.455
		Barium	17.3		0.0606	0.455
		Beryllium	0.201	J	0.0455	0.455
		Cadmium	0.0476	J	0.0435	0.455
		Calcium	18000		1.19	9.09
		Chromium	2.4		0.146	0.455
		Cobalt	2.05		0.0725	0.455
		Copper	2.62		0.185	0.455
		Iron	5360		3.56	22.7
		Lead	2.48		0.645	1.14
		Magnesium	1250	B	0.532	9.09
		Manganese	101		0.119	0.909
		Mercury	0.000942	U	0.000942	0.00958
		Nickel	2.34		0.0776	0.455
		Potassium	359		3.25	9.09
		Selenium	0.147	U	0.147	0.455
		Silver	0.082	U	0.082	0.455
		Sodium	34.3		8.25	22.7
		Thallium	2.27	U	2.27	2.27
		Vanadium	9.54		0.0825	0.455
		Zinc	11.4		0.153	0.455
	75	Aluminum	8540		0.778	9.8
		Antimony	0.403	J	0.337	0.98
		Arsenic	2.66		0.202	0.49
		Barium	86.4		0.0654	0.49
		Beryllium	0.489	J	0.049	0.49
		Cadmium	0.0469	U	0.0469	0.49
		Calcium	26600		1.28	9.8
		Chromium	10.7		0.158	0.49
		Cobalt	4.97		0.0782	0.49
		Copper	10.6		0.498	1.23
		Iron	12200		3.84	24.5
		Lead	9.19		0.278	0.49
		Magnesium	3840		0.573	9.8
		Manganese	209		0.128	0.98
		Mercury	0.00588	J	0.000962	0.00979
		Nickel	9.07		0.0837	0.49
		Potassium	1860		8.77	24.5
		Selenium	0.159	U	0.159	0.49
		Silver	0.0884	U	0.0884	0.49
		Sodium	74.4		3.56	9.8
		Thallium	0.98	U	0.98	0.98
		Vanadium	21.8		0.089	0.49
		Zinc	33.6		0.413	1.23

See notes at end of table.

TABLE C-12. Non-radiological Results for On-Site by Location for Calendar Year 2003, Sediment (Concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Analyte	Result		Decision Level	Detection Limit
On-Site (Concluded)	**79**	Aluminum	9430	B	0.77	9.71
		Antimony	0.333	U	0.333	0.971
		Arsenic	3.66		0.501	1.21
		Barium	120		0.648	4.85
		Beryllium	0.438	J	0.0485	0.485
		Cadmium	0.212	J	0.0464	0.485
		Calcium	126000	B	12.7	97.1
		Chromium	14		0.156	0.485
		Cobalt	3.91		0.0775	0.485
		Copper	8.13		0.197	0.485
		Iron	13000		3.8	24.3
		Lead	6.62		0.275	0.485
		Magnesium	4940		5.68	97.1
		Manganese	303		0.317	2.43
		Mercury	0.00583	J	0.000981	0.00998
		Nickel	10.6		0.0829	0.485
		Potassium	1690		34.7	97.1
		Selenium	0.308	BJ	0.157	0.485
		Silver	0.0876	U	0.0876	0.485
		Sodium	111		35.3	97.1
		Thallium	0.971	U	0.971	0.971
		Vanadium	22.6		0.22	1.21
		Zinc	31.5	B	0.163	0.485

NOTES: B = The analyte was found in the blank above the effective minimum detection limit (MDL) (organics), or the effective practical quantitation limit (PQL) (inorganics).
J = Estimated value, the analyte concentration fell above the effective minimum detection limit (MDL) and below the effective practical quantitation limit (PQL).
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective minimum detection limit (MDL). For radiochemical analytes the result is less than the decision level.

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TABLE C-13. Radiological Replicate Results for Calendar Year 2003, Soil

Location Type	Loc.	Sample ID	Analyte	Units	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	11	061612-001	Cesium-137	pCi/g	0.0702 ± 0.0301		0.0151	0.0315	0.066733	0.012176	18.25%
		061612-002	Cesium-137	pCi/g	0.0532 ± 0.0201		0.0115	0.0243			
		061612-003	Cesium-137	pCi/g	0.0768 ± 0.0291		0.0118	0.0248			
		061612-001	Tritium	pCi/mL	1.09 ± 0.233		0.124	0.258	0.643333	0.386857	60.13%
		061612-002	Tritium	pCi/mL	0.415 ± 0.144		0.101	0.21			
		061612-003	Tritium	pCi/mL	0.425 ± 0.148		0.103	0.215			
		061612-001	Uranium	μg/g	0.546		0.00592	0.0394	0.555000	0.035369	6.37%
		061612-002	Uranium	μg/g	0.525		0.00588	0.0392			
		061612-003	Uranium	μg/g	0.594		0.00593	0.0395			
Perimeter	64	061571-001	Cesium-137	pCi/g	1.24 ± 0.103		0.0136	0.028	1.044000	0.170165	16.30%
		061571-002	Cesium-137	pCi/g	0.934 ± 0.106		0.00954	0.0195			
		061571-003	Cesium-137	pCi/g	0.958 ± 0.105		0.012	0.0247			
		061571-001	Tritium	pCi/mL	-0.0143 ± 0.594	U	0.499	0.998	-0.026850	0.028355	-105.61%
		061571-002	Tritium	pCi/mL	-0.0068 ± 0.133	U	0.112	0.234			
		061571-003	Tritium	pCi/mL	-0.0469 ± 0.162	U	0.123	0.253			
		061571-001	Uranium	μg/g	0.814		0.00598	0.0398	0.784000	0.054580	6.96%
		061571-002	Uranium	μg/g	0.721		0.00589	0.0393			
		061571-003	Uranium	μg/g	0.817		0.00591	0.0394			
On-Site	20	061585-001	Cesium-137	pCi/g	0.466 ± 0.0565		0.00842	0.0173	0.371667	0.087203	23.46%
		061585-002	Cesium-137	pCi/g	0.294 ± 0.0416		0.0129	0.0268			
		061585-003	Cesium-137	pCi/g	0.355 ± 0.0372		0.0111	0.0229			
		061585-001	Tritium	pCi/g	0.226 ± 0.817	U	0.674	1.35	0.050767	0.189296	372.87%
		061585-002	Tritium	pCi/g	-0.15 ± 0.79	U	0.67	1.34			
		061585-003	Tritium	pCi/g	0.0763 ± 0.817	U	0.682	1.36			
		061585-001	Uranium	μg/g	0.542		0.00599	0.0399	0.537333	0.038214	7.11%
		061585-002	Uranium	μg/g	0.497		0.00595	0.0397			
		061585-003	Uranium	μg/g	0.573		0.00598	0.0398			
	2NE	061604-001	Cesium-137	pCi/g	0.187 ± 0.0235		0.00704	0.0145	0.171667	0.015011	8.74%
		061604-002	Cesium-137	pCi/g	0.157 ± 0.0257		0.00749	0.0154			
		061604-003	Cesium-137	pCi/g	0.171 ± 0.0293		0.0103	0.0213			
		061604-001	Tritium	pCi/g	-0.414 ± 0.461	U	0.401	0.802	-0.484000	0.211858	-43.77%
		061604-002	Tritium	pCi/g	-0.722 ± 0.448	U	0.4	0.799			
		061604-003	Tritium	pCi/g	-0.316 ± 0.473	U	0.408	0.816			
		061604-001	Uranium	μg/g	0.333		0.00599	0.0399	0.330000	0.056560	17.14%
		061604-002	Uranium	μg/g	0.385		0.00599	0.0399			
		061604-003	Uranium	μg/g	0.272		0.00592	0.0394			

See notes at end of table.

