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Site Environmental Report for 2013 Sandia National Laboratories, California

Barbara L. Larsen

Prepared by
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Livermore, California 94550

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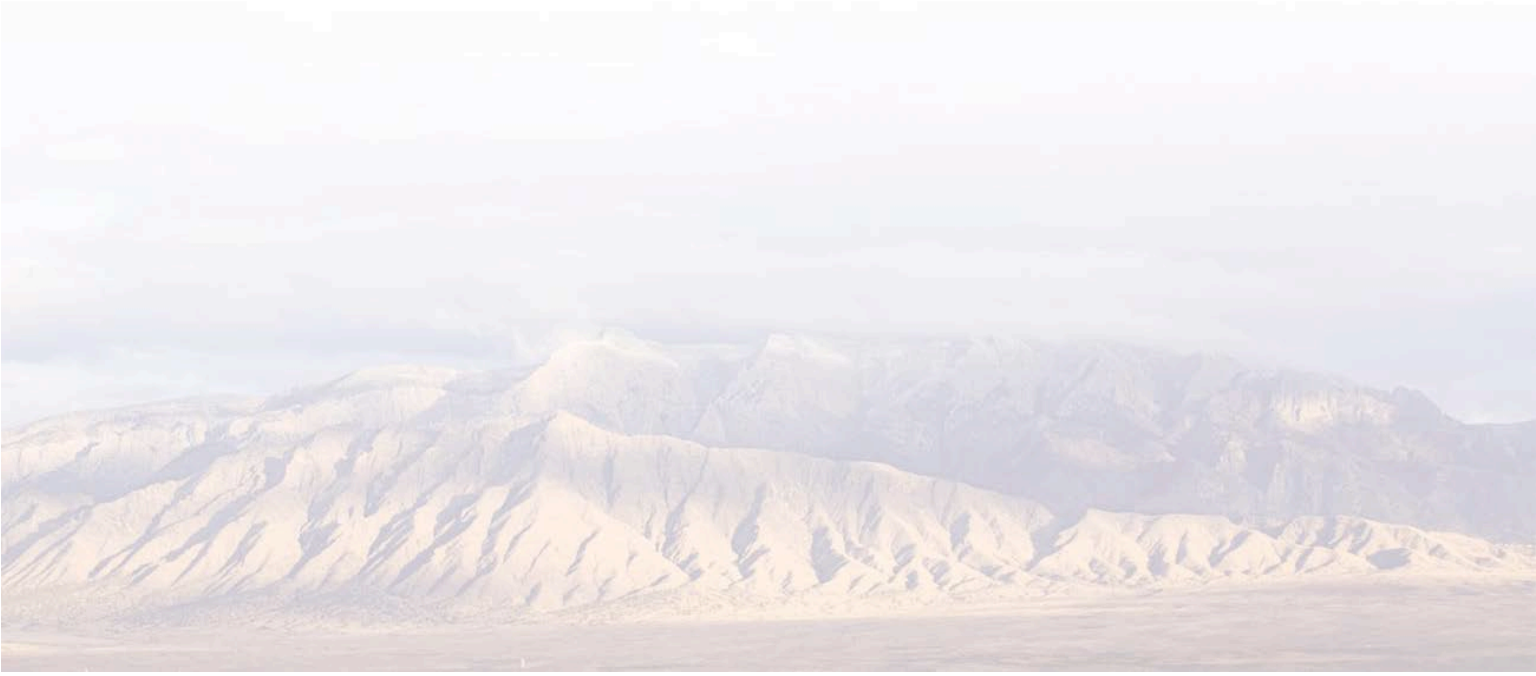

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Site Environmental Report for 2013 Sandia National Laboratories, California

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Abstract

Sandia National Laboratories, California (SNL/CA) is a government-owned/contractor-operated laboratory. Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates the laboratory for the Department of Energy's National Nuclear Security Administration (NNSA). The NNSA Sandia Field Office administers the contract and oversees contractor operations at the site. This Site Environmental Report for 2013 was prepared in accordance with DOE Order 231.1B, *Environment, Safety and Health Reporting* (DOE 2011d). The report provides a summary of environmental monitoring information and compliance activities that occurred at SNL/CA during calendar year 2013. General site and environmental program information is also included.

Acknowledgements

This report was prepared by the Environmental Management Department located at Sandia National Laboratories in Livermore, California. The report was reviewed and approved by the Department of Energy, National Nuclear Security Administration, Sandia Field Office. The author acknowledges the following key contributors to the content, review, and production of this report.

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CONTENTS

1 EXECUTIVE SUMMARY 15

1.1 OVERVIEW 15
1.2 ENVIRONMENTAL MANAGEMENT 15
1.3 PERFORMANCE MEASURES 15
1.4 ENVIRONMENTAL MONITORING 16

2 INTRODUCTION 17

2.1 HISTORY AND MISSION 17
2.2 LOCATION 17
2.3 SITE POPULATION 19
2.4 ENVIRONMENTAL SETTING 19
2.4.1 Geology and Soils 20
2.4.2 Hydrology and Water Resources 21
2.4.3 Climate and Meteorology 22
2.4.4 Ecology 22

3 COMPLIANCE SUMMARY 25

3.1 ENVIRONMENTAL MANAGEMENT SYSTEM AND SUSTAINABILITY 25
3.2 NATIONAL ENVIRONMENTAL POLICY ACT 26
3.3 AIR QUALITY 26
3.3.1 Clean Air Act 26
3.3.2 Radionuclide Emissions 27
3.4 NATURAL AND CULTURAL RESOURCES 27
3.4.1 Endangered Species Act 27
3.4.2 Interim Protections for California Red-legged Frogs 28
3.4.3 Migratory Bird Treaty Act 28
3.4.4 Protection of Wetlands 28
3.4.5 Floodplain Management 28
3.4.6 National Historic Preservation Act 29
3.5 ENVIRONMENTAL RESTORATION 29
3.5.1 Comprehensive Environmental Response, Compensation, and Liability Act 29
3.5.2 Site Clean-up Orders 30
3.6 CHEMICAL MANAGEMENT 30
3.6.1 Emergency Planning and Community Right-to-Know Act 30
3.6.2 California Hazardous Materials Release Response Plans and Inventory 31
3.6.3 Underground Storage Tanks 31
3.6.4 Toxic Substances Control Act 31
3.6.5 Federal Insecticide, Fungicide, and Rodenticide Act 32
3.7 POLLUTION PREVENTION AND WASTE MINIMIZATION 32
3.7.1 Pollution Prevention Goals of Site Sustainability Plan 32
3.7.2 Hazardous Waste Source Reduction and Management Review Act 33
3.7.3 Pollution Prevention Act 33
3.8 HAZARDOUS WASTE 33
3.8.1 Federal Facility Compliance Act 33
3.8.2 Resource Conservation and Recovery Act 34
3.8.3 California Hazardous Waste Control Law 34
3.8.4 Medical Waste Management Act 35
3.9 RADIATION PROTECTION 35
3.9.1 Atomic Energy Act 35
3.9.2 DOE Order 435.1, Radioactive Waste Management 35
3.9.3 DOE Order 458.1, Radiation Protection of the Public and the Environment 36
3.10 WATER QUALITY AND PROTECTION 38
3.10.1 Clean Water Act 38

3.11 AUDITS, ASSESSMENTS, AND INSPECTIONS 39
3.12 ENVIRONMENTAL OCCURRENCES 40
3.13 PERMITS 40

4 ENVIRONMENTAL MANAGEMENT 43

4.1 EMS ELEMENTS 43
4.2 ENVIRONMENTAL PERFORMANCE 45
4.3 ENVIRONMENTAL HIGHLIGHTS 61
4.3.1 Air Quality Function 61
4.3.2 Environmental Monitoring and Ecology Function 62
4.3.3 Environmental Planning Function 62
4.3.4 Pollution Prevention and Waste Minimization Function 63
4.3.5 Waste Management Function 64

5 ENVIRONMENTAL MONITORING 67

5.1 STORM WATER 67
5.2 WASTEWATER 69
5.2.1 Sewer Outfall 70
5.2.2 Liquid Effluent Control System 71
5.2.3 Categorical Processes 72
5.3 GROUNDWATER 72
5.4 BIOLOGICAL DOSE ASSESSMENT 78
5.5 RADIATION MONITORING 78

6 QUALITY ASSURANCE 81

6.1 ENVIRONMENTAL MONITORING QUALITY ASSURANCE 81
6.2 ENVIRONMENTAL SAMPLING 81
6.3 SAMPLE ANALYSES 82
6.3.1 Accredited Laboratory 82
6.3.2 SNL/CA Health Physics Laboratory 82
6.3.3 SNL/NM Health Instrumentation Laboratory 82
6.4 DATA VERIFICATION AND VALIDATION 82
6.4.1 Quality Control Samples 83
6.4.2 Statistical Analyses 83

7 REFERENCES 85

8 GLOSSARY 89

9 GROUNDWATER ANALYTICAL RESULTS, WELL COMPLETION DATA, AND SANITARY SEWER ANALYTICAL RESULTS 91

10 DISTRIBUTION LIST 103

TABLES

Table 2-1 Frequently Seen Animals at SNL/CA 24
Table 3-1 Status of EPCRA Reporting for SNL/CA, 2013 31
Table 3-2 Order 458.1 Compliance Summary, 2013....37
Table 3-3 SNL/CA Audits, Assessments, and Inspections, 2013....40
Table 3-4 SNL/CA Environmental Permits and Orders, 2013 41
Table 4-1 Elements of the SNL/CA EMS 44
Table 4-2 Green House Gas Emissions by Category....55
Table 4-3 Summary of GHG Reporting, 2013 56
Table 4-4 Comparison of 2013 Operations with SWEA / SA Envelope 62
Table 5-1 Summary of Analytical Results for Storm Water, 2012/2013 Wet Season....69
Table 5-2 Sewer Outfall Sampling Schedule....70
Table 5-3 Weekly Composite Sewer Outfall Monitoring Results – Physical Parameters and Metals, 2013....71
Table 5-4 Monitoring for Semiconductor Manufacturing Categorical Process, 2013....72
Table 5-5 Groundwater Sampling Schedule....73
Table 5-6 Summary of Groundwater Analyses – Navy Landfill, 2013....74
Table 5-7 Summary of Groundwater Analyses – Fuel Oil Spill, 2013....75
Table 5-8 Summary of Groundwater Analyses at Arroyo Seco Wells - Metals, 2013....76
Table 5-9 Summary of Groundwater Analyses at Arroyo Seco Wells – Minerals, 2013....77
Table 6-1 Summary of Statistical Analyses, 2013....84
Table 9-1 Results of Groundwater Analyses at SNL/CA, 2013 92
Table 9-2 Well Depth and Screen Period Interval....96
Table 9-3 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2013 97
Table 9-4 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, Method E200.8, 2013 98
Table 9-5 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2013 101

FIGURES

Figure 2-1 Regional Location Map 18
Figure 2-2 SNL/CA Site Map....19
Figure 2-3 SNL/CA Topography....20
Figure 2-4 Regional Earthquake Faults 21
Figure 2-5 Habitat at SNL/CA....23
Figure 3-1 Radioactive Waste Shipped from SNL/CA....36
Figure 4-1 Measurement of Excellence in Environmental Management....46
Figure 4-2 SNL/CA Hazardous Material Inventory 47
Figure 4-3 SNL/CA Chemical Inventory Age....48
Figure 4-4 SNL/CA Energy Consumption 49
Figure 4-5 Water Consumption at SNL/CA 50
Figure 4-6 Annual Wastewater Discharges 51
Figure 4-7 Hazardous Waste Generated at SNL/CA 52
Figure 4-8 Radioactive Waste Generated at SNL/CA 53
Figure 4-9 Solid Waste and Construction Debris Diverted From Landfill Disposal 54
Figure 4-10 SNL/CA Landfill Waste 55
Figure 4-11 Weekly Composite Copper Concentrations in Wastewater 57
Figure 4-12 Weekly Composite Zinc Concentrations in Wastewater....58
Figure 4-13 Constituents in Storm Water, 2012/2013 Rainy Season 59
Figure 4-14 SNL/CA Chemical Spills....60
Figure 5-1 Storm Water Sampling Locations....68
Figure 5-2 Groundwater Monitoring Well Locations....73
Figure 5-3 Dosimeter Locations at SNL/CA and Around Site Perimeter....79
Figure 5-4 Dosimeter Locations in Livermore Valley....80

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Preface

Each year, Sandia Corporation (Sandia) prepares a summary report for Sandia National Laboratories, California (SNL/CA) to provide environmental information to the local community, pursuant to the requirements of Department of Energy Order 231.1B, *Environment, Safety and Health Reporting*. The Site Environmental Report for 2013 summarizes compliance with environmental requirements, presents the results of monitoring and surveillance activities, and provides an update of site environmental activities for SNL/CA.

The Site Environmental Report for 2013 was prepared for ease in readability. Each chapter focuses on a specific topic or area. Reference to other sections and chapters is made throughout the report to avoid redundancy. Detailed data is provided only when necessary to improve the presentation of information and the quality of the document. Acronyms are defined within each chapter as well as listed at the beginning of the report. References are compiled into one list and presented in Chapter 7.

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Acronyms and Abbreviations

ALARA	as low as reasonably achievable
BAAQMD	Bay Area Air Quality Management District
CCR	California Code of Regulations
CARB	California Air Resources Board
CEARP	Comprehensive Environmental Assessment and Response Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COD	chemical oxygen demand
cu ft	cubic feet
cu yd	cubic yard
DOE	Department of Energy
DTSC	Department of Toxic Substances Control (California)
EISA	Energy Independence and Security Act
EMS	environmental management system
EO	executive order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EPEAT	Electronic Product Environmental Assessment Tool
ES&H	environment, safety, and health
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
gal	gallon
General Industrial Permit	State of California, NPDES General Permit for Storm Water Discharge Associated with Industrial Activities
GHG	greenhouse gas
ISO	International Organization for Standardization
kg	kilogram
LECS	liquid effluent control system
LEED	Leadership in Energy and Environmental Design
LLNL	Lawrence Livermore National Laboratory
MCLs	maximum contaminant levels
mg/L	milligrams per liter
mL	milliliter

M&O Contract	Management and Operating Contract
mrem	millirem
MS4	California Small Municipal Separate Storm Sewer System
mSv	milliSeivert
MW hr	Megawatt hour
NA	not applicable
ND	non-detectable
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
NNSA/SFO	National Nuclear Security Administration, Sandia Field Office
NOV	notice of violation
NPDES	national pollutant discharge elimination system
O&G	oil and grease
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
POTW	publicly owned treatment works
QAPP	quality assurance program plan
RCRA	Resource Conservation and Recovery Act
RPDP	Radiation Protection Dosimetry Program
RWQCB	Regional Water Quality Control Board (California)
SA	supplement analysis
Sandia	Sandia Corporation
SARA Title III	Superfund Amendments and Reauthorization Act of 1986, Title III
SF6	Sulfur Hexafluoride
SHPO	State Historic Preservation Officer
SNL	Sandia National Laboratories
SNL/CA	Sandia National Laboratories, California
SNL/NM	Sandia National Laboratories, New Mexico
sf	square feet
SSP	Site Sustainability Plan
SWEA	site-wide environmental assessment
TPHD	total petroleum hydrocarbons diesel
TSCA	Toxic Substances Control Act
TSS	total suspended solids

µg/L	micrograms per liter
µmho/cm	micromhos per centimeter
U.S.	United States
USC	United States Code
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
yr	year

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1 Executive Summary

1.1 Overview

Sandia National Laboratories (SNL) is one of three national laboratories supporting the United States Department of Energy (DOE) statutory responsibilities for nuclear weapon research and design, development of energy technologies, and basic scientific research. SNL facilities are located in New Mexico, California, Nevada, and Hawaii. Sandia National Laboratories, California (SNL/CA) is a multi-program engineering and science laboratory supporting the nuclear weapons stockpile program, energy and environment research, homeland security, micro- and nano-technologies, and basic science and engineering research.

This Site Environmental Report provides a summary of environmental management performance and compliance efforts at SNL/CA for calendar year 2013. The document also satisfies the DOE requirement for preparation of an annual environmental report, one of the required reports listed in DOE Order 231.1B, *Environment, Safety, and Health Reporting* (DOE 2011d).

This Site Environmental Report is divided into ten chapters. Chapter 1, the Executive Summary, highlights compliance and monitoring results obtained in 2013. Chapter 2 provides a brief introduction to SNL/CA and the existing environment found on site. Chapter 3 summarizes SNL/CA's compliance activities with the major environmental requirements applicable to site operations. Chapter 4 presents information on environmental management, performance measures, and environmental functions. Chapter 5 presents the results of monitoring and surveillance activities in 2013. Chapter 6 discusses quality assurance. Chapters 7 through 9 provide supporting information for the report and Chapter 10 is the report distribution list.

1.2 Environmental Management

Sandia personnel maintain a comprehensive environmental management system (EMS) for SNL/CA that incorporates environmental stewardship, compliance, and a process of continual improvement. The site EMS conforms to the international standard for environmental management systems, ISO 14001 (ISO 2004). Sandia obtained re-registration of the SNL/CA EMS on May 19, 2012. Additional information on environmental management is presented in Chapter 4.

1.3 Performance Measures

Sandia personnel measure environmental performance as progress towards achieving site EMS objectives and contract performance measures established jointly between Sandia and the DOE National Nuclear Security Administration, Sandia Field Office (NNSA/SFO). During 2013, Sandia personnel measured performance in achieving all ten EMS objectives

and one NNSA/SFO performance measure. Sandia did not receive any notices of violation in 2013 for SNL/CA operations. Additional information about SNL/CA's environmental performance in 2013 is presented in Section 4.2.

1.4 Environmental Monitoring

Sandia personnel monitor storm water, wastewater, groundwater, and direct (ambient) radiation at SNL/CA. The results of monitoring during the 2012/2013 wet season show that no pollutants were detected in storm water runoff at levels that are a cause for concern. During 2013, there were no exceedances of the wastewater discharge limit at the site sewer outfall. Monitoring results continued to show carbon tetrachloride in groundwater at the Navy Landfill in 2013 with a concentration similar to that detected in past years. No constituents of concern were found in groundwater from wells at the Fuel Oil Spill site or along Arroyo Seco. The average annual gamma radiation dose from all sources including background radiation at the site perimeter was 66.1 mrem (0.66 mSv), which is within the dose range measured over the last ten years. The measured background for this area is approximately 55.8 mrem (0.56 mSv). The difference between the two values is statistically significant. However, since both numbers are within the historical range, and there are no known sources of new or increased radiation exposure at SNL/CA, the difference is not considered to be indicative of increased radiation from Sandia operations. Additional information about environmental monitoring at SNL/CA is provided in Chapter 5.

2 Introduction

2.1 History and Mission

Sandia National Laboratories, California (SNL/CA) was established in 1956 by Sandia Corporation (Sandia) to provide a closer relationship with Lawrence Livermore National Laboratory (LLNL) and their nuclear weapons design work. The SNL/CA facility evolved into an engineering research and development laboratory by the early 1960s and into a multi-program engineering and science laboratory during the 1970s. As international arms control efforts increased in the late 1970s and throughout the 1980s, the United States emphasized treaty monitoring, safety, security, and control of the national nuclear weapons stockpile. With the end of the Cold War in the late 1980s, the role of Sandia to support stockpile stewardship ensuring nonproliferation and continued safety, security, and reliability, took on greater importance.

Research Activities at SNL/CA

- Science-based performance and reliability testing and computer-based modeling of nuclear weapon components
- Development, design, and testing of nonnuclear components for nuclear weapon systems
- Development and testing of materials and diagnostic equipment in support of defense programs, homeland security, and basic science and engineering
- Energy and environmental research
- Research and development of microelectronics, microsystems, and nanotechnologies

Sandia personnel have provided distinguished service to the nation for over 50 years through engineering support and systems integration for nuclear weapons and related national security research and development efforts. At SNL/CA, our programs support four key areas – the national nuclear deterrence policy and stockpile security, nonproliferation and materials control, energy and critical infrastructure, and emerging threats. Sandia personnel are committed to collaborative research and development with industry and universities, resulting in new and enhanced technologies that have both commercial and national security benefits.

SNL/CA is a government owned/contractor operated laboratory. The site, the buildings, and the equipment are owned by the government, while Sandia, a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates the laboratory for the Department of Energy's National Nuclear Security Administration (NNSA). The NNSA/Sandia Field Office (NNSA/SFO) oversees the operations at the site, using Sandia as a management and operating contractor.

2.2 Location

SNL/CA is located approximately 40 miles east of San Francisco, near the City of Livermore in eastern Alameda County. The site lies at the western base of the Altamont Hills on relatively flat terrain with low relief sloping gently northwest and north. Figure 2-1 shows the regional location of the site.

SNL/CA is comprised of 410 acres. The main campus (134 acres) is surrounded by the remaining undeveloped land (276 acres) on the east, south, and west (Figure 2-2, Site Map). To the north of SNL/CA are East Avenue and LLNL. Land use to the east and south of the site is agricultural and low-density residential. A residential development is located along the western boundary of the site.