TABLE C-13. Radiological Replicate Results for Calendar Year 2003, Soil (concluded)

Location Type	Loc.	Sample ID	Analyte	Units	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site *(concluded)*	33	061561-001	Cesium-137	pCi/g	0.141 ± 0.0334		0.0127	0.0263	0.140333	0.032005	22.81%
		061561-002	Cesium-137	pCi/g	0.108 ± 0.0267		0.0137	0.0282			
		061561-003	Cesium-137	pCi/g	0.172 ± 0.034		0.0127	0.0262			
		061561-001	Tritium	pCi/g	-0.177 ± 0.589	U	0.502	1	-0.047300	0.183423	-387.79%
		061561-002	Tritium	pCi/g	0.0824 ± 0.61	U	0.508	1.02			
		061561-003	Tritium	pCi/g	-0.0181 ± 0.131	U	0.111	0.232			
		061561-001	Uranium	μg/g	0.853		0.00589	0.0393	1.129000	0.393829	34.88%
		061561-002	Uranium	μg/g	1.58		0.00594	0.0396			
		061561-003	Uranium	μg/g	0.954		0.00588	0.0392			
	53	061603-001	Cesium-137	pCi/g	0.139 ± 0.0193		0.00857	0.0176	0.146000	0.012124	8.30%
		061603-002	Cesium-137	pCi/g	0.16 ± 0.0263		0.00763	0.0157			
		061603-003	Cesium-137	pCi/g	0.139 ± 0.0224		0.00732	0.0151			
		061603-001	Tritium	pCi/mL	0.0906 ± 0.124	U	0.0993	0.208	0.093600	0.002718	2.90%
		061603-002	Tritium	pCi/mL	0.0943 ± 0.129	U	0.103	0.216			
		061603-003	Tritium	pCi/mL	0.0959 ± 0.131	U	0.105	0.22			
		061603-001	Uranium	μg/g	0.334		0.00592	0.0394	0.376333	0.045829	12.18%
		061603-002	Uranium	μg/g	0.425		0.00591	0.0394			
		061603-003	Uranium	μg/g	0.37		0.00593	0.0395			

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
μg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level. Some tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.
CV = coefficient of variation
Std Dev = standard deviation

TABLE C-14. Radiological Replicate Results for Calendar Year 2003, Sediment

Location Type	Loc.	Sample ID	Analyte	Units	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	11	061614-001	Cesium-137	pCi/g	0.0722 ± 0.0247		0.0121	0.0254	0.054767	0.024860	45.39%
		061614-002	Cesium-137	pCi/g	0.0658 ± 0.0326		0.0123	0.0259			
		061614-003	Cesium-137	pCi/g	0.0263 ± 0.0126		0.00844	0.0175			
		061614-001	Tritium	pCi/mL	0.296 ± 0.16		0.12	0.249	0.310500	0.020506	6.60%
		061614-002	Tritium	pCi/mL	0.325 ± 0.16		0.118	0.246			
		061614-003	Tritium	pCi/mL	0.163 ± 0.15	U	0.118	0.246			
		061614-001	Uranium	μg/g	0.381		0.00591	0.0394	0.418667	0.066108	15.79%
		061614-002	Uranium	μg/g	0.495		0.00598	0.0398			
		061614-003	Uranium	μg/g	0.38		0.00592	0.0394			
On-Site	74	061526-001	Cesium-137	pCi/g	0.0129 ± 0.0166	U	0.00989	0.0203	0.012500	0.000566	4.53%
		061526-002	Cesium-137	pCi/g	0.0121 ± 0.012	U	0.00613	0.0126			
		061526-003	Cesium-137	pCi/g	0.0383 ± 0.0204		0.0123	0.0253			
		061526-001	Tritium	pCi/g	0.7 ± 0.837	U	0.666	1.33	0.235000	0.579345	246.53%
		061526-002	Tritium	pCi/g	0.419 ± 0.77	U	0.625	1.25			
		061526-003	Tritium	pCi/g	-0.414 ± 0.762	U	0.66	1.32			
		061526-001	Uranium	μg/g	0.604		0.00592	0.0394	0.580333	0.048993	8.44%
		061526-002	Uranium	μg/g	0.524		0.00591	0.0394			
		061526-003	Uranium	μg/g	0.613		0.00595	0.0397			

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
μg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level. Some tritium results reported in pCi/g due to inadequate soil moisture to run standard analytical method.
CV = coefficient of variation
Std Dev = standard deviation

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TABLE C-15. Radiological Replicate Results for Calendar Year 2003, Vegetation

Location Type	Loc.	Sample ID	Analyte	Units	Activity (± 2 σ) and/or Concentration		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	11	061613-001	Cesium-137	pCi/g	-0.0368 ± 0.0552	U	0.0423	0.0887	-0.004150	0.046174	-1112.63%
		061613-002	Cesium-137	pCi/g	0.0285 ± 0.0491	U	0.0397	0.0826			
		061613-003	Cesium-137	pCi/g	0.173 ± 0.0852		0.0402	0.0843			
		061613-001	Tritium	pCi/mL	0.192 ± 0.152	U	0.119	0.249	0.133367	0.097258	72.93%
		061613-002	Tritium	pCi/mL	0.187 ± 0.168	U	0.12	0.248			
		061613-003	Tritium	pCi/mL	0.0211 ± 0.133	U	0.11	0.23			
		061613-001	Uranium	μg/g	0.00594	U	0.00594	0.0396	0.005960	0.000026	0.44%
		061613-002	Uranium	μg/g	0.00595	U	0.00595	0.0397			
		061613-003	Uranium	μg/g	0.00599	U	0.00599	0.0399			
On-Site	33	061562-001	Cesium-137	pCi/g	0 ± 0.0538	UX	0.0449	0.0932	0.000000	0.000000	--
		061562-002	Cesium-137	pCi/g	0 ± 0.129	UX	0.104	0.215			
		061562-003	Cesium-137	pCi/g	0.0236 ± 0.0601	U	0.0483	0.102			
		061562-001	Tritium	pCi/mL	0.051 ± 0.13	U	0.107	0.224	0.075233	0.035514	47.21%
		061562-002	Tritium	pCi/mL	0.0587 ± 0.133	U	0.108	0.227			
		061562-003	Tritium	pCi/mL	0.116 ± 0.118	U	0.0936	0.196			
		061562-001	Uranium	μg/g	0.00769	J	0.00592	0.0394	0.007820	0.000184	2.35%
		061562-002	Uranium	μg/g	0.00588	U	0.00588	0.0392			
		061562-003	Uranium	μg/g	0.00795	J	0.00596	0.0398			

NOTES: pCi/g = picocurie per gram
pCi/mL = picocurie per milliliter
μg/g = microgram per gram
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
CV = coefficient of variation
Std Dev = standard deviation