Figure 2-1 Regional Location Map

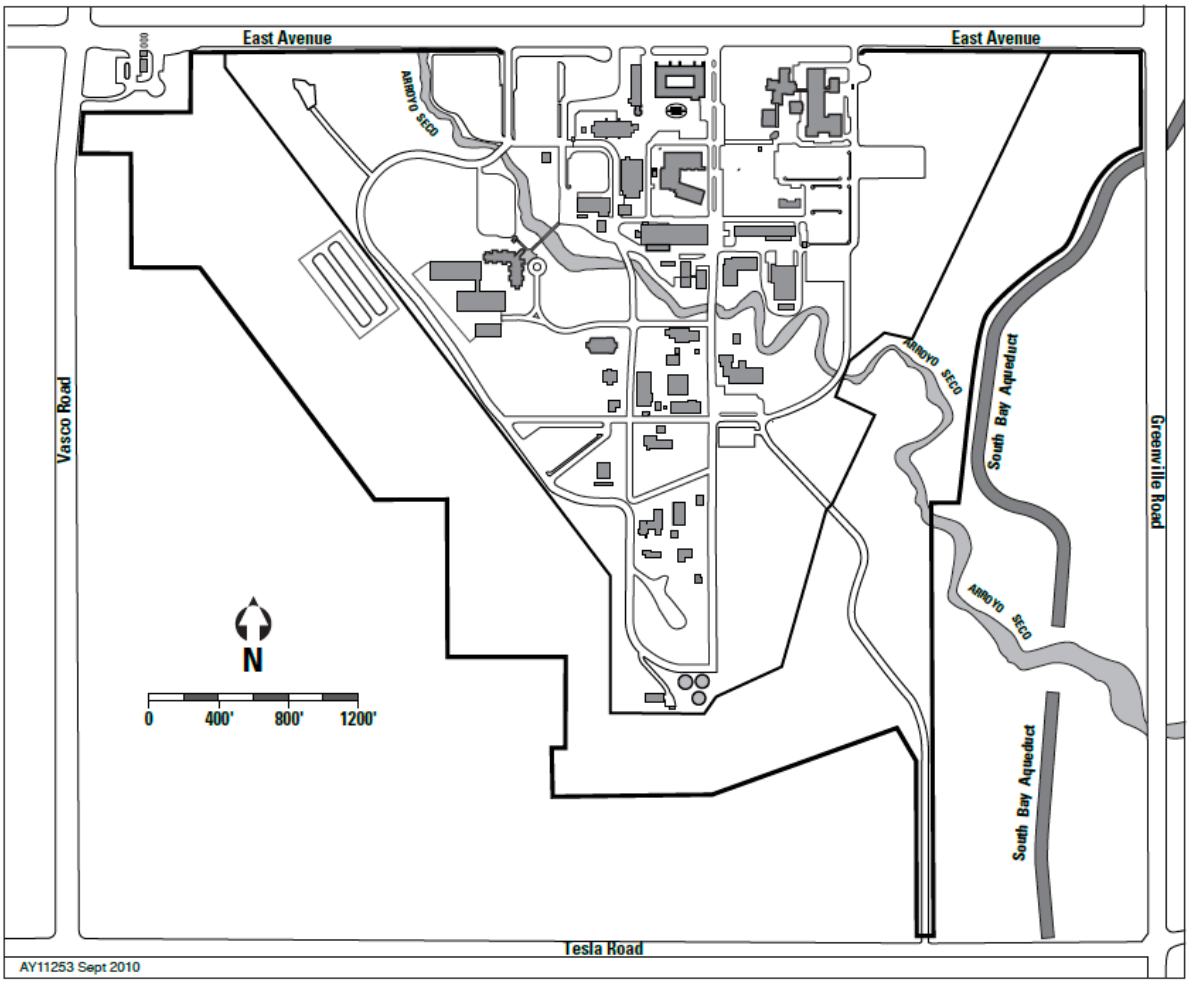

Figure 2-2 SNL/CA Site Map

2.3 Site Population

The SNL/CA workforce is comprised of Sandia employees (full and part-time staff, student interns, and post-doctoral appointees) and contracted staff. As of December 2013, there were 1376 personnel (employees and on-site contractors) working at SNL/CA. Eighty-four percent of Sandia employees live in Alameda, Contra Costa, and San Joaquin counties. Thirty-four percent live in Livermore. Place of residence data is not available for on-site contractors.

2.4 Environmental Setting

The following summarizes the environmental setting at SNL/CA. Additional information can be found in the *Final Site-wide Environmental Assessment of the Sandia National Laboratories/California* (DOE 2003a).

2.4.1 Geology and Soils

SNL/CA is located in the California Coast Ranges geologic province in the southeastern portion of the Livermore Valley. The valley forms an irregularly shaped lowland area about 16 miles long, east to west, and 7 to 10 miles wide, north to south. The land at SNL/CA slopes gently to the northwest and north, with steep terrain in the southern portion of the site and along the banks of Arroyo Seco. The site ranges in elevation from 615 feet above mean sea level at the northwest corner of the property to 849 feet at the southern end. Site topography is depicted on Figure 2-3.

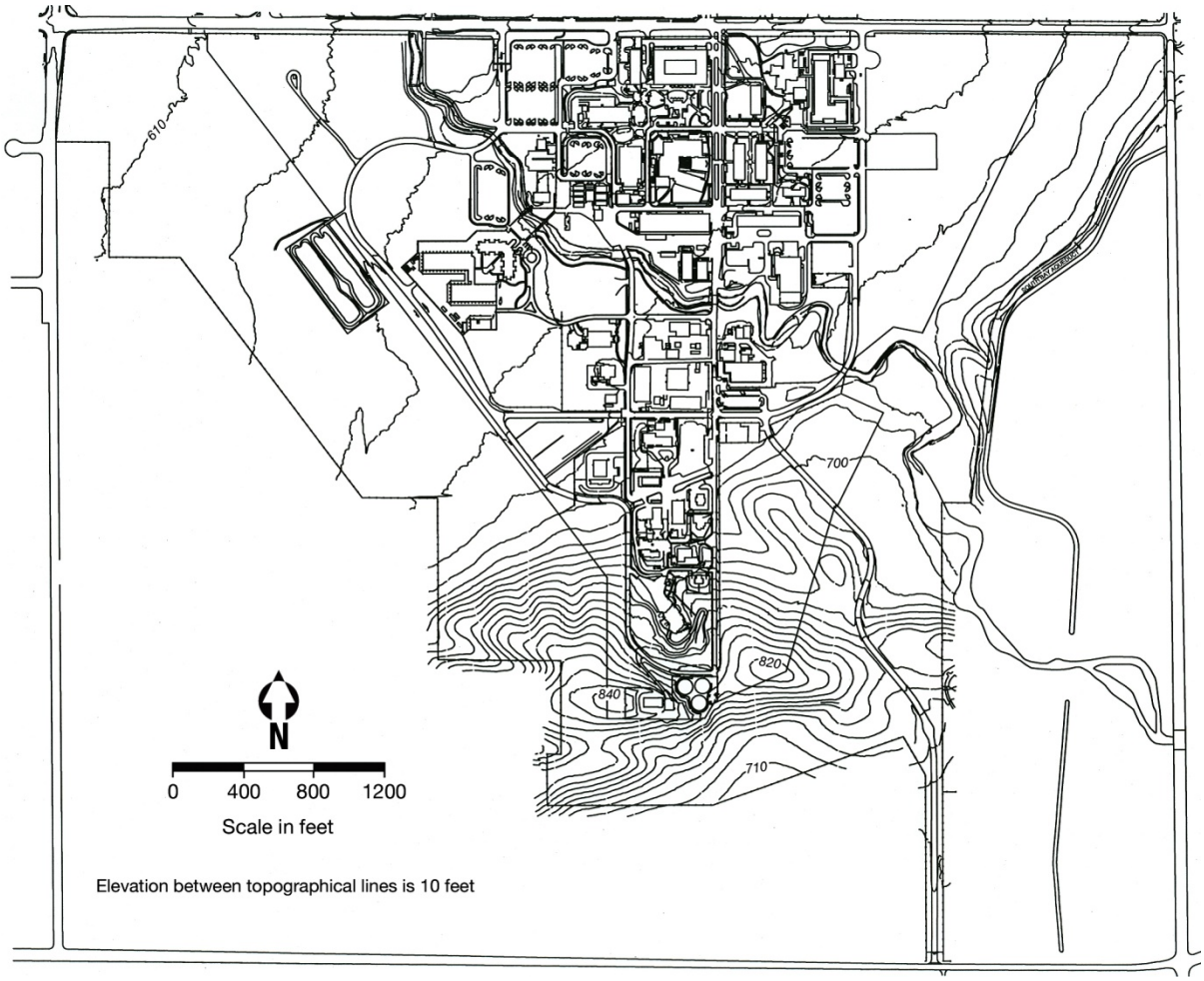

Figure 2-3 SNL/CA Topography

SNL/CA is located in a seismically active region. The major fault systems in the area are the San Andreas Fault system and the much older Coast Range thrust fault system. The upper plate of the Coast Range thrust formed the northwest trending Coast Range, including the Altamont Hills. Any seismic activity in the Livermore Valley would probably result from movement on the San Andreas Fault, a right-lateral strike-slip fault system trending northwest-southeast, extending from Point Arena to the Gulf of California. The regional faults closest to SNL/CA, the Hayward, Calaveras, Greenville, and Tesla faults follow this trend, and have been seismically active in the historic past. A magnitude 5.8 earthquake on

the Greenville fault in 1980 caused minor damage at SNL/CA and in the Livermore Valley. The Las Positas fault crossing SNL/CA is a transverse fault, at right angles to the Greenville fault, and was active during this earthquake. The Verona fault is a low angle thrust fault, dissimilar to the regional faulting, and probably not connecting with either the Calaveras or Las Positas faults. Only microseismicity was recorded on the Verona fault in 1980. These faults are shown on Figure 2-4.

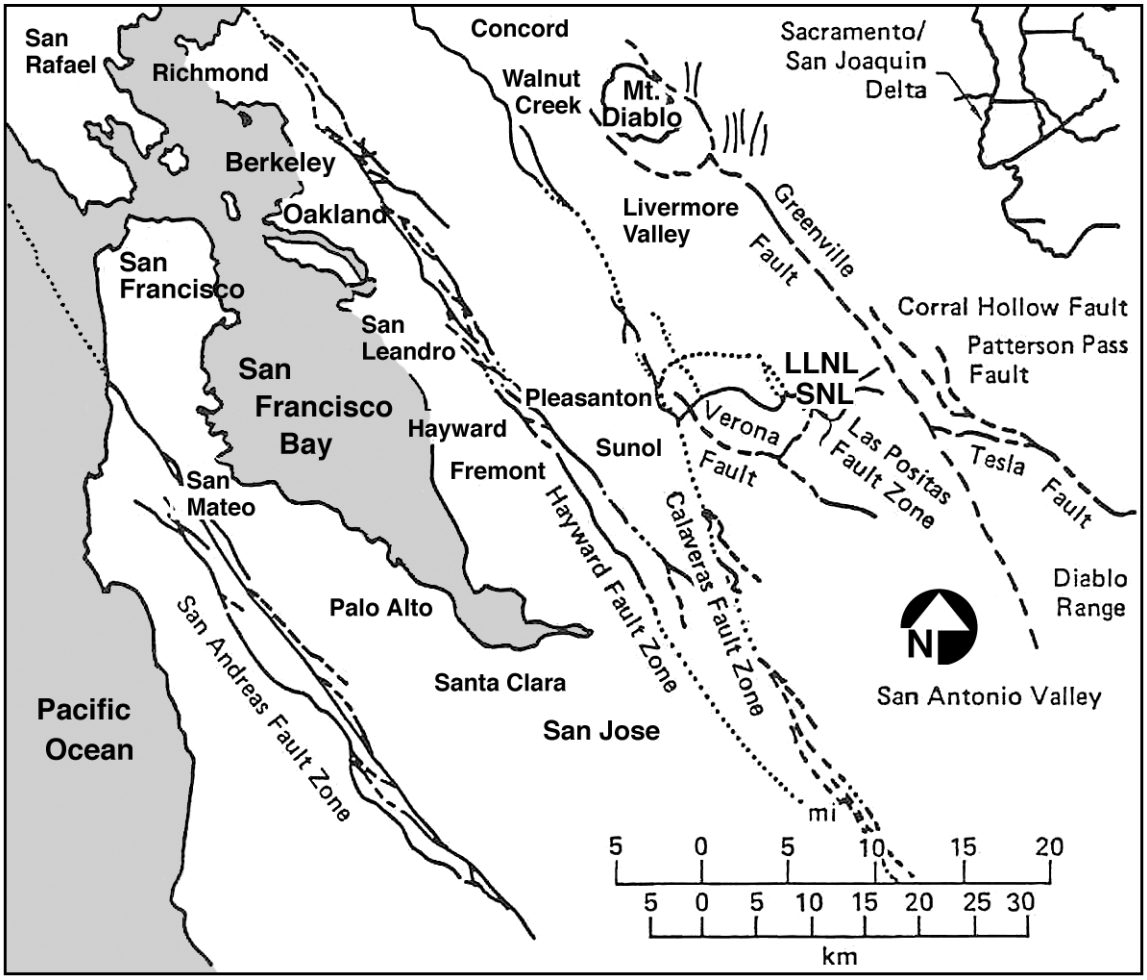

Figure 2-4 Regional Earthquake Faults

Surface soils and arroyo sediments cover the SNL/CA site. Soils at the site are formed primarily upon sediments deposited by local streams. Three soils cover most of SNL/CA: Rincon clay loam, Positas gravelly loam, and Livermore gravelly loam (SNL/CA 2002). There are no known mineral resources or fossil occurrences at the site.

2.4.2 Hydrology and Water Resources

Groundwater at SNL/CA occurs within saturated unconsolidated geologic material. Depth to groundwater varies from less than 20 feet on the eastern portion of the site to 126 feet on the west side of the site. Water bearing-units beneath the site are composed of shallow heterogeneous, unconsolidated alluvium and deep fluvial and lacustrine sediments.

Groundwater near SNL/CA is generally suitable for use as domestic, municipal, agricultural, and industrial supply. However, some shallower groundwater may be of marginal quality and not suitable for industrial or agricultural purposes. Groundwater less than 300 feet deep is usually unsuitable for domestic use without treatment (LLNL 1990).

Potable water used at SNL/CA is purchased from LLNL, which is supplied by the San Francisco Water District through the Hetch Hetchy Aqueduct. Additionally, the Alameda County Flood Control and Water Conservation District, Zone 7, supplements this primary water source as needed. Sandia's water use at SNL/CA is metered by LLNL as it enters the site. In fiscal year 2013, 53.1 million gallons of water were used at SNL/CA, an increase of 18.0 percent (8.1 million gallons) from water used in fiscal year 2012. (See discussion in Section 4.2). The site discharged approximately 4.8 million gallons of wastewater during the fiscal year. Water loss, or the difference between water use and wastewater discharge, is attributed to irrigation, cooling towers, water tank releases, evaporative losses, eyewash and safety shower testing, and fire system testing.

There are no perennial streams or natural surface water bodies at SNL/CA. The Arroyo Seco, an ephemeral and intermittent stream, diagonally traverses the site from southeast to northwest. The arroyo typically flows only in very wet years, and for short periods of time during heavy storms. A seasonal wetland that is wet well into June, and sometimes July, is located in the streambed along the eastern part of the arroyo. Storm water runoff at SNL/CA is conveyed to Arroyo Seco through a system of storm drains and channels. The Arroyo Seco and seasonal wetland are shown on Figure 2-5.

2.4.3 Climate and Meteorology

The climate at SNL/CA is typical of the Mediterranean conditions in the San Francisco Bay region where cool, wet winters and hot, dry summers are normal. In the summer, inland valleys, such as the Livermore Valley, generally experience more sunshine and higher temperatures than the coastal areas. In the winter, temperatures in the valley are usually cooler than at the coast.

Annual meteorological data for 2013 was obtained from a nearby meteorological tower located at LLNL (LLNL 2014). The annual rainfall for 2013 was 4.04 inches. Temperatures in 2013 ranged from 29.6 to 103.9^{o} Fahrenheit. Average annual rainfall in the Livermore area over the last five years was 10.03 inches. The windiest months in the area occur in the spring and summer, and are dominated by westerly sea breezes. The winds during the fall and winter are typically lighter and more varied in direction.

2.4.4 Ecology

Plant Species

The plant community at SNL/CA is typical of the surrounding region, consisting primarily of grassland. Localized areas of coyote brush scrub, willow riparian woodland, and wetland habitat are also present. Areas developed and disturbed by SNL operations constitute an

additional habitat type, designated altered habitat. Habitat types are depicted on Figure 2-5. No threatened, endangered, proposed, or candidate plant species are present on-site.

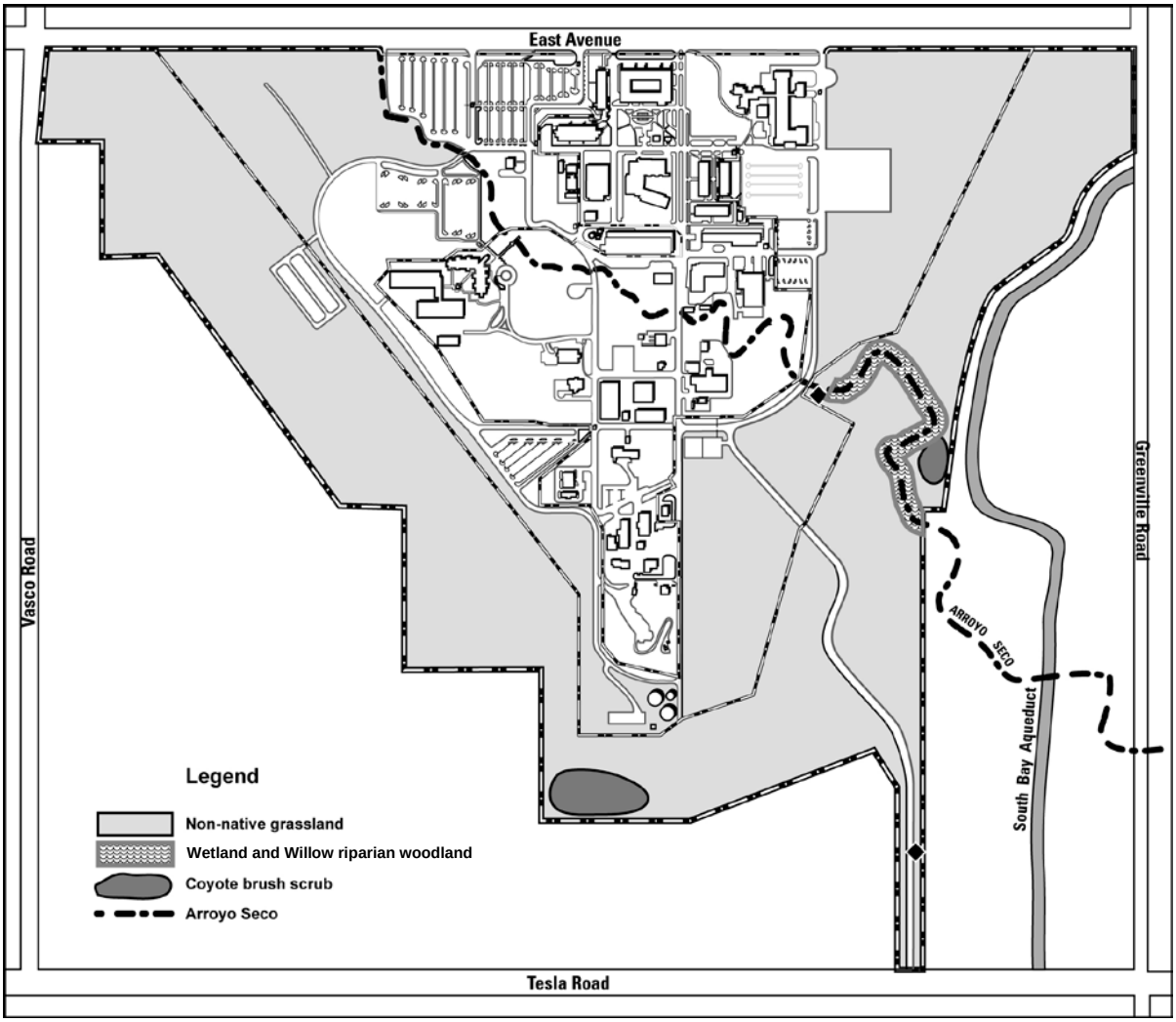

Figure 2-5 Habitat at SNL/CA

Wildlife Species

A variety of wildlife species live and forage at SNL/CA. Table 2-1 provides a list of animals frequently seen on site. State and Federally protected animals are not included in this list but discussed separately below.

SNL/CA is located within the range of the mountain lion (*Puma concolor*), a "specially protected mammal" under California law. There were no reports of a mountain lion at SNL/CA in 2013.

SNL/CA provides habitat (or potential habitat) for two threatened wildlife species, the California red-legged frog *(Rana aurora draytonii)* and the California tiger salamander *(Ambystoma californiense)*. The most recent confirmed observation of a tiger salamander at SNL/CA was on December 13, 2007, when an adult salamander was found within the

developed area of the site. The first confirmed observation of California red-legged frogs at SNL/CA occurred in April 2004 when several individuals were found on the eastern portion of the site in shallow water contained within Arroyo Seco. The most recent observation of red-legged frogs at SNL/CA was in 2010. Monitoring for California red-legged frogs is conducted annually, but none were observed in 2013.

Table 2-1 Frequently Seen Animals at SNL/CA

BIRDS			
American crow	*Corvus brachyrhynchos*	Northern mockingbird	*Mimus polyglottos*
American kestrel	*Falco sparverius*	Nuttall's woodpecker	*Picoides nuttallii*
American robin	*Turdus migratorius*	Red-tailed hawk	*Buteo jamaicensis*
Anna's hummingbird	*Calypte anna*	Turkey vulture	*Cathartes aura*
Barn owl	*Tyto alba*	Western kingbird	*Tyrannus verticalis*
Bushtit	*Psaltriparus minimus*	Western meadowlark	*Sturnella neglecta*
California towhee	*Pipilo crissalis*	Western scrub jay	*Aphelocoma californica*
Golden-crowned sparrow	*Zonotrichia atricapilla*	White-crowned sparrow	*Zonotrichia leucophrys*
Kildeer	*Charadrius vociferous*	White-tailed kite	*Elanus leucurus*
Northern flicker	*Colaptes auratus*	Yellow-rumped warbler	*Dendroica coronata*
MAMMALS			
Bobcat	*Lynx rufus*	Fox squirrel	*Sciurus niger*
California ground squirrel	*Spermophylus beecheyii*	Raccoon	*Procyon lotor*
Coyote	*Canis latrans*	Red fox	*Vulpes vulpes*
Desert cottontail	*Sylvilagus audubonii*	Striped skunk	*Mephitis mephitis*
REPTILES AND AMPHIBIANS			
Pacific chorus frog	*Pseudacris regilla*	Western fence lizard	*Sceloporus occidentalis*
Pacific gopher snake	*Pituophis catenifer catenifer*	Western toad	*Bufo boreas*

3 Compliance Summary

Sandia Corporation (Sandia) manages and operates the Sandia National Laboratories, California (SNL/CA) site in compliance with the letter and spirit of applicable federal, state, and local environmental laws and regulations. Additionally, as a Department of Energy (DOE) facility, site activities are subject to DOE directives (i.e., Orders, Manuals, Policies, Notices, and Guides) and to presidential executive orders. This chapter provides a summary of compliance status with major environmental requirements for calendar year 2013.

3.1 Environmental Management System and Sustainability

DOE Order 436.1, *Departmental Sustainability* was established in 2011 to ensure that an environmental management system (EMS) and site sustainability are at the forefront of environmental excellence at DOE facilities. The entire content of DOE Order 436.1 is not a requirement of the Sandia Management and Operating Contract (M&O Contract). Applicable sections of the order identify requirements for establishing and implementing a Site Sustainability Plan (SSP). Sandia developed the first corporate-wide SSP that addresses energy, water, fuels, and a variety of other environmental concerns for all Sandia sites in 2011. The corporate SSP is updated annually. At SNL/CA, site personnel follow the corporate SSP, but continue to maintain a site-specific EMS. To meet the intent of DOE Order 436.1, the EMS provision is implemented through a Special Contract Requirement in the M&O Contract that directs Sandia to maintain an EMS that is registered to the International Organization for Standardization (ISO) 14001.