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TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Loc.	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**11**	061612-001	Aluminum	4670	B	0.77	9.71	4647	475.429630	10.23%
		061612-002	Aluminum	4160	B	0.785	9.9			
		061612-003	Aluminum	5110	B	0.77	9.71			
		061612-001	Antimony	0.333	U	0.333	0.971	0.337	0.004950	1.47%
		061612-002	Antimony	0.34	U	0.34	0.99			
		061612-003	Antimony	0.479	J	0.333	0.971			
		061612-001	Arsenic	2.57		0.2	0.485	2.70	0.173877	6.43%
		061612-002	Arsenic	2.64		0.204	0.495			
		061612-003	Arsenic	2.9		0.2	0.485			
		061612-001	Barium	172		0.0648	0.485	162	14.224392	8.76%
		061612-002	Barium	146		0.066	0.495			
		061612-003	Barium	169		0.0648	0.485			
		061612-001	Beryllium	0.3	J	0.0485	0.485	0.297	0.027099	9.11%
		061612-002	Beryllium	0.269	J	0.0495	0.495			
		061612-003	Beryllium	0.323	J	0.0485	0.485			
		061612-001	Cadmium	0.0709	J	0.0464	0.485	0.0831	0.010613	12.77%
		061612-002	Cadmium	0.0882	J	0.0473	0.495			
		061612-003	Cadmium	0.0902	J	0.0464	0.485			
		061612-001	Calcium	12500	B	1.27	9.71	12367	513.160144	4.15%
		061612-002	Calcium	11800	B	1.29	9.9			
		061612-003	Calcium	12800	B	1.27	9.71			
		061612-001	Chromium	6.93		0.156	0.485	6.74	0.391280	5.81%
		061612-002	Chromium	6.29		0.16	0.495			
		061612-003	Chromium	7		0.156	0.485			
		061612-001	Cobalt	3.31		0.0775	0.485	3.32	0.230072	6.94%
		061612-002	Cobalt	3.09		0.079	0.495			
		061612-003	Cobalt	3.55		0.0775	0.485			
		061612-001	Copper	5.25		0.197	0.485	5.10	0.467582	9.16%
		061612-002	Copper	4.58		0.201	0.495			
		061612-003	Copper	5.48		0.197	0.485			
		061612-001	Iron	8790		1.52	9.71	8420	456.398948	5.42%
		061612-002	Iron	7910		1.55	9.9			
		061612-003	Iron	8560		1.52	9.71			
		061612-001	Lead	8.41		0.275	0.485	7.21	1.047871	14.53%
		061612-002	Lead	6.46		0.281	0.495			
		061612-003	Lead	6.77		0.275	0.485			
		061612-001	Magnesium	2320	B	0.568	9.71	2317	205.020324	8.85%
		061612-002	Magnesium	2110	B	0.579	9.9			
		061612-003	Magnesium	2520	B	0.568	9.71			
		061612-001	Manganese	283		0.127	0.971	279	25.696952	9.20%
		061612-002	Manganese	252		0.13	0.99			
		061612-003	Manganese	303		0.127	0.971			
		061612-001	Mercury	0.00153	J	0.000888	0.00904	0.00144	0.000219	15.23%
		061612-002	Mercury	0.0016	J	0.000859	0.00873			
		061612-003	Mercury	0.00119	J	0.000907	0.00923			
		061612-001	Nickel	5.59	B	0.0829	0.485	5.46	0.353412	6.47%
		061612-002	Nickel	5.06	B	0.0846	0.495			
		061612-003	Nickel	5.73	B	0.0829	0.485			
		061612-001	Potassium	1280		3.47	9.71	1247	113.724814	9.12%
		061612-002	Potassium	1120		3.54	9.9			
		061612-003	Potassium	1340		3.47	9.71			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**11** (continued)	061612-001	Selenium	0.77	J	0.393	1.21	0.1585	0.002121	1.34%
		061612-002	Selenium	0.16	U	0.16	0.495			
		061612-003	Selenium	0.157	U	0.157	0.485			
		061612-001	Silver	0.0876	U	0.0876	0.485	0.0881	0.000981	1.11%
		061612-002	Silver	0.0893	U	0.0893	0.495			
		061612-003	Silver	0.0876	U	0.0876	0.485			
		061612-001	Sodium	139		3.53	9.71	142	27.098585	19.13%
		061612-002	Sodium	116		3.6	9.9			
		061612-003	Sodium	170		3.53	9.71			
		061612-001	Thallium	0.971	U	0.971	1.94	0.977	0.010970	1.12%
		061612-002	Thallium	0.99	U	0.99	1.98			
		061612-003	Thallium	0.971	U	0.971	1.94			
		061612-001	Vanadium	19.6		0.0882	0.485	18.6	0.953939	5.13%
		061612-002	Vanadium	17.7		0.0899	0.495			
		061612-003	Vanadium	18.5		0.0882	0.485			
		061612-001	Zinc	22.4		0.163	0.485	21.2	1.644182	7.77%
		061612-002	Zinc	19.3		0.167	0.495			
		061612-003	Zinc	21.8		0.163	0.485			
		061571-001	Aluminum	14500	B	0.755	9.52	12200	2042.057786	16.74%
		061571-002	Aluminum	10600	B	0.728	9.17			
		061571-003	Aluminum	11500	B	0.785	9.9			
		061571-001	Antimony	0.413	J	0.327	0.952	0.474	0.053267	11.23%
		061571-002	Antimony	0.509	J	0.315	0.917			
		061571-003	Antimony	0.501	J	0.34	0.99			
		061571-001	Arsenic	3.27		0.197	0.476	2.77	0.495076	17.87%
		061571-002	Arsenic	2.28		0.189	0.459			
		061571-003	Arsenic	2.76		0.204	0.495			
		061571-001	Barium	127		0.0635	0.476	106	18.915954	17.83%
		061571-002	Barium	90.2		0.0612	0.459			
		061571-003	Barium	101		0.066	0.495			
		061571-001	Beryllium	0.636		0.0476	0.476	0.550	0.082682	15.02%
		061571-002	Beryllium	0.471		0.0459	0.459			
		061571-003	Beryllium	0.544		0.0495	0.495			
		061571-001	Cadmium	0.182	J	0.0455	0.476	0.1092	0.064019	58.64%
		061571-002	Cadmium	0.0618	J	0.0439	0.459			
		061571-003	Cadmium	0.0837	J	0.0473	0.495			
		061571-001	Calcium	6150	B	3.11	23.8	5133	895.786433	17.45%
		061571-002	Calcium	4460	B	1.2	9.17			
		061571-003	Calcium	4790	B	1.29	9.9			
		061571-001	Chromium	10.9		0.153	0.476	9.22	1.508907	16.37%
		061571-002	Chromium	7.98		0.148	0.459			
		061571-003	Chromium	8.78		0.16	0.495			
		061571-001	Cobalt	9.35		0.076	0.476	8.36	0.857496	10.26%
		061571-002	Cobalt	7.85		0.0732	0.459			
		061571-003	Cobalt	7.88		0.079	0.495			
		061571-001	Copper	16.5		0.483	1.19	14.3	2.074448	14.54%
		061571-002	Copper	12.4		0.466	1.15			
		061571-003	Copper	13.9		0.502	1.24			
		061571-001	Iron	25500		3.73	23.8	23033	2218.858565	9.63%
		061571-002	Iron	21200		3.59	22.9			
		061571-003	Iron	22400		3.88	24.8			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**11** (concluded)	061571-001	Lead	16.7		0.27	0.476	14.5	2.112660	14.60%
		061571-002	Lead	12.5		0.26	0.459			
		061571-003	Lead	14.2		0.281	0.495			
		061571-001	Magnesium	7700		1.39	23.8	6503	1054.529911	16.22%
		061571-002	Magnesium	5710		0.537	9.17			
		061571-003	Magnesium	6100		0.579	9.9			
		061571-001	Manganese	590		0.125	0.952	513	74.625733	14.55%
		061571-002	Manganese	441		0.12	0.917			
		061571-003	Manganese	508		0.13	0.99			
		061571-001	Mercury	0.017 8		0.000945	0.00962	0.0149	0.002532	16.96%
		061571-002	Mercury	0.014		0.000861	0.00876			
		061571-003	Mercury	0.013		0.000978	0.00995			
		061571-001	Nickel	10.1	B	0.0813	0.476	8.61	1.342398	15.59%
		061571-002	Nickel	7.49	B	0.0783	0.459			
		061571-003	Nickel	8.25	B	0.0846	0.495			
		061571-001	Potassium	3960		8.52	23.8	3150	720.624729	22.88%
		061571-002	Potassium	2580		3.28	9.17			
		061571-003	Potassium	2910		3.54	9.9			
		061571-001	Selenium	0.154	U	0.154	0.476	0.157	0.004243	2.70%
		061571-002	Selenium	0.401	J	0.149	0.459			
		061571-003	Selenium	0.16	U	0.16	0.495			
		061571-001	Silver	0.085 9	U	0.0859	0.476	0.086	0.003251	3.78%
		061571-002	Silver	0.082 8	U	0.0828	0.459			
		061571-003	Silver	0.089 3	U	0.0893	0.495			
		061571-001	Sodium	83.7		3.46	9.52	69.9	11.966202	17.12%
		061571-002	Sodium	63.6		3.33	9.17			
		061571-003	Sodium	62.4		3.6	9.9			
		061571-001	Thallium	2.38	U	2.38	2.38	2.38	0.095044	3.99%
		061571-002	Thallium	2.29	U	2.29	2.29			
		061571-003	Thallium	2.48	U	2.48	2.48			
		061571-001	Vanadium	38.9		0.0865	0.476	34.4	4.135618	12.03%
		061571-002	Vanadium	30.8		0.0833	0.459			
		061571-003	Vanadium	33.4		0.0899	0.495			
		061571-001	Zinc	85.3		0.401	1.19	76.8	7.450503	9.70%
		061571-002	Zinc	73.7		0.386	1.15			
		061571-003	Zinc	71.4		0.417	1.24			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**20**	061585-001	Aluminum	7930		0.734	9.26	7860	717.565328	9.13%
		061585-002	Aluminum	7110		0.785	9.9			
		061585-003	Aluminum	8540		0.755	9.52			
		061585-001	Antimony	989		0.318	0.926	920	886.319259	96.33%
		061585-002	Antimony	1770		0.34	0.99			
		061585-003	Antimony	1.38		0.327	0.952			
		061585-001	Arsenic	429		0.191	0.463	345	308.220976	89.42%
		061585-002	Arsenic	602		0.204	0.495			
		061585-003	Arsenic	3.1		0.197	0.476			
		061585-001	Barium	95.7		0.0618	0.463	92.2	5.577036	6.05%
		061585-002	Barium	85.8		0.066	0.495			
		061585-003	Barium	95.2		0.0635	0.476			
		061585-001	Beryllium	0.385	J	0.0463	0.463	0.387	0.033045	8.54%
		061585-002	Beryllium	0.355	J	0.0495	0.495			
		061585-003	Beryllium	0.421	J	0.0476	0.476			
		061585-001	Cadmium	2.24		0.0443	0.463	1.89	0.749066	39.63%
		061585-002	Cadmium	2.4		0.0473	0.495			
		061585-003	Cadmium	1.03		0.0455	0.476			
		061585-001	Calcium	22300		1.21	9.26	18700	3132.091953	16.75%
		061585-002	Calcium	17200		1.29	9.9			
		061585-003	Calcium	16600		1.24	9.52			
		061585-001	Chromium	10.4		0.149	0.463	10.2	1.531187	15.03%
		061585-002	Chromium	8.56		0.16	0.495			
		061585-003	Chromium	11.6		0.153	0.476			
		061585-001	Cobalt	4.6		0.0739	0.463	4.84	0.480867	9.94%
		061585-002	Cobalt	4.52		0.079	0.495			
		061585-003	Cobalt	5.39		0.076	0.476			
		061585-001	Copper	12.9		0.188	0.463	17.7	10.886842	61.39%
		061585-002	Copper	30.2		0.201	0.495			
		061585-003	Copper	10.1		0.193	0.476			
		061585-001	Iron	12600		3.63	23.1	12500	1652.271164	13.22%
		061585-002	Iron	10800		3.88	24.8			
		061585-003	Iron	14100		3.73	23.8			
		061585-001	Lead	53000		6.57	11.6	34520	29870.094618	86.53%
		061585-002	Lead	50500		7.02	12.4			
		061585-003	Lead	58.8		0.675	1.19			
		061585-001	Magnesium	3620	B	0.541	9.26	3500	151.327460	4.32%
		061585-002	Magnesium	3330	B	0.579	9.9			
		061585-003	Magnesium	3550	B	0.557	9.52			
		061585-001	Manganese	248		0.121	0.926	238	10.535654	4.43%
		061585-002	Manganese	227		0.13	0.99			
		061585-003	Manganese	239		0.125	0.952			
		061585-001	Mercury	0.0165		0.00098	0.00997	0.0148	0.001514	10.26%
		061585-002	Mercury	0.0137		0.000942	0.00958			
		061585-003	Mercury	0.0141		0.000967	0.00984			
		061585-001	Nickel	8.68		0.0791	0.463	9.13	0.635715	6.96%
		061585-002	Nickel	8.86		0.0846	0.495			
		061585-003	Nickel	9.86		0.0813	0.476			
		061585-001	Potassium	2130		3.31	9.26	2083	117.189306	5.63%
		061585-002	Potassium	1950		3.54	9.9			
		061585-003	Potassium	2170		3.41	9.52			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**20** (concluded)	061585-001	Selenium	0.15	U	0.15	0.463	0.155	0.007071	4.56%
		061585-002	Selenium	0.16	U	0.16	0.495			
		061585-003	Selenium	0.216	J	0.154	0.476			
		061585-001	Silver	2.41		0.0835	0.463	1.71	0.989949	57.89%
		061585-002	Silver	1.01		0.0893	0.495			
		061585-003	Silver	0.0859	U	0.0859	0.476			
		061585-001	Sodium	54.2		8.41	23.1	46.7	7.099531	15.21%
		061585-002	Sodium	40.1		8.99	24.8			
		061585-003	Sodium	45.7		8.65	23.8			
		061585-001	Thallium	2.31	U	2.31	2.31	2.39	0.085440	3.57%
		061585-002	Thallium	2.48	U	2.48	2.48			
		061585-003	Thallium	2.38	U	2.38	2.38			
		061585-001	Vanadium	21.1		0.0841	0.463	22.4	3.194266	14.28%
		061585-002	Vanadium	20		0.0899	0.495			
		061585-003	Vanadium	26		0.0865	0.476			
		061585-001	Zinc	36.7		0.156	0.463	34.9	1.750238	5.01%
		061585-002	Zinc	33.2		0.167	0.495			
		061585-003	Zinc	34.9		0.16	0.476			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**2NE**	061604-001	Aluminum	5320		0.793	10	7493	1882.268135	25.12%
		061604-002	Aluminum	8600		0.728	9.17			
		061604-003	Aluminum	8560		0.778	9.8			
		061604-001	Antimony	0.558	J	0.343	1	0.544	0.020881	3.84%
		061604-002	Antimony	0.52	J	0.315	0.917			
		061604-003	Antimony	0.554	J	0.337	0.98			
		061604-001	Arsenic	1.76		0.206	0.5	2.14	0.337095	15.78%
		061604-002	Arsenic	2.41		0.189	0.459			
		061604-003	Arsenic	2.24		0.202	0.49			
		061604-001	Barium	49.1		0.0667	0.5	67.8	17.141276	25.29%
		061604-002	Barium	82.8		0.0612	0.459			
		061604-003	Barium	71.4		0.0654	0.49			
		061604-001	Beryllium	0.246	J	0.05	0.5	0.326	0.113137	34.70%
		061604-002	Beryllium	0.462		0.0459	0.459			
		061604-003	Beryllium	0.406	J	0.049	0.49			
		061604-001	Cadmium	0.152	BJ	0.0478	0.5	0.269	0.107364	39.91%
		061604-002	Cadmium	0.363	BJ	0.0439	0.459			
		061604-003	Cadmium	0.292	BJ	0.0469	0.49			
		061604-001	Calcium	3580	B	1.3	10	6083	2633.445145	43.29%
		061604-002	Calcium	8830	B	1.2	9.17			
		061604-003	Calcium	5840	B	1.28	9.8			
		061604-001	Chromium	5.03		0.161	0.5	7.51	2.145561	28.58%
		061604-002	Chromium	8.69		0.148	0.459			
		061604-003	Chromium	8.8		0.158	0.49			
		061604-001	Cobalt	3.74		0.0798	0.5	3.32	0.365011	10.98%
		061604-002	Cobalt	3.17		0.0732	0.459			
		061604-003	Cobalt	3.06		0.0782	0.49			
		061604-001	Copper	8.25		0.203	0.5	7.31	0.925545	12.67%
		061604-002	Copper	7.27		0.186	0.459			
		061604-003	Copper	6.4		0.199	0.49			
		061604-001	Iron	7900		1.57	10	9083	1026.856043	11.30%
		061604-002	Iron	9740		1.44	9.17			
		061604-003	Iron	9610		1.54	9.8			
		061604-001	Lead	5.55		0.284	0.5	8.72	2.742414	31.46%
		061604-002	Lead	10.3		0.26	0.459			
		061604-003	Lead	10.3		0.278	0.49			
		061604-001	Magnesium	2850	B	0.585	10	2493	310.859025	12.47%
		061604-002	Magnesium	2350	B	0.537	9.17			
		061604-003	Magnesium	2280	B	0.573	9.8			
		061604-001	Manganese	213		0.131	1	173	34.443190	19.87%
		061604-002	Manganese	156		0.12	0.917			
		061604-003	Manganese	151		0.128	0.98			
		061604-001	Mercury	0.000941	U	0.000941	0.00957	0.000897	0.000038	4.25%
		061604-002	Mercury	0.000874	U	0.000874	0.00889			
		061604-003	Mercury	0.000876	U	0.000876	0.00892			
		061604-001	Nickel	5.53		0.0854	0.5	6.17	0.563205	9.13%
		061604-002	Nickel	6.59		0.0783	0.459			
		061604-003	Nickel	6.39		0.0837	0.49			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**2NE** (concluded)	061604-001	Potassium	1020	B	3.58	10	1603	505.404129	31.52%
		061604-002	Potassium	1910	B	3.28	9.17			
		061604-003	Potassium	1880	B	3.51	9.8			
		061604-001	Selenium	0.32	J	0.162	0.5	0.299	0.029698	9.93%
		061604-002	Selenium	0.48		0.149	0.459			
		061604-003	Selenium	0.278	J	0.159	0.49			
		061604-001	Silver	0.0902	U	0.0902	0.5	0.0893	0.001273	1.43%
		061604-002	Silver	0.0994	J	0.0828	0.459			
		061604-003	Silver	0.0884	U	0.0884	0.49			
		061604-001	Sodium	17.7		3.63	10	25.9	7.180761	27.69%
		061604-002	Sodium	30.9		3.33	9.17			
		061604-003	Sodium	29.2		3.56	9.8			
		061604-001	Thallium	1	U	1	1	0.966	0.043317	4.49%
		061604-002	Thallium	0.917	U	0.917	0.917			
		061604-003	Thallium	0.98	U	0.98	0.98			
		061604-001	Vanadium	11.5		0.0908	0.5	15.2	3.181719	20.98%
		061604-002	Vanadium	17.2		0.0833	0.459			
		061604-003	Vanadium	16.8		0.089	0.49			
		061604-001	Zinc	31.3		0.168	0.5	29.4	1.700980	5.79%
		061604-002	Zinc	28.7		0.154	0.459			
		061604-003	Zinc	28.1		0.165	0.49			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**33**	061561-001	Aluminum	8270	B	0.741	9.35	10190	1663.520364	16.33%
		061561-002	Aluminum	11200	B	0.77	9.71			
		061561-003	Aluminum	11100	B	0.728	9.17			
		061561-001	Antimony	0.499	J	0.321	0.935	0.324	0.012728	3.93%
		061561-002	Antimony	0.333	U	0.333	0.971			
		061561-003	Antimony	0.315	U	0.315	0.917			
		061561-001	Arsenic	32.7		0.482	1.17	30.5	18.896296	61.96%
		061561-002	Arsenic	48.2		0.501	1.21			
		061561-003	Arsenic	10.6		0.473	1.15			
		061561-001	Barium	86.6		0.0623	0.467	101.2	13.119451	12.96%
		061561-002	Barium	105		0.0648	0.485			
		061561-003	Barium	112		0.0612	0.459			
		061561-001	Beryllium	1.34		0.0467	0.467	2.00	1.154744	57.83%
		061561-002	Beryllium	3.33		0.0485	0.485			
		061561-003	Beryllium	1.32		0.0459	0.459			
		061561-001	Cadmium	0.129	J	0.0447	0.467	0.158	0.025120	15.90%
		061561-002	Cadmium	0.173	J	0.0464	0.485			
		061561-003	Cadmium	0.172	J	0.0439	0.459			
		061561-001	Calcium	26300	B	1.22	9.35	31533	4578.573286	14.52%
		061561-002	Calcium	33500	B	6.33	48.5			
		061561-003	Calcium	34800	B	5.98	45.9			
		061561-001	Chromium	9.91		0.151	0.467	11.77	1.610807	13.69%
		061561-002	Chromium	12.7		0.156	0.485			
		061561-003	Chromium	12.7		0.148	0.459			
		061561-001	Cobalt	6.51		0.0746	0.467	9.36	3.383947	36.15%
		061561-002	Cobalt	13.1		0.0775	0.485			
		061561-003	Cobalt	8.47		0.0732	0.459			
		061561-001	Copper	8.97		0.19	0.467	11.59	2.346977	20.25%
		061561-002	Copper	12.3		0.197	0.485			
		061561-003	Copper	13.5		0.186	0.459			
		061561-001	Iron	15800		3.66	23.4	19967	4055.038019	20.31%
		061561-002	Iron	23900		3.8	24.3			
		061561-003	Iron	20200		3.59	22.9			
		061561-001	Lead	11.2		0.265	0.467	13.3	3.051229	22.94%
		061561-002	Lead	16.8		0.275	0.485			
		061561-003	Lead	11.9		0.26	0.459			
		061561-001	Magnesium	3750		0.547	9.35	4983	1068.285230	21.44%
		061561-002	Magnesium	5620		2.84	48.5			
		061561-003	Magnesium	5580		2.68	45.9			
		061561-001	Manganese	273		0.306	2.34	502	200.175756	39.85%
		061561-002	Manganese	642		0.317	2.43			
		061561-003	Manganese	592		0.3	2.29			
		061561-001	Mercury	0.0111		0.000929	0.00945	0.0182	0.006864	37.71%
		061561-002	Mercury	0.0248		0.000909	0.00924			
		061561-003	Mercury	0.0187		0.000922	0.00938			
		061561-001	Nickel	8.85		0.0798	0.467	12.65	4.353447	34.41%
		061561-002	Nickel	17.4		0.0829	0.485			
		061561-003	Nickel	11.7		0.0783	0.459			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**33** (concluded)	061561-001	Potassium	1890		3.34	9.35	2997	959.704816	32.03%
		061561-002	Potassium	3600		17.4	48.5			
		061561-003	Potassium	3500		16.4	45.9			
		061561-001	Selenium	0.151	BU	0.151	0.467	0.259	0.113844	44.04%
		061561-002	Selenium	0.339	BJ	0.157	0.485			
		061561-003	Selenium	0.178	BJ	0.149	0.459			
		061561-001	Silver	0.0843	U	0.0843	0.467	0.0849	0.002456	2.89%
		061561-002	Silver	0.0876	U	0.0876	0.485			
		061561-003	Silver	0.0828	U	0.0828	0.459			
		061561-001	Sodium	139		3.39	9.35	500	361.502882	72.35%
		061561-002	Sodium	862		3.53	9.71			
		061561-003	Sodium	498		3.33	9.17			
		061561-001	Thallium	4.67	U	4.67	4.67	4.70	0.133167	2.83%
		061561-002	Thallium	4.85	U	4.85	4.85			
		061561-003	Thallium	4.59	U	4.59	4.59			
		061561-001	Vanadium	35.9		0.212	1.17	41.0	6.690541	16.31%
		061561-002	Vanadium	48.6		0.22	1.21			
		061561-003	Vanadium	38.6		0.208	1.15			
		061561-001	Zinc	48.6	B	0.157	0.467	61.1	13.025104	21.31%
		061561-002	Zinc	74.6	B	0.163	0.485			
		061561-003	Zinc	60.2	B	0.154	0.459			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**53**	061603-001	Aluminum	4780	B	0.793	10	5770	888.988189	15.41%
		061603-002	Aluminum	6500	B	0.77	9.71			
		061603-003	Aluminum	6030	B	0.755	9.52			
		061603-001	Antimony	0.645	J	0.343	1	0.491	0.134671	27.45%
		061603-002	Antimony	0.43	J	0.333	0.971			
		061603-003	Antimony	0.397	J	0.327	0.952			
		061603-001	Arsenic	1.89		0.206	0.5	1.98	0.125033	6.33%
		061603-002	Arsenic	2.12		0.2	0.485			
		061603-003	Arsenic	1.92		0.197	0.476			
		061603-001	Barium	47.3		0.0667	0.5	52.3	4.508141	8.63%
		061603-002	Barium	56.1		0.0648	0.485			
		061603-003	Barium	53.4		0.0635	0.476			
		061603-001	Beryllium	0.268	J	0.05	0.5	0.311	0.039400	12.66%
		061603-002	Beryllium	0.345	J	0.0485	0.485			
		061603-003	Beryllium	0.321	J	0.0476	0.476			
		061603-001	Cadmium	0.114	J	0.0478	0.5	0.124	0.017616	14.24%
		061603-002	Cadmium	0.144	J	0.0464	0.485			
		061603-003	Cadmium	0.113	J	0.0455	0.476			
		061603-001	Calcium	1610	B	1.3	10	1450	147.309199	10.16%
		061603-002	Calcium	1420	B	1.27	9.71			
		061603-003	Calcium	1320	B	1.24	9.52			
		061603-001	Chromium	5.24		0.161	0.5	6.27	0.894949	14.27%
		061603-002	Chromium	6.8		0.156	0.485			
		061603-003	Chromium	6.78		0.153	0.476			
		061603-001	Cobalt	2.27		0.0798	0.5	2.66	0.338674	12.73%
		061603-002	Cobalt	2.83		0.0775	0.485			
		061603-003	Cobalt	2.88		0.076	0.476			
		061603-001	Copper	4.64		0.203	0.5	5.2	0.493254	9.49%
		061603-002	Copper	5.57		0.197	0.485			
		061603-003	Copper	5.39		0.193	0.476			
		061603-001	Iron	6110		1.57	10	7130	886.115117	12.43%
		061603-002	Iron	7710		1.52	9.71			
		061603-003	Iron	7570		1.49	9.52			
		061603-001	Lead	6.73		0.284	0.5	7.52	0.719050	9.57%
		061603-002	Lead	8.14		0.275	0.485			
		061603-003	Lead	7.68		0.27	0.476			
		061603-001	Magnesium	1230	B	0.585	10	1457	205.264058	14.09%
		061603-002	Magnesium	1630	B	0.568	9.71			
		061603-003	Magnesium	1510	B	0.557	9.52			
		061603-001	Manganese	117		0.131	1	140	20.074860	14.34%
		061603-002	Manganese	149		0.127	0.971			
		061603-003	Manganese	154		0.125	0.952			
		061603-001	Mercury	0.000962	U	0.000962	0.00979	0.000908	0.000058	6.44%
		061603-002	Mercury	0.000846	U	0.000846	0.00861			
		061603-003	Mercury	0.000917	U	0.000917	0.00933			
		061603-001	Nickel	3.98	B	0.0854	0.5	4.68	0.605833	12.95%
		061603-002	Nickel	5.08	B	0.0829	0.485			
		061603-003	Nickel	4.97	B	0.0813	0.476			