Sandia implemented its EMS in December 2005 at the SNL/CA site. In 2006, the SNL/CA EMS was upgraded to conform to the international standard, ISO 14001:2004 and received third-party registration. In 2012, Sandia received a three-year re-registration of the SNL/CA EMS to the ISO standard. Chapter 4 provides additional information on the site EMS.

The Sandia SSP addresses the following DOE reporting requirements:

- DOE's Annual Energy Report, as required by the National Energy Conservation Policy Act, Energy Policy Act of 2005, and Energy Independence and Security Act (EISA) of 2007;
- Section 432 of EISA 2007, which requires reporting of energy and water conservation measures that are identified as a result of site audits; and
- Commitments in the DOE Strategic Sustainability Performance Plan.

In 2013, site personnel provided input to the reports identified above and participated in development of the Sandia SSP for FY2014. Chapter 4 presents additional information about the specific objectives and targets that support these requirements.

3.2 National Environmental Policy Act

The National Environmental Policy Act (NEPA) (42 USC § 4321) is the basic national charter for protection of the environment. It requires all federal agencies to evaluate the effects of major federal actions on the human environment, including the physical, socioeconomic, and cultural environments. NEPA review of DOE actions is conducted in accordance with *DOE NEPA Implementing Procedures* (10 CFR 1021). Under these procedures, DOE may prepare a programmatic (including site-wide) document at any time to further the purposes of NEPA. DOE's National Nuclear Security Administration/ Sandia Field Office (NNSA/SFO) issued a site-wide environmental assessment (SWEA) for continued operations at SNL/CA (DOE 2003a) in 2003 and a Finding of No Significant Impact (FONSI) on March 20, 2003 (DOE 2003b). The SWEA provides an evaluation of the impacts of site operations, and the FONSI concludes that continuation of site operations is not a major federal action significantly affecting the quality of the human environment.

In 2012, NNSA/SFO completed a review of SNL/CA's SWEA through a supplement analysis. The results of the analysis found that continuing operations at SNL/CA do not constitute substantial changes to the SWEA, FONSI, or result in significant new circumstances or information relevant to environmental concerns. No further NEPA documentation is required as the SWEA and FONSI remain valid for site operations. Sandia personnel support compliance with NEPA and DOE's NEPA Implementing Procedures by reviewing all new projects and programs or changes to existing projects and programs to ensure that they fit within the bounds of existing NEPA documents and impact analyses for the site. During fiscal year 2013, 61 SNL/CA projects underwent NEPA review. None of these projects required the preparation of an environmental assessment or an environmental impact statement.

3.3 Air Quality

3.3.1 Clean Air Act

The Clean Air Act (42 USC § 7401) is the federal statute that forms the basis for the national air pollution control effort. It authorizes the Environmental Protection Agency (EPA) to promulgate air quality regulations and establishes national ambient air quality standards for criteria pollutants. Authority to implement the requirements of the Clean Air Act is provided to each state that has an EPA approved State Implementation Plan. The State Implementation Plan for California describes how National Ambient Air Quality Standards will be obtained in each air district. Each district establishes and enforces air pollution regulations to attain and maintain state and federal ambient air quality standards. The Bay Area Air Quality Management District (BAAQMD) is the regulating authority for controlling air pollution from stationary sources at SNL/CA. The California Air Resources Board (CARB) is responsible for ensuring that federal and state standards are met for mobile and small "area" sources of air pollution.

SNL/CA does not have any major sources of air pollutants (as defined in 40 CFR Part 70.2) present on site. Sandia personnel work with the BAAQMD and CARB to permit or register

all regulated emission sources. There were 14 permitted sources for both the 2012/2013 and 2013/2014 permitting periods[1]. Table 3-4 (Section 3.13) provides a list of the permitted sources.

3.3.2 Radionuclide Emissions

The *National Emissions Standards for Hazardous Air Pollutants, Subpart H – National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities* (NESHAPs) (40 CFR Part 61) establishes radiation protection standards, monitoring requirements, and annual reporting of radionuclide air emissions. Additional requirements pertaining to radionuclide emissions are contained in DOE Order 458.1 *Radiation Protection of the Public and the Environment* (DOE 2011c).

Sandia does not currently have any radionuclide emission sources at SNL/CA that are subject to the monitoring requirements of 40 CFR Part 61. To comply with national emission standards, Sandia personnel evaluate individual projects with the potential to release radionuclide emissions to determine the worst-case dose to the public. Additionally, dose calculations are compared to the requirements to determine the need for annual monitoring. During 2013, there were no projects using radionuclides above the Annual Possession Quantity; consequently, no NESHAPs evaluations were completed.

3.4 Natural and Cultural Resources

3.4.1 Endangered Species Act

The Endangered Species Act (16 USC § 1531 et. seq.) provides for protection of plant and wildlife species in danger of becoming extinct. In 2002, NNSA/SFO and Sandia personnel initiated consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act for maximum operations of the SNL/CA site. On December 8, 2004, the USFWS issued a biological and conference opinion for continued operations at SNL/CA. The biological opinion concludes that proposed site operations are not likely to jeopardize the continued existence of the California red-legged frog (*Rana aurora draytonii*) and the California tiger salamander (*Ambystoma californiense*), the two threatened species present on site. The conference opinion concludes that site operations are not likely to destroy or adversely modify proposed critical habitat for the red-legged frog[2].

[1] The BAAQMD permit period is July 1 through June 30 each year. Permit data is presented for the two periods applicable to 2013.

[2] In 2002, when the consultation process began, the Sandia site was within designated critical habitat for the California red-legged frog. In November 2002, the designation was overturned (U.S. District Court 2002), and in April 2004, the USFWS re-issued proposed critical habitat that included the Sandia site (USFWS 2004). However, in November 2005, the USFWS issued a revised designation (USFWS 2005), and a final rule in April 2006 (USFWS 2006). The scientific integrity of the 2006 rule was questioned resulting in another revision to critical habitat. The USFWS issued a new designation in March 2010. The Sandia site is not included in the final determination of critical habitat for the California red-legged frog.

3.4.2 Interim Protections for California Red-legged Frogs

In October 2006, interim restrictions on pesticide use went into effect to protect the California red-legged frog. The restrictions are the result of a settlement agreement between the EPA and the Center for Biological Diversity that requires the EPA to consult with the USFWS under the Endangered Species Act on the impacts of 66 pesticide ingredients to the red-legged frog. The agreement, outlined in a Stipulated Injunction and Order (US District Court 2006), places restrictions on the use of these pesticides in red-legged frog aquatic and upland habitat until consultations are complete and biological opinions are issued by the USFWS. In response to these interim protections, products containing the named pesticide ingredients are restricted from use in and along Arroyo Seco. By December 31, 2009, the EPA had completed effects determinations (or canceled the registration) for all 66 pesticide ingredients but no opinions have yet been issued.

3.4.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC §703 et. seq.) provides for protection of migratory birds, their nests, and eggs. Most of the bird species observed at SNL/CA are protected under this act. Migratory birds often build nests within the developed campus in locations where they will be disturbed by maintenance activities. To avoid harming birds, nests, or eggs, SNL/CA activities are delayed until the young have fledged, or surveys determine that the nest is abandoned. In 2013, there was no intentional take of migratory birds or disturbance to nests or eggs at the site. Surveys for nesting birds were completed for all projects that had the potential to disturb trees and shrubs. No active nests were encountered.

3.4.4 Protection of Wetlands

Executive Order 11990, Protection of Wetlands (EO 11990), requires federal agencies to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands. A small wetland area of 0.44 acres is present at SNL/CA. During 2013, no activities were conducted in the wetland area, or affecting wetlands.

3.4.5 Floodplain Management

Executive Order 11988, Floodplain Management (EO 11988), requires federal agencies to consider impacts associated with the occupancy and modification of floodplains, to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains. In 2002, a management plan for the Arroyo Seco was completed to identify channel improvements and stream zone management activities that will reduce flood and erosion risk and provide improved habitat for wildlife species that may use the arroyo (Matthews 2002). The plan identifies areas for constructing functional floodplains and for planting of native riparian vegetation. During 2006 and 2007, five improvement tasks were completed under a two-year permit issued by the U.S. Army Corp of Engineers. A new permit request was submitted in 2006 for the remaining improvement actions. In September 2008, a new ten-year permit for

SNL/CA was received from the U.S. Army Corp of Engineers to continue the Arroyo Seco Improvement Program. Thirteen improvement projects have been completed to date under the ten-year permit. Restored areas are monitored annually to determine progress in meeting survival and growth criteria established in the permit. When needed, shrubs and trees are replanted or grasses reseeded. In 2013, no replanting or reseeding was needed.

3.4.6 National Historic Preservation Act

The National Historic Preservation Act (16 USC § 470) requires federal agencies to identify, record, and protect cultural resources. In 1990, an assessment of cultural resources at the SNL/CA site was completed. Although no prehistoric resources, Native American resources, or historic archaeological sites were identified during this assessment, there is a possibility that buried resources could be present on site (DOE 2003a). Provisions for cultural resources are included in all construction-related contracts where the potential for buried resources may be unearthed. In 2013, there were no buried archaeological resources unearthed at SNL/CA.

In 2001, Sandia personnel completed an historic building survey. None of the buildings on-site are identified as historically significant or eligible for the National Register of Historic Places (SNL 2002). The results of the historic building survey were submitted to NNSA/SFO. In December 2004, NNSA transmitted the survey results to the California State Historic Preservation Officer (SHPO). In April 2005, NNSA/SFO received concurrence from the California SHPO that none of the properties located at SNL/CA are eligible for inclusion in the National Register of Historic Places.

3.5 Environmental Restoration

3.5.1 Comprehensive Environmental Response, Compensation, and Liability Act

Between 1984 and 1986, DOE investigated the SNL/CA site under their Comprehensive Environmental Assessment and Response Program (CEARP) to identify and assess potential environmental problems (DOE 1986). The CEARP investigation evaluated compliance with major federal environmental laws, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601). CERCLA established

liability compensation, cleanup, and emergency response for hazardous substances released to the environment. During the CEARP investigation, two potential CERCLA sites were identified at SNL/CA, the Fuel Oil Spill Site and the Navy Landfill. A Hazard Ranking System study was performed for each site to determine if either qualified for listing on the National Priorities List. Hazard Ranking System scores for both sites fell below 28.5, the qualifying score for listing. Since completion of the CEARP investigation, there have been no hazardous substance releases or contaminated sites found at SNL/CA that warranted CERCLA investigation or a Hazard Ranking System study.

In addition to cleanup and emergency response requirements, CERCLA also established a program to report spills of hazardous substances to the National Response Center. CERCLA reporting requirements are incorporated into an operating procedure for spill prevention and control (SNL/CA 2013). In 2013, there were no releases of hazardous substances that required notification under CERCLA.

3.5.2 Site Clean-up Orders

Since 1985, environmental restoration and monitoring activities at SNL/CA have been conducted in compliance with site clean-up orders issued by the California Regional Water Quality Control Board, San Francisco Bay Region under provisions established in the California Water Code (California RWQCB 1989). Although there are no active remediation sites at SNL/CA, groundwater monitoring is ongoing at two locations, the Fuel Oil Spill site and the Navy Landfill. SNL/CA personnel currently sample three groundwater monitoring wells for residual contamination, two at the Fuel Oil Spill site (when there is sufficient water to collect a sample), and one at the Navy Landfill. Sampling results are presented in Chapter 5, Environmental Monitoring.

3.6 Chemical Management

3.6.1 Emergency Planning and Community Right-to-Know Act

The Emergency Planning and Community Right-to-Know Act (EPCRA) -- also known as the Superfund Amendments and Reauthorization Act of 1986, Title III (SARA Title III) (42 USC §11001, et. seq.) -- requires reporting of toxic chemical usage and releases. To meet EPCRA requirements applicable to SNL/CA operations, Sandia personnel submit annual reports to the EPA, the State of California Office of Emergency Services, the Livermore-Pleasanton Fire Department, and the Alameda County Fire Department at Lawrence Livermore National Laboratory (LLNL). Applicable EPCRA reporting requirements for 2013 are presented in Table 3-1.

Table 3-1 Status of EPCRA Reporting for SNL/CA, 2013

EPCRA Section	Description of Reporting	Required in 2013
Sec. 302-303*	Planning Notification	Yes (sulfuric acid only)
Sec. 304*	Extremely Hazardous Substances Release Notification	No
Sec. 311-312*	Material Safety Data Sheet/ Chemical Inventory	Yes
Sec. 313	Toxic Release Inventory Reporting	Yes (lead only)

* Reporting accomplished through the annual Hazardous Materials Business Plan, a California requirement. See Section 3.6.2.

3.6.2 California Hazardous Materials Release Response Plans and Inventory

The California Hazardous Materials Release Response Plans and Inventory (Assembly Bill 2185) addresses the management of hazardous and acutely hazardous materials and is codified in the California Health and Safety Code, Division 20, Chapter 6.95 §25500, et seq. Specific requirements pertaining to hazardous materials are in Title 19, California Code of Regulations, Division 2, Chapter 4, sections 2729-2732. In compliance with California requirements, Sandia personnel annually submit a Hazardous Material Business Plan for SNL/CA to the Livermore-Pleasanton Fire Department via the California Environmental Reporting System.

3.6.3 Underground Storage Tanks

Hazardous or petroleum products stored in underground storage tanks (UST) are regulated under California Health and Safety Code Division 20, Chapter 6.7, §§ 25280-25299.8. California code incorporates the UST provisions of the Resource Conservation and Recovery Act (RCRA) and establishes standards for construction, operation, maintenance, inspection, and testing of USTs. The Livermore-Pleasanton Fire Department is the regulating authority for USTs at SNL/CA. Sandia personnel operate one UST in accordance with California requirements. Each year, the UST is declared through the Hazardous Material Business Plan described in Section 3.6.2, and it receives a permit to operate from the Livermore-Pleasanton Fire Department. One minor violation associated with the UST was received in 2013 for a lapse in monitoring personnel certification and delay in submitting two monthly reports.

3.6.4 Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) is the primary Federal statute regulating the manufacture, use, distribution, disposal, import, or export of certain chemicals and substances (15 USC § 2601 et. seq.). TSCA requirements that are applicable to SNL operations are incorporated into Corporate Process ESH100.2, *Analyze and Control Hazards* (SNL 2013a). For SNL/CA operations, the only TSCA regulated chemicals imported or exported are for research and development purposes thus are exempt from general reporting requirements. However, Sandia personnel notify EPA of exempt imports and exports when appropriate. In 2013, no TSCA Notification of Export or Import declarations were prepared. Sandia personnel track disposal of TSCA materials generated from SNL/CA operations that are not otherwise captured as RCRA or California toxic hazardous waste. These materials

include asbestos and polychlorinated biphenyls (PCBs). The majority of TSCA waste generated on-site is asbestos from abatement activities. Only small quantities of PCB wastes are generated at SNL/CA, consisting of light ballasts that are not specifically marked as PCB-free.

3.6.5 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) restricts the registration, sale, use, and disposal of pesticides (includes herbicides, insecticides, fungicides, and rodenticides) (7 USC § 136). The only activity conducted at SNL/CA that falls under the provisions of FIFRA is pesticide use. This activity is conducted by a licensed commercial pesticide applicator under a service contract. Contract requirements include a site-specific environmental specification. All empty pesticide containers are managed by the service contractor and removed from the site.

3.7 Pollution Prevention and Waste Minimization

Pollution prevention concepts first appeared in RCRA. An expressed concern was to minimize the generation of hazardous waste through process substitution, materials recovery, recycling, reuse, and treatment. RCRA established the reduction or elimination of hazardous waste as national policy, and required that hazardous waste generators and RCRA permit holders have a program in place to minimize waste. Sandia personnel are required to report waste generation and recycling information quarterly to DOE and Lockheed Martin Corporation, as Sandia is a wholly-owned subsidiary of Lockheed Martin Corporation. To meet these requirements, SNL/CA personnel provided data to SNL/NM pollution prevention personnel for inclusion in corporate quarterly progress reports. In past years, select purchasing data was reported in the annual Pollution Prevention Tracking Report (PPTR). The PPTR was eliminated in 2013 and data is now reported in the Consolidated Energy Data Report and submitted to DOE in December along with the Site Sustainability Plan. Additionally, SNL/CA's Waste Minimization Certificate required by the Hazardous Waste Storage Facility Part B Permit was submitted to the California Department of Toxic Substances Control (DTSC) prior to the March deadline.

3.7.1 Pollution Prevention Goals of Site Sustainability Plan

The Sandia Site Sustainability Plan establishes a commitment to meet pollution prevention goals identified in DOE's Strategic Sustainability Performance Plan and Executive Order 13514. In 2013, Sandia personnel continued to implement SNL/CA site-specific activities to support these goals through:

- recycling of 29 solid waste streams;
- recycling of construction debris;
- chemical exchange;
- awareness campaigns targeting paper use;

P2 Goals

- Diversion of solid waste and demolition / construction debris from landfill disposal
- Prevent or reduce pollution at the source, whenever feasible
- Recycle, whenever feasible
- Treat pollution that cannot be reduced or recycled, in an environmentally safe manner, whenever feasible
- Release or dispose only as a last resort

- chemical acquisition program that encourages purchasing only the quantity needed;
- management of batteries as universal waste; and
- reapplication of equipment and supplies.

Sandia personnel reported pollution prevention and waste minimization data for SNL/CA to the corporate Site Sustainability Plan team on November 18, 2013 for submittal to NNSA/SFO on December 16, 2013. Additional information about pollution prevention activities is provided in Chapter 4.

3.7.2 Hazardous Waste Source Reduction and Management Review Act

The California Hazardous Waste Source Reduction and Management Review Act of 1989, (Senate Bill 14), requires hazardous waste generators to consider source reduction as the preferred method of managing hazardous waste. Under this act, facilities that generate more than 12,000 kilograms (kg) of hazardous waste or 12 kg of extremely hazardous waste annually are required to conduct source reduction planning.

Under an agreement between DOE and DTSC, all of DOE's California sites are considered one waste generator, rather than individual DOE facilities. Every four years, Sandia personnel complete a Source Reduction and Evaluation Review and Plan in cooperation with the other three DOE sites in California: LLNL; Lawrence Berkeley National Laboratory; and Stanford Linear Accelerator Center. The most recent plan was submitted to DTSC on August 31, 2011 and provided information for calendar year 2010. The plan also identifies waste reduction opportunities for any waste stream that is over five percent of a site's total routine regulated waste. The next plan, which will include information from calendar year 2014, will be prepared in 2015.

3.7.3 Pollution Prevention Act

The Pollution Prevention Act of 1990 declares, as national policy, that pollution should be prevented or reduced at the source (42 USC § 13101 et. seq.). Facilities that meet the reporting requirements under EPCRA, Section 313 are also required to file a toxic chemical source reduction and recycling report. The Section 313 report for 2013 (for lead only) will include source reduction and recycling information to meet this requirement. The report is due annually on July 1. See Section 3.6.1 for additional information on EPCRA reporting requirements.

3.8 Hazardous Waste

3.8.1 Federal Facility Compliance Act

The Federal Facility Compliance Act waives sovereign immunity with respect to RCRA for federal facilities (42 USC § 6961). The act gives EPA, and authorized states, authority to conduct annual inspections of federal facilities and establishes requirements for management of hazardous/mixed waste.

Activities at SNL/CA are not subject to a site-specific federal facility compliance agreement for mixed waste. Sandia does not possess or store any legacy mixed waste at the SNL/CA site. All mixed waste generated at SNL/CA during 2013 was appropriately managed under the site's RCRA Hazardous Waste Facility Permit.

3.8.2 Resource Conservation and Recovery Act

RCRA regulates the generation, transportation, treatment, storage, and disposal of hazardous chemical waste, non-hazardous solid waste, and hazardous or petroleum products stored in USTs (42 USC §6901 et. seq.). The State of California has authority from the EPA to implement RCRA. The DTSC administers most aspects of RCRA in the state, and is the regulating authority for hazardous waste operations at SNL/CA, including the hazardous component of radioactive mixed waste.

Sandia operates a Hazardous Waste Treatment and Storage Facility at SNL/CA under a RCRA Hazardous Waste Facility Permit issued by DTSC on March 30, 2004. The permit is effective through March 2014 and allows for storage, consolidation, commingling, and packaging of hazardous waste. A permit renewal application for another ten-year period was submitted to DTSC on June 28, 2013. Sandia received notice from DTSC on July 23, 2013 granting a Determination of Administrative Completeness. The technical review of the permit renewal application is underway. The conditions of the expired permit will continue in force until DTSC issues a new permit.

By definition, the SNL/CA facility is a large quantity generator of RCRA waste. As such, site personnel are required under RCRA standards and implementing regulations (40 CFR 262.41) to submit a biennial report to EPA on even numbered years.

3.8.3 California Hazardous Waste Control Law

The Hazardous Waste Control Law (California Health and Safety Code, Division 20, Chapter 6.5, §25100 et. seq.) provides a separate regulatory framework for hazardous waste management in California. The state law incorporates all RCRA requirements and imposes additional requirements that are broader and more comprehensive than the federal system. Under the California law, additional waste materials (e.g., oils, metals, asbestos) or activities (e.g., treatment) are regulated as hazardous. State standards are incorporated into the Waste Management Function at SNL/CA so that California regulated waste is managed as hazardous waste in compliance with state requirements.

The California Environmental Health Standards for Management of Hazardous Waste (22 CCR, Division 4.5) require all permitted hazardous waste facilities to submit an annual facility report to DTSC. Annual facility reports provide information about the quantity of RCRA and California designated hazardous waste generated and stored at SNL/CA, and the quantity of waste shipped from the site.

Sandia personnel submit an annual facility report to DTSC either in the form of the federal Biennial Report or the California Annual Facility Report, or both if requested by DTSC.

3.8.4 Medical Waste Management Act

The California Medical Waste Management Act (California Health and Safety Code, Division 104, Part 14, §§ 117600-118360) provides for regulation of medical waste generators, transporters, and treatment facilities. The Alameda County Department of Environmental Health is the regulating authority for medical waste generated at SNL/CA. There are two facilities at SNL/CA identified as small quantity generators of medical waste, one with limited on-site treatment and one without on-site treatment.

3.9 Radiation Protection

3.9.1 Atomic Energy Act

The purpose of the Atomic Energy Act is to assure the proper management of nuclear materials and radioactive waste (42 USC § 2011 et. seq.). The act allows DOE to set radiation protection standards to control exposure to the public and the environment that may result from operations at DOE facilities. DOE sets these standards through department directives. Operations at SNL/CA are subject to the requirements established in DOE Order 435.1, *Radioactive Waste Management* (DOE 2001) and DOE Order 458.1, *Radiation Protection of the Public and the Environment* (DOE 2011c).