See notes at end of table.

TABLE C-16. Non-Radiological Replicate Results for Calendar Year 2003, Soil (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**53**	061603-001	Potassium	1150		3.58	10	1350	175.783958	13.02%
	(concluded)	061603-002	Potassium	1480		3.47	9.71			
		061603-003	Potassium	1420		3.41	9.52			
		061603-001	Selenium	0.162	U	0.162	0.5	0.236	0.135736	57.43%
		061603-002	Selenium	0.393	U	0.393	1.21			
		061603-003	Selenium	0.154	U	0.154	0.476			
		061603-001	Silver	0.0902	U	0.0902	0.5	0.0879	0.002166	2.46%
		061603-002	Silver	0.0876	U	0.0876	0.485			
		061603-003	Silver	0.0859	U	0.0859	0.476			
		061603-001	Sodium	23.2		3.63	10	21	1.905256	9.07%
		061603-002	Sodium	19.9		3.53	9.71			
		061603-003	Sodium	19.9		3.46	9.52			
		061603-001	Thallium	1	U	1	2	0.974	0.024173	2.48%
		061603-002	Thallium	0.971	U	0.971	1.94			
		061603-003	Thallium	0.952	U	0.952	1.9			
		061603-001	Vanadium	10.4		0.0908	0.5	12.2	1.550269	12.74%
		061603-002	Vanadium	12.8		0.0882	0.485			
		061603-003	Vanadium	13.3		0.0865	0.476			
		061603-001	Zinc	17.4		0.168	0.5	19.6	1.997498	10.19%
		061603-002	Zinc	21.3		0.163	0.485			
		061603-003	Zinc	20.1		0.16	0.476			

NOTES: B = The analyte was found in the blank above the effective decision level (organics), or the effective detection limit (inorganics).
J = Estimated value, the analyte concentration fell above the effective decision level and below the effective detection limit.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
CV = coefficient of variation
Std Dev = standard deviation