3.9.2 DOE Order 435.1, Radioactive Waste Management

DOE Order 435.1 establishes requirements to manage radioactive waste in a manner that protects the environment, and worker and public health and safety. Under this order, DOE contractor operated facilities are required to plan, document, execute, and evaluate the management of radioactive waste. Requirements of Order 435.1 are incorporated into the radioactive waste management element of the SNL/CA site Waste Management Function. The function includes certification and characterization of waste; provisions for inspections and audits; training requirements; and operating procedures for handling, storing, packaging, shipping, and off-site disposal of radioactive waste.

SNL/CA operations generate low-level radioactive waste and low-level mixed waste. No transuranic or high-level radioactive waste is generated by SNL/CA operations. Low-level radioactive and mixed wastes are stored prior to shipment in the Radioactive Waste Treatment and Storage Facility. Low-level radioactive waste is shipped off-site to SNL/NM with final land disposal at the Nevada Nuclear Security Site. Mixed waste is managed under federal RCRA and state waste regulations and shipped off-site for treatment and disposal via commercial disposal facilities. Figure 3.1 shows the quantity of total radioactive waste shipped from SNL/CA since 2008.

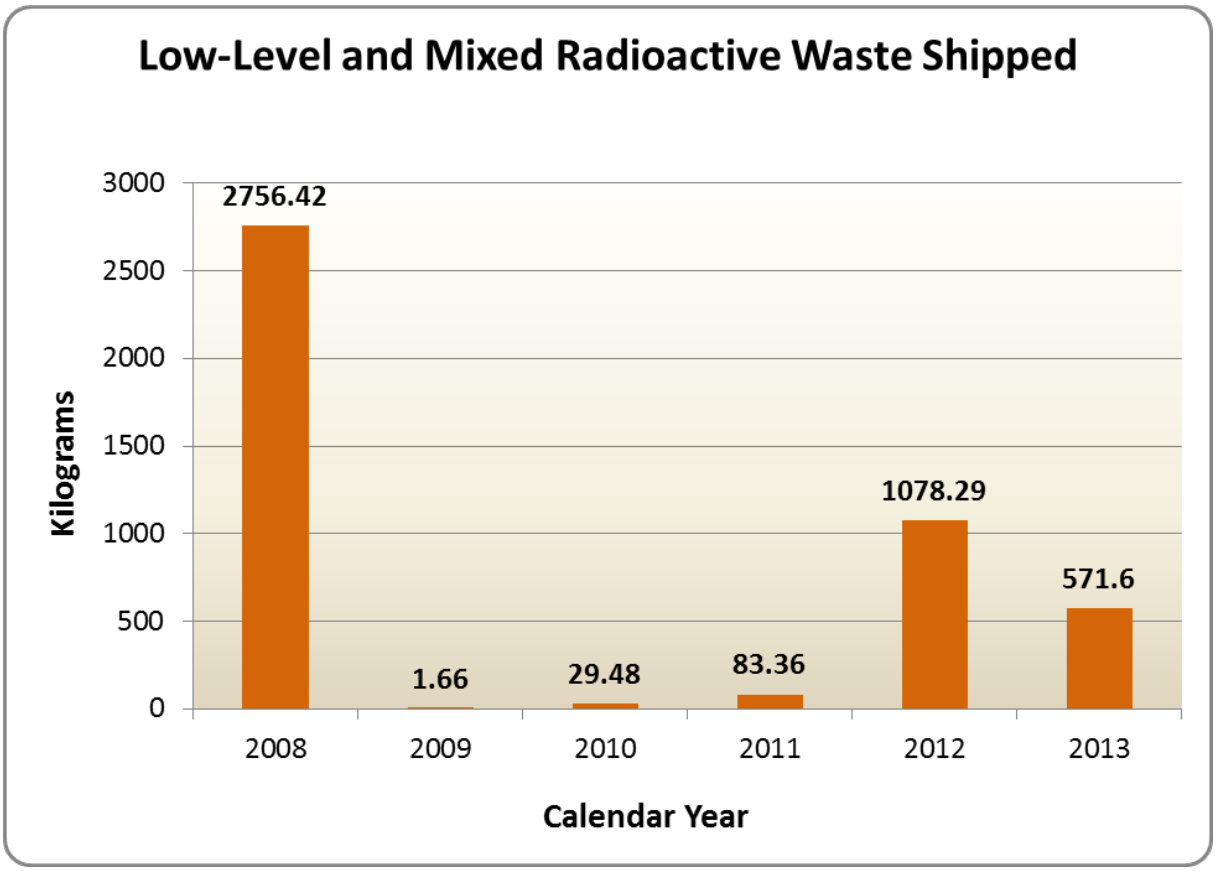

Figure 3-1 Radioactive Waste Shipped from SNL/CA

3.9.3 DOE Order 458.1, Radiation Protection of the Public and the Environment

DOE Order 458.1 sets radiation protection standards for DOE operations so that radiation exposures to members of the public and the environment are as low as reasonably achievable (ALARA) and maintained within established limits of the order. Table 3-2 provides a summary of related compliance activities conducted at SNL/CA in 2013.

Table 3-2 Order 458.1 Compliance Summary, 2013

Order 458.1 Requirement	SNL/CA 2013 Summary
Develop and implement an environmental radiological protection program	An environmental radiological protection program has been in place at SNL/CA for more than 30 years. An internal evaluation of the program was completed in 2011 by Sandia personnel and it was determined that the program meets the requirements of DOE Order 458.1.
Control exposure to the public such that annual exposure will not exceed a total effective dose of 100 mrem, an equivalent dose to the lens of the eye of 1500 mrem, or an equivalent dose to the skin or extremities of 5000 mrem.	There were no radionuclide emissions in 2013. The average annual gamma radiation measurement at the site perimeter in 2013 was 66.1 mrem or 10.3 mrem more than the local background dose of 55.8 mrem. The difference between the perimeter and distant locations is most likely the result of normal fluctuations and natural variations in ambient radiation.
Request authorization for temporary dose limits.	There were no special circumstances in 2013 requiring temporary dose limits.
Adopt ALARA exposures.	ALARA is incorporated into environment, safety, and health (ES&H) policy, processes, and procedures.
Demonstrate compliance with public dose limits from the air pathway.	NESHAPS dose calculations are completed as needed. There were no airborne radionuclide emission sources in 2013; therefore, there is no monitoring data available for dose evaluations.
Control airborne radioactive effluents.	ES&H policy, processes, procedures, and management systems are incorporated into site operations to ensure that projects are reviewed for potential airborne effluents and dose calculations are performed, as needed.
Control release of liquid radioactive discharges.	No intentional discharges of liquid radioactive wastes to the environment occur on-site. No accidental releases of liquid radioactive waste occurred in 2013. Radioactive releases to the sanitary sewer above DOE O 458.1 guidelines are not allowed at SNL/CA. ES&H policy, processes, procedures, and management systems are incorporated into site operations to ensure proper handling and disposal of radioactive materials.
Control radioactive waste.	SNL/CA generates only low-level radioactive waste. ES&H policy, processes, procedures, and management systems are incorporated into site operations to ensure proper handling and disposal of radioactive waste.
Protect drinking water and groundwater.	ES&H policy, processes, procedures, and management systems are incorporated into site operations to ensure proper handling, and disposal of radioactive materials offsite at approved facilities. Routine analyses of groundwater and storm water samples include radioactive constituents.

Order 458.1 Requirement	SNL/CA 2013 Summary
Protect biota.	ES&H policy, processes, procedures, and management systems are incorporated into site operations to ensure proper handling, and disposal of radioactive materials offsite at approved facilities. SNL/CA is not required to monitor biota.
Control the release of property with residual radioactivity.	Property is released from SNL/CA areas utilizing clearance surveys as required by DOE Order 458.1. However, historically, material with measureable residual radioactivity has not been released. Excess property of this type is either transferred to other DOE facilities for reuse or transferred to Waste Management for disposal.
Retain records.	ES&H policy, processes and procedures are in place to manage records.

3.10 Water Quality and Protection

SNL/CA operations are subject to the requirements of the Clean Water Act and equivalent California statutes. Sandia does not operate a public water system at the SNL/CA facility, and is not involved in any environmental restoration activities for which Safe Drinking Water Act standards are being applied.

Drinking water at SNL/CA is purchased through LLNL and obtained from the San Francisco Water District or the Alameda County Flood Control and Water Conservation District, Zone 7. The San Francisco Water District and Zone 7 are responsible for monitoring the quality of the incoming water. Sandia is not required to treat or sample the drinking water. LLNL maintains the primary drinking water distribution system that feeds to SNL/CA and screens for water quality (SNL/CA 2002).

3.10.1 Clean Water Act

The Clean Water Act regulates all direct discharges into navigable waters of the United States (U.S.) (33 USC § 1251). Direct discharges to waters of the U.S. require permits issued under the National Pollutant Discharge Elimination System (NPDES). In California, the State Water Resources Control Board has authority from EPA to implement the Clean Water Act. Federal permitting requirements are included in Waste Discharge Requirements issued by Regional Water Quality Control Boards.

Wastewater Discharge

Wastewater generated at SNL/CA is discharged to the City of Livermore Water Reclamation Plant, a publicly owned treatment works (POTW). The Livermore POTW maintains an NPDES permit, and then regulates industry discharges into their sewer system. A Wastewater Discharge Permit issued by the Livermore POTW regulates SNL/CA's wastewater discharges. The permit is updated annually and includes discharge limits for the site sanitary sewer outfall and for processes subject to EPA pretreatment standards. There were no permit

exceedances in 2013 at the sanitary sewer outfall. For routine wastewater monitoring information, see Section 5.2.1.

There are three categorical processes at the SNL/CA site that are subject to EPA's pretreatment standards: two metal finishing operations, and a semiconductor manufacturing operation. The two metal finishing operations are closed-loop processes and do not discharge any effluents. Wastewater generated from the semiconductor manufacturing process is sampled and monitored as part of the Environmental Monitoring Function. There were no exceedances of the discharge limits from this source during 2013.

Storm Water Discharge

General storm water discharges at SNL/CA are covered under the *State of California NPDES General Permit for Storm Water Discharge Associated with Industrial Activities* (General Industrial Permit) (California Water Resources Control Board 1997). The General Industrial Permit requires Sandia to implement a storm water pollution prevention plan. The SNL/CA plan describes the rationale for monitoring discharge locations and identifies best management practices for reducing pollutant contact with storm water.

The current General Industrial Permit does not contain numeric limits or standards for storm water discharges. However, the most current draft of the new General Industrial Permit does identify action levels. The new General Industrial Permit is expected to be adopted sometime in 2014. When the new permit becomes effective, Sandia personnel will compare storm water analytical results to the standards as required by the General Industrial Permit.
The latest draft of the California Small Municipal Separate Storm Water Sewer System (MS4) General Permit did not include Sandia National Laboratories as a regulated entity. Although Sandia is not required to comply with the provisions of the MS4 General Permit, aspects of the permit are implemented at SNL/CA as best management practices.

In 2013, Sandia personnel visually monitored 22 storm water discharge locations and sampled eight of nine locations. Four sampling locations did not have sufficient runoff during the year to collect two separate storm event samples. One location had insufficient runoff to collect any samples. The result of monitoring and sampling activities conducted in 2013 did not identify any issues of concern. Section 5.1 presents a summary of 2013 results.

Under Section 438 of the Energy Independence and Security Act of 2007, federal agencies have requirements to reduce storm water runoff from development and redevelopment projects. In 2013, these requirements were applicable to one construction project at SNL/CA. Sandia installed a retention pond at the project location to capture storm water runoff for infiltration.

3.11 Audits, Assessments, and Inspections

Table 3-3 provides a list of environmental audits, assessments, and/or inspections conducted at SNL/CA during 2013.

Table 3-3 SNL/CA Audits, Assessments, and Inspections, 2013

Title	Area of Focus	Date Conducted	Results
Alameda County Inspection	Erosion at the Navy Landfill site	September 30, 2013	No violations
City of Livermore, Water Resources Division Inspections	Wastewater discharges and categorical process laboratories	November 18-19, 2013	No issues
Third Party Environmental Management System (EMS) Surveillance Audit (NSF-ISR)	Conformance with the ISO 14001:2004 EMS standard	May 2013	Two minor non-conformances
Livermore-Pleasanton Fire Department	Tiered permits, hazardous waste training, hazardous materials business plan	August 29-30, 2013	No violations
Livermore-Pleasanton Fire Department	Underground Storage Tanks	March 12, 2013	One minor violation
Army Corp of Engineers	Arroyo Seco Improvement Program	September 25, 2013	No issues

3.12 Environmental Occurrences

An environmental occurrence is an event that meets the occurrence criteria established in DOE Order 232.2 (DOE 2011e). In 2013, there was one environmental occurrence from SNL/CA operations. On May 30, 2013, approximately 700 gallons of sewage overflowed from the sewer outfall station onto the surrounding ground surface due to failure of an automated sensor / control system. Manual operations were implemented immediately and continued until equipment was repaired.

3.13 Permits

Environmental permits and clean-up orders held for SNL/CA operations are listed in Table 3-4. Additional information is provided in previous sections under the related program or regulation.

Table 3-4 SNL/CA Environmental Permits and Orders, 2013

Type	Description	Effective Date	Statute / Regulation	Issuing Agency
Environmental restoration	Site Clean-up Order No. 89-184	December 1989 (no expiration date)	California Water Code	Regional Water Quality Control Board, San Francisco Bay
Hazardous materials	Business Plan Permit to Operate	January 1 – December 31, annually	California Health and Safety Code	Livermore-Pleasanton Fire Department
Hazardous waste	RCRA Hazardous Waste Facility Permit	March 2004 - March 2014	Resource Conservation and Recovery Act	California Department of Toxic Substances Control
Hazardous waste	Permit by Rule	January 1 – December 31, annually	California Health and Safety Code	Livermore-Pleasanton Fire Department
Hazardous waste	Conditionally Authorized Permit to Operate	January 1 – December 31, annually	California Health and Safety Code	Livermore-Pleasanton Fire Department
Medical waste	Small Quantity Generator with On-site Treatment	August 9 - August 8, annually	California Health and Safety Code	Alameda County Dept. of Environmental Health
Medical waste	Small Quantity Generator without On-site Treatment	April 11 - April 10, annually	California Health and Safety Code	Alameda County Dept. of Environmental Health
Wastewater	Wastewater Discharge Permit	August 4 - August 3, annually	Clean Water Act	City of Livermore Water Reclamation Plant
Storm water	State of California General Industrial Permit	July 1997 - July 2002[a]	Clean Water Act	California Water Resources Control Board
Jurisdictional waters of the U.S.	Channel Improvements under the Arroyo Seco Improvement Program	September 25, 2008 – July 11, 2018	Clean Water Act	Army Corp of Engineers
Underground storage tank	Permit to Operate	January 1 – December 31, annually	Resource Conservation and Recovery Act and California Health and Safety Code	Livermore-Pleasanton Fire Department
Aboveground storage tanks	Storage statement	January 1 – December 31, biannually	Aboveground Petroleum Storage Act	Livermore-Pleasanton Fire Department
Air	Permit to Operate 14/14 emission sources[b]	July 1 - June 30, annually	Clean Air Act	Bay Area Air Quality Management District
Universal waste	Generator statement	February 1, 2006	California Electronic Waste Recycling Act	California Department of Toxic Substances Control

[a] The current General Industrial Permit continues in effect until a new permit is issued by the State Water Resources Control Board (Permit Section C.18). When the renewal process is complete and a new General Industrial Permit is issued by the State, Sandia will apply for coverage under the new permit.

[b] The BAAQMD permit period is July 1 through June 30 each year. Permit data is presented for the two periods applicable to 2013. Emission sources include 1 non-retail gasoline dispensing facility, 5 miscellaneous sources (decontamination sink, waste compactor, drum crusher, site-wide wipe-cleaning, and adhesives source for maintenance activities), 6 emergency generators, 1 low-use portable generator, and 1 spray paint booth.

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4 Environmental Management

Sandia Corporation (Sandia) is firmly committed to sound environmental stewardship practices as well as compliance with environmental requirements. Sandia National Laboratories, California (SNL/CA) site management meets this commitment through an environmental management system (EMS) that integrates traditional environmental program elements with objectives for improving the environmental footprint of site operations. The EMS for SNL/CA is dynamic, encompassing an annual cycle of planning, implementing, assessing, and improving operations in support of corporate and site-specific environmental goals.

SNL/CA's EMS conforms to the international standard for environmental management systems, ISO 14001. Sandia initially received ISO 14001:2004 registration for the SNL/CA site on September 25, 2006. In May 2012, the site underwent a successful audit to the ISO 14001 standard and received re-registration through May 18, 2015, provided the EMS is adequately maintained during the interim. To ensure that the site maintains conformance with the standard, surveillance audits are conducted annually.

SNL/CA Environment, Safety, and Health (ES&H) Standard of Performance

SNL/CA is firmly committed to meeting all corporate and regulatory ES&H policies and requirements that apply to its operations. The application of compliant ES&H principles and practices is considered a fundamental element of everyone's work assignment.

In this regard, SNL/CA commits to:

- **Nurture a safety and health conscious work ethic and culture.** We will all assume responsibility for creating and maintaining a worksite, as well as performing our work, in a manner that respects and supports the safety and health of every individual. SNL/CA believes that all accidents are preventable. We will all strive to create a workplace that is free of accidents and injuries.
- **Be a responsible steward of the environmental resources in our care.** We will integrate environmental risk assessment, planning and impact mitigation into every aspect of our work. SNL/CA programs, operations, processes, and facilities will be planned and managed such that they support environmental objectives and targets to minimize the creation of waste, pollution, and adverse impact on the public and the environment. SNL/CA will remain committed to an efficient and effective Environmental Management System as part of the laboratory's Integrated Safety Management System.
- **Comply with all applicable laws, regulations and permits.** Compliance with the letter and the spirit of ES&H laws and regulations is viewed as the minimum acceptable standard. When necessary and appropriate we will go beyond legal mandates in order to implement more effective approaches and to nurture a positive and learning ES&H culture. SNL/CA is committed to continual improvement in all aspects of our environment, safety, and health performance and commits to establish performance indicators to guide these efforts and measure our progress.
- **Employ engineered safety principles.** We will integrate an engineered safety approach into all aspects of our work. We will strive for an operational system where safety is an attribute achieved by intent; is systematically and critically analyzed to identify ways in which it can fail to perform as intended; and is designed and validated to prevent identified potential failure modes and mitigate the consequences of a failure, should one occur.

4.1 EMS Elements

Sandia's EMS at the SNL/CA site encompasses the seventeen elements of an effective EMS as identified in the ISO 14001:2004 standard. Table 4-1 identifies the EMS elements and summarizes the methods, tools, and functions implemented in support of each.

Table 4-1 Elements of the SNL/CA EMS

EMS Element	Implementation Summary
Environmental policy	Sandia personnel operate under a site-specific ES&H standard of performance that reinforces individual accountability, environmental stewardship, compliance, and engineered safety. Sandia management stresses the need to move beyond compliance to nurturing of a positive ES&H culture at all levels of the workforce.
Environmental aspects	Environmental aspects are elements of operations and activities that can interact with the environment, such as water discharges. Sandia personnel evaluate SNL/CA site activities and operations annually to ensure environmental aspects are up-to-date and accurate. From this complete list (19 aspects), significant aspects are determined through a risk evaluation. For 2013, significant environmental aspects at SNL/CA are water discharges, air emissions, general transportation, land use, and hazardous waste.
Legal and other requirements	Sandia maintains a formal process for monitoring federal, state, and local government publications for regulatory changes and issues applicable to Sandia operations. Environmental personnel at SNL/CA augment this process by monitoring publications specific to environmental functions and through interaction with regulating agencies. Environmental subject matter experts analyze all new requirements, and team with other site personnel to achieve compliance. New requirements and modifications to environmental functions are documented in an Environmental Functional Area Annual Report.
Objectives and targets	Site management maintains ten EMS objectives that support efforts to reduce potential environmental risk and enhance environmental stewardship. Targets are evaluated and set each year to support site objectives. 2013 objectives at SNL/CA are to: ➢ Demonstrate exceptional environmental performance and management. ➢ Minimize consumption (energy, water, non-renewable resources). ➢ Minimize the production of waste (non-hazardous, hazardous, radiological, wastewater). ➢ Minimize air pollutant and greenhouse gas emissions. ➢ Preserve and, when possible, enhance the site's natural habitat. ➢ Design and manage all buildings and facilities using "green" principles. ➢ Maintain sewer effluent within regulatory discharge limits. ➢ Minimize the volume and pollution of storm water runoff and water discharges. ➢ Procure and use environmentally friendly products and materials. ➢ Minimize pollutants released to the ground or groundwater (spills, landscape chemicals, metals, etc.).
Environmental Functions	The SNL/CA EMS is supported by five environmental functions. Air Quality Environmental Monitoring and Ecology Environmental Planning Pollution Prevention and Waste Minimization Waste Management
Structure, responsibilities, and authorities	The SNL/CA EMS is implemented through existing site management and organizational structures. The site Vice President holds overall responsibility for success of the EMS. Director and senior management personnel ensure availability of resources. An environmental management representative and EMS core team are responsible for day-to-day management of the system. All members of the workforce hold responsibility and authority to implement EMS elements into their operations.
Competence, training, and awareness	Sandia employs a variety of mechanisms to ensure that the site workforce and visitors maintain the appropriate training and competence levels for their assignments, and to foster awareness. These mechanisms include corporate training programs, site-specific training programs, and activity-specific training programs. For contractor-directed activities that occur on site, standard specifications are issued that identify training, credentials, and certifications required for each project.

EMS Element	Implementation Summary
Communication	Sandia staff communicates EMS information internally through project review teams, publications, websites, briefings, assessments, and promotional information. Information is communicated externally through publications, websites, SNL/CA's Public and Media Relations Office, and regulatory-driven documents.
EMS documentation	Sandia maintains an EMS Program Manual as the primary EMS document for the site. General corporate and site policies, document systems, and databases provide supporting documentation for the EMS.
Document control	At SNL/CA, document control is accomplished with electronic documents that are available in online databases. If paper copies of technical work documents are maintained at the point of use, department managers ensure that a process is in place to keep them up to date. Permits and other regulatory documents of external origin are typically marked as valid for a specified period and controlled by limited distribution coordinated by environmental subject matter experts.
Operational controls	Sandia employs an integrated system to address ES&H concerns associated with site operations. This integrated system provides the framework for planning work, evaluating hazards, identifying controls, conducting work, and