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TABLE C-17. Non-Radiological Replicate Results for Calendar Year 2003, Sediment

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**11**	061614-001	Aluminum	5830	B	0.748	9.43	4683	1170.697798	25.00%
		061614-002	Aluminum	4730	B	0.748	9.43			
		061614-003	Aluminum	3490	B	0.77	9.71			
		061614-001	Antimony	0.579	J	0.324	0.943	0.481	0.085278	17.74%
		061614-002	Antimony	0.436	J	0.324	0.943			
		061614-003	Antimony	0.427	J	0.333	0.971			
		061614-001	Arsenic	2.6		0.195	0.472	2.33	0.427707	18.33%
		061614-002	Arsenic	1.84		0.195	0.472			
		061614-003	Arsenic	2.56		0.2	0.485			
		061614-001	Barium	87.1		0.0629	0.472	75.7	12.843805	16.96%
		061614-002	Barium	78.3		0.0629	0.472			
		061614-003	Barium	61.8		0.0648	0.485			
		061614-001	Beryllium	0.332	J	0.0472	0.472	0.285	0.044770	15.73%
		061614-002	Beryllium	0.279	J	0.0472	0.472			
		061614-003	Beryllium	0.243	J	0.0485	0.485			
		061614-001	Cadmium	0.0718	J	0.0451	0.472	0.0596	0.017253	28.95%
		061614-002	Cadmium	0.0474	J	0.0451	0.472			
		061614-003	Cadmium	0.0464	U	0.0464	0.485			
		061614-001	Calcium	11400	B	1.23	9.43	9520	1937.343542	20.35%
		061614-002	Calcium	9630	B	1.23	9.43			
		061614-003	Calcium	7530	B	1.27	9.71			
		061614-001	Chromium	5.63		0.152	0.472	4.94	0.690000	13.97%
		061614-002	Chromium	4.94		0.152	0.472			
		061614-003	Chromium	4.25		0.156	0.485			
		061614-001	Cobalt	2.54		0.0753	0.472	2.37	0.181475	7.65%
		061614-002	Cobalt	2.4		0.0753	0.472			
		061614-003	Cobalt	2.18		0.0775	0.485			
		061614-001	Copper	4.96		0.192	0.472	4.24	0.671789	15.84%
		061614-002	Copper	4.13		0.192	0.472			
		061614-003	Copper	3.63		0.197	0.485			
		061614-001	Iron	6990		1.48	9.43	6450	476.235236	7.38%
		061614-002	Iron	6090		1.48	9.43			
		061614-003	Iron	6270		1.52	9.71			
		061614-001	Lead	5.66		0.268	0.472	5.04	0.587566	11.65%
		061614-002	Lead	4.98		0.268	0.472			
		061614-003	Lead	4.49		0.275	0.485			
		061614-001	Magnesium	2350	B	0.552	9.43	1993	360.046293	18.06%
		061614-002	Magnesium	2000	B	0.552	9.43			
		061614-003	Magnesium	1630	B	0.568	9.71			
		061614-001	Manganese	176		0.123	0.943	148	24.758837	16.73%
		061614-002	Manganese	139		0.123	0.943			
		061614-003	Manganese	129		0.127	0.971			
		061614-001	Mercury	0.000939	U	0.000939	0.00955	0.000946	0.000020	2.10%
		061614-002	Mercury	0.00093	U	0.00093	0.00946			
		061614-003	Mercury	0.000968	U	0.000968	0.00985			
		061614-001	Nickel	4.9	B	0.0806	0.472	4.26	0.620967	14.58%
		061614-002	Nickel	4.22	B	0.0806	0.472			
		061614-003	Nickel	3.66	B	0.0829	0.485			

See notes at end of table.

TABLE C-17. Non-Radiological Replicate Results for Calendar Year 2003, Sediment (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**11** (concluded)	061614-001	Potassium	1220		3.37	9.43	990	233.045775	23.55%
		061614-002	Potassium	995		3.37	9.43			
		061614-003	Potassium	754		3.47	9.71			
		061614-001	Selenium	0.153	U	0.153	0.472	0.154	0.002309	1.50%
		061614-002	Selenium	0.153	U	0.153	0.472			
		061614-003	Selenium	0.157	U	0.157	0.485			
		061614-001	Silver	0.0851	U	0.0851	0.472	0.0859	0.001443	1.68%
		061614-002	Silver	0.0851	U	0.0851	0.472			
		061614-003	Silver	0.0876	U	0.0876	0.485			
		061614-001	Sodium	122		3.43	9.43	112	11.930353	10.62%
		061614-002	Sodium	116		3.43	9.43			
		061614-003	Sodium	99		3.53	9.71			
		061614-001	Thallium	0.943	U	0.943	1.89	0.952	0.016166	1.70%
		061614-002	Thallium	0.943	U	0.943	1.89			
		061614-003	Thallium	0.971	U	0.971	1.94			
		061614-001	Vanadium	13.2		0.0857	0.472	12.8	0.513160	4.02%
		061614-002	Vanadium	12.2		0.0857	0.472			
		061614-003	Vanadium	12.9		0.0882	0.485			
		061614-001	Zinc	18.4		0.159	0.472	16.3	1.913984	11.77%
		061614-002	Zinc	15.7		0.159	0.472			
		061614-003	Zinc	14.7		0.163	0.485			

See notes at end of table.

TABLE C-17. Non-Radiological Replicate Results for Calendar Year 2003, Sediment (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**74**	061526-001	Aluminum	2280		0.721	9.09	3860	1519.177409	39.36%
		061526-002	Aluminum	3990		0.793	10			
		061526-003	Aluminum	5310		0.748	9.43			
		061526-001	Antimony	0.312	U	0.312	0.909	0.326	0.015631	4.79%
		061526-002	Antimony	0.343	U	0.343	1			
		061526-003	Antimony	0.324	U	0.324	0.943			
		061526-001	Arsenic	0.607		0.188	0.455	1.072	0.414037	38.61%
		061526-002	Arsenic	1.21		0.206	0.5			
		061526-003	Arsenic	1.4		0.195	0.472			
		061526-001	Barium	17.3		0.0606	0.455	33.5	14.221931	42.41%
		061526-002	Barium	43.8		0.0667	0.5			
		061526-003	Barium	39.5		0.0629	0.472			
		061526-001	Beryllium	0.201	J	0.0455	0.455	0.235	0.030238	12.85%
		061526-002	Beryllium	0.258	J	0.05	0.5			
		061526-003	Beryllium	0.247	J	0.0472	0.472			
		061526-001	Cadmium	0.0476	J	0.0435	0.455	0.0465	0.001909	4.11%
		061526-002	Cadmium	0.0478	U	0.0478	0.5			
		061526-003	Cadmium	0.0451	U	0.0451	0.472			
		061526-001	Calcium	18000		1.19	9.09	18900	2286.919325	12.10%
		061526-002	Calcium	17200		1.3	10			
		061526-003	Calcium	21500		1.23	9.43			
		061526-001	Chromium	2.4		0.146	0.455	4.11	1.562605	37.99%
		061526-002	Chromium	4.48		0.161	0.5			
		061526-003	Chromium	5.46		0.152	0.472			
		061526-001	Cobalt	2.05		0.0725	0.455	3.49	1.250053	35.78%
		061526-002	Cobalt	4.23		0.0798	0.5			
		061526-003	Cobalt	4.2		0.0753	0.472			
		061526-001	Copper	2.62		0.185	0.455	5.94	3.014039	50.71%
		061526-002	Copper	6.71		0.203	0.5			
		061526-003	Copper	8.5		0.192	0.472			
		061526-001	Iron	5360		3.56	22.7	8337	2664.776413	31.96%
		061526-002	Iron	9150		3.92	25			
		061526-003	Iron	10500		3.7	23.6			
		061526-001	Lead	2.48		0.645	1.14	3.73	1.175004	31.47%
		061526-002	Lead	4.81		0.709	1.25			
		061526-003	Lead	3.91		0.669	1.18			
		061526-001	Magnesium	1250	B	0.532	9.09	2270	991.362699	43.67%
		061526-002	Magnesium	2330	B	0.585	10			
		061526-003	Magnesium	3230	B	0.552	9.43			
		061526-001	Manganese	101		0.119	0.909	158	57.000000	36.08%
		061526-002	Manganese	158		0.131	1			
		061526-003	Manganese	215		0.123	0.943			
		061526-001	Mercury	0.000942	U	0.000942	0.00958	0.002425	0.000587	24.20%
		061526-002	Mercury	0.00284	J	0.000871	0.00886			
		061526-003	Mercury	0.00201	J	0.000871	0.00886			
		061526-001	Nickel	2.34		0.0776	0.455	3.83	1.408652	36.78%
		061526-002	Nickel	4.01		0.0854	0.5			
		061526-003	Nickel	5.14		0.0806	0.472			

See notes at end of table.

TABLE C-17. Non-Radiological Replicate Results for Calendar Year 2003, Sediment (concluded)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**74** (concluded)	061526-001	Potassium	359		3.25	9.09	774	359.701728	46.45%
		061526-002	Potassium	985		3.58	10			
		061526-003	Potassium	979		3.37	9.43			
		061526-001	Selenium	0.147	U	0.147	0.455	0.154	0.007550	4.90%
		061526-002	Selenium	0.162	U	0.162	0.5			
		061526-003	Selenium	0.153	U	0.153	0.472			
		061526-001	Silver	0.082	U	0.082	0.455	0.0861	0.005798	6.73%
		061526-002	Silver	0.0902	U	0.0902	0.5			
		061526-003	Silver	0.25	J	0.0851	0.472			
		061526-001	Sodium	34.3		8.25	22.7	56.3	19.025334	33.81%
		061526-002	Sodium	67.5		9.08	25			
		061526-003	Sodium	67		8.56	23.6			
		061526-001	Thallium	2.27	U	2.27	2.27	2.38	0.115902	4.88%
		061526-002	Thallium	2.5	U	2.5	2.5			
		061526-003	Thallium	2.36	U	2.36	2.36			
		061526-001	Vanadium	9.54		0.0825	0.455	15.21	5.024195	33.02%
		061526-002	Vanadium	17		0.0908	0.5			
		061526-003	Vanadium	19.1		0.0857	0.472			
		061526-001	Zinc	11.4		0.153	0.455	20.6	8.043009	39.04%
		061526-002	Zinc	24.1		0.168	0.5			
		061526-003	Zinc	26.3		0.159	0.472			

NOTES: B = The analyte was found in the blank above the effective decision level (organics), or the effective detection limit (inorganics).
J = Estimated value, the analyte concentration fell above the effective decision level and below the effective detection limit.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
CV = coefficient of variation
Std Dev = standard deviation

TABLE C-18. Non-Radiological Replicate Results for Calendar Year 2003, Vegetation
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-Site	**11**	061613-001	Aluminum	19.7	B	0.793	10	22.1	2.615977	11.82%
		061613-002	Aluminum	21.8	B	0.748	9.43			
		061613-003	Aluminum	24.9	B	0.793	10			
		061613-001	Antimony	0.403	J	0.343	1	0.3335	0.013435	4.03%
		061613-002	Antimony	0.324	U	0.324	0.943			
		061613-003	Antimony	0.343	U	0.343	1			
		061613-001	Arsenic	0.215	J	0.206	0.5	0.2115	0.004950	2.34%
		061613-002	Arsenic	0.208	J	0.195	0.472			
		061613-003	Arsenic	0.206	U	0.206	0.5			
		061613-001	Barium	8.11		0.0667	0.5	6.02	1.965740	32.67%
		061613-002	Barium	5.73		0.0629	0.472			
		061613-003	Barium	4.21		0.0667	0.5			
		061613-001	Beryllium	0.05	U	0.05	0.5	.0491	0.001617	3.29%
		061613-002	Beryllium	0.0472	U	0.0472	0.472			
		061613-003	Beryllium	0.05	U	0.05	0.5			
		061613-001	Cadmium	0.0478	U	0.0478	0.5	0.0469	0.001559	3.32%
		061613-002	Cadmium	0.0451	U	0.0451	0.472			
		061613-003	Cadmium	0.0478	U	0.0478	0.5			
		061613-001	Calcium	2570	B	1.3	10	2207	346.458271	15.70%
		061613-002	Calcium	1880	B	1.23	9.43			
		061613-003	Calcium	2170	B	1.3	10			
		061613-001	Chromium	0.163	J	0.161	0.5	0.7155	0.084146	11.76%
		061613-002	Chromium	0.656		0.152	0.472			
		061613-003	Chromium	0.775		0.161	0.5			
		061613-001	Cobalt	0.0798	U	0.0798	0.5	0.0783	0.002598	3.32%
		061613-002	Cobalt	0.0753	U	0.0753	0.472			
		061613-003	Cobalt	0.0798	U	0.0798	0.5			
		061613-001	Copper	1.51		0.203	0.5	1.48	0.142945	9.68%
		061613-002	Copper	1.6		0.192	0.472			
		061613-003	Copper	1.32		0.203	0.5			
		061613-001	Iron	22.9		1.57	10	23.7	2.211334	9.33%
		061613-002	Iron	22		1.48	9.43			
		061613-003	Iron	26.2		1.57	10			
		061613-001	Lead	0.284	U	0.284	0.5	0.279	0.009238	3.31%
		061613-002	Lead	0.268	U	0.268	0.472			
		061613-003	Lead	0.284	U	0.284	0.5			
		061613-001	Magnesium	1570	B	0.585	10	1190	329.545647	27.70%
		061613-002	Magnesium	989	B	0.552	9.43			
		061613-003	Magnesium	1010	B	0.585	10			
		061613-001	Manganese	5.9		0.131	1	6.06	0.486038	8.02%
		061613-002	Manganese	5.68		0.123	0.943			
		061613-003	Manganese	6.61		0.131	1			
		061613-001	Mercury	0.00091	U	0.00091	0.00926	0.00124	0.000561	45.15%
		061613-002	Mercury	0.00189	U	0.00189	0.0193			
		061613-003	Mercury	0.000927	U	0.000927	0.00943			
		061613-001	Nickel	0.356	BJ	0.0854	0.5	0.4065	0.071418	17.57%
		061613-002	Nickel	0.457	BJ	0.0806	0.472			
		061613-003	Nickel	0.587	B	0.0854	0.5			

See notes at end of table.

TABLE C-18. Non-Radiological Replicate Results for Calendar Year 2003, Vegetation (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
Off-site	**11** (concluded)	061613-001	Potassium	1910		3.58	10	2333	402.036483	17.23%
		061613-002	Potassium	2380		3.37	9.43			
		061613-003	Potassium	2710		3.58	10			
		061613-001	Selenium	0.657	B	0.162	0.5	0.2575	0.026163	10.16%
		061613-002	Selenium	0.276	BJ	0.153	0.472			
		061613-003	Selenium	0.239	BJ	0.162	0.5			
		061613-001	Silver	0.0902	U	0.0902	0.5	0.0885	0.002944	3.33%
		061613-002	Silver	0.0851	U	0.0851	0.472			
		061613-003	Silver	0.0902	U	0.0902	0.5			
		061613-001	Sodium	4.83	J	3.63	10	6.695	2.637508	39.40%
		061613-002	Sodium	16.2		3.43	9.43			
		061613-003	Sodium	8.56	J	3.63	10			
		061613-001	Thallium	1	U	1	2	0.981	0.032909	3.35%
		061613-002	Thallium	0.943	U	0.943	1.89			
		061613-003	Thallium	1	U	1	2			
		061613-001	Vanadium	0.0908	U	0.0908	0.5	0.0908	0.000000	0.00%
		061613-002	Vanadium	0.105	J	0.0857	0.472			
		061613-003	Vanadium	0.0908	U	0.0908	0.5			
		061613-001	Zinc	25.3		0.168	0.5	17.3	7.311863	42.35%
		061613-002	Zinc	15.5		0.159	0.472			
		061613-003	Zinc	11		0.168	0.5			

See notes at end of table.

TABLE C-18. Non-Radiological Replicate Results for Calendar Year 2003, Vegetation (continued)
(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**33**	061562-001	Aluminum	58.3	B	0.793	10	66.7	7.613365	11.41%
		061562-002	Aluminum	73.1	B	0.748	9.43			
		061562-003	Aluminum	68.8	B	0.793	10			
		061562-001	Antimony	0.343	U	0.343	1	0.337	0.010970	3.26%
		061562-002	Antimony	0.324	U	0.324	0.943			
		061562-003	Antimony	0.343	U	0.343	1			
		061562-001	Arsenic	0.516	U	0.516	1.25	0.506	0.016743	3.31%
		061562-002	Arsenic	0.487	U	0.487	1.18			
		061562-003	Arsenic	0.516	U	0.516	1.25			
		061562-001	Barium	2.38		0.0667	0.5	2.91	0.618789	21.26%
		061562-002	Barium	2.76		0.0629	0.472			
		061562-003	Barium	3.59		0.0667	0.5			
		061562-001	Beryllium	0.05	U	0.05	0.5	0.0491	0.001617	3.29%
		061562-002	Beryllium	0.0472	U	0.0472	0.472			
		061562-003	Beryllium	0.05	U	0.05	0.5			
		061562-001	Cadmium	0.0478	U	0.0478	0.5	0.04645	0.001909	4.11%
		061562-002	Cadmium	0.0451	U	0.0451	0.472			
		061562-003	Cadmium	0.0523	J	0.0478	0.5			
		061562-001	Calcium	1430	B	13	100	2057	645.781181	31.40%
		061562-002	Calcium	2720	B	12.3	94.3			
		061562-003	Calcium	2020	B	13	100			
		061562-001	Chromium	0.161	U	0.161	0.5	0.161	0.000000	0.00%
		061562-002	Chromium	0.225	J	0.152	0.472			
		061562-003	Chromium	0.161	U	0.161	0.5			
		061562-001	Cobalt	0.0798	U	0.0798	0.5	0.0783	0.002598	3.32%
		061562-002	Cobalt	0.0753	U	0.0753	0.472			
		061562-003	Cobalt	0.0798	U	0.0798	0.5			
		061562-001	Copper	1.41		0.203	0.5	1.87	0.486450	25.97%
		061562-002	Copper	2.38		0.192	0.472			
		061562-003	Copper	1.83		0.203	0.5			
		061562-001	Iron	72.5		3.92	25	74.1	6.493330	8.77%
		061562-002	Iron	81.2		3.7	23.6			
		061562-003	Iron	68.5		3.92	25			
		061562-001	Lead	0.284	U	0.284	0.5	0.279	0.009238	3.31%
		061562-002	Lead	0.268	U	0.268	0.472			
		061562-003	Lead	0.284	U	0.284	0.5			
		061562-001	Magnesium	800		5.85	100	980	253.574447	25.87%
		061562-002	Magnesium	1270		5.52	94.3			
		061562-003	Magnesium	870		5.85	100			
		061562-001	Manganese	21.5		0.327	2.5	31.4	8.916838	28.40%
		061562-002	Manganese	38.8		0.308	2.36			
		061562-003	Manganese	33.9		0.327	2.5			
		061562-001	Mercury	0.00399	J	0.000856	0.00871	0.00331	0.000589	17.79%
		061562-002	Mercury	0.00296	J	0.000973	0.0099			
		061562-003	Mercury	0.00298	J	0.000959	0.00976			
		061562-001	Nickel	0.361	J	0.0854	0.5	1	0.268701	26.87%
		061562-002	Nickel	1.19		0.0806	0.472			
		061562-003	Nickel	0.81		0.0854	0.5			

See notes at end of table.

TABLE C-18. Non-Radiological Replicate Results for Calendar Year 2003, Vegetation (concluded)

(All results reported in milligrams per kilogram [mg/kg] unless otherwise specified.)

Location Type	Location	Sample ID	Analyte	Result		Decision Level	Detection Limit	Average	Std Dev	CV
On-Site	**33**	061562-001	Potassium	9430		35.8	100	8460	928.277976	10.97%
	(concluded)	061562-002	Potassium	7580		33.7	94.3			
		061562-003	Potassium	8370		35.8	100			
		061562-001	Selenium	0.318	BJ	0.162	0.5	0.374	0.054537	14.60%
		061562-002	Selenium	0.376	BJ	0.153	0.472			
		061562-003	Selenium	0.427	BJ	0.162	0.5			
		061562-001	Silver	0.0902	U	0.0902	0.5	0.0885	0.002944	3.33%
		061562-002	Silver	0.0851	U	0.0851	0.472			
		061562-003	Silver	0.0902	U	0.0902	0.5			
		061562-001	Sodium	2360		3.63	10	1081	1107.820082	102.45%
		061562-002	Sodium	474		3.43	9.43			
		061562-003	Sodium	410		3.63	10			
		061562-001	Thallium	1	U	1	1	0.981	0.032909	3.35%
		061562-002	Thallium	0.943	U	0.943	0.943			
		061562-003	Thallium	1	U	1	1			
		061562-001	Vanadium	0.227	U	0.227	1.25	0.223	0.007506	3.37%
		061562-002	Vanadium	0.214	U	0.214	1.18			
		061562-003	Vanadium	0.227	U	0.227	1.25			
		061562-001	Zinc	3.55	B	0.168	0.5	6.95	3.705739	53.32%
		061562-002	Zinc	10.9	B	0.159	0.472			
		061562-003	Zinc	6.4	B	0.168	0.5			

NOTES: B = The analyte was found in the blank above the effective decision level (organics), or the effective detection limit (inorganics).
J = Estimated value, the analyte concentration fell above the effective decision level and below the effective detection limit.
U = The analyte was analyzed for, but not detected, below this concentration. For organic and inorganic analytes the result is less than the effective decision level. For radiochemical analytes the result is less than the decision level.
CV = coefficient of variation
Std Dev = standard deviation

TABLE C-19. TLD Measurements by Quarter and Location Class for Calendar Year, 2003

Location Class	Location Number	1st Quarter (85 Days) Exposure (mR)	Error	2nd Quarter (108 Days) Exposure (mR)	Error	3rd Quarter (106 Days) Exposure (mR)	Error	4th Quarter (96 Days) Exposure (mR)	Error	Exposure Rate μR per hour	Error
Off-Site	10	32	1.7	32.1	1.7	23	1	31.2	1.6	12.5	0.3
	11	27.1	1	23.6	1.5	15	0.4	23.7	0.9	9.4	0.2
	21	29.9	1.1	26.7	0.9	18.1	0.5	27	1.4	10.7	0.2
	22	26.9	1.5	24.8	1.1	15.6	0.3	24.7	1.2	9.7	0.2
	23	27.4	1.7	25.1	1.9	16.8	0.9	24.9	2	9.9	0.4
	24	26.7	0.9	24.2	1.5	14.7	1.5	23.5	1.4	9.4	0.3
	25	27.1	0.7	25.6	1.5	16.3	1.1	25	1.3	9.9	0.3
	26	32.7	1.1	33.5	1	23.5	0.8	32.1	3.4	12.8	0.4
	27	29.6	1.1	28.7	1.1	19.3	0.5	0	0	10.8	0.2
	28	26.8	1	26.1	0.8	0	0	23.2	2.4	11.0	0.4
	29	26.4	1.7	22	1.8	14.4	1.1	21.7	1.5	8.9	0.3
	30	32.3	1.4	30.6	2.4	21.1	0.4	30.8	1.8	12.1	0.4
Perimeter	4	29	1.7	27.5	1.4	18.8	1.5	26.4	0.9	10.7	0.3
	5	27.3	1	24.2	1.3	16.4	1	23.4	1.7	9.6	0.3
	16	33.9	1.2	31.5	0.9	22.8	1.3	31	0.9	12.6	0.2
	18	29.3	1.4	26.9	0.7	17.8	1.7	25.5	1.4	10.5	0.3
	19	31.4	1.3	29.2	0.9	20.2	0.6	28.4	2.7	11.5	0.3
	39	26.1	5.2	26	1.8	18.4	1.4	26.2	2.6	10.2	0.7
	40	28.5	2.3	26.7	1.5	17.3	1.1	25.6	2.4	10.3	0.4
	81	30.3	1.4	27.9	1.9	18.3	0.5	27.1	0.8	10.9	0.3
On-site	1	30.3	1	29	1.2	22.3	0.7	26.6	1	11.4	0.2
	2NW	27.7	0.9	24.5	0.9	17.5	0.8	24.6	1.1	9.9	0.2
	3	29.4	1.9	28.2	3	18.4	0.5	28	2.6	11.0	0.5
	6	28.3	1.8	27	1.3	18	0.5	25.1	0.9	10.4	0.3
	7	30.6	1.4	27.6	1.1	20.6	0.5	27.6	1.8	11.2	0.3
	20	30.8	0.9	28.4	2.6	19.7	0.9	28.3	1.9	11.3	0.4
	31	28.2	1	25.3	1.9	17.5	1	26.8	3.1	10.3	0.4
	41	29.6	0.9	27.3	2.2	18.4	0.6	25.3	1	10.6	0.3
	42	28	1.6	25.9	1.7	18.2	0.8	25.3	1	10.3	0.3
	43	28.2	1.8	26.5	3.1	17.5	0.7	25.4	2.2	10.3	0.4
	46	31	2.1	29.1	2.7	0	0	28	2.3	12.7	0.6
	47	30.3	0.9	32.3	4.7	19.4	0.5	26.8	1.1	11.5	0.5
	48	33.5	1.8	32.1	0.8	22.8	2	29.9	1.9	12.5	0.4
	66	29	1.1	26.7	0.8	17.4	0.5	26	3.3	10.5	0.4
Operational	45	36.6	2.1	37	1.9	27.3	1.5	35.1	1.3	14.3	0.4
	45E	29.9	0.9	25.5	1.3	19.1	0.6	27.7	1.8	10.8	0.3

NOTES: mR = Milliroentgen (10^{-3} roentgen) μR = microroentgen (10^{-6} roentgen)

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TABLE C-20. Summary TLD Results for Calendar Year 2003, SNL/NM

Location Class	Number of Locations	Mean Exposure Rate (μR/hour)	Median Exposure Rate (μR/hour)	Std Dev.	Minimum	Maximum
Off-Site	12	10.6	10.3	1.3	8.9	12.8
Perimeter	7	10.8	10.5	1.0	9.6	12.6
On-Site	14	11.0	10.8	0.8	9.9	12.7
Operational	2	12.6	12.6	2.5	10.8	14.3

NOTES: μR = microroentgen (10^{-6} roentgen)
"Operational" refers to TLD locations that are near ongoing operations that may influence readings, such that they may not truly reflect "environmental" conditions.

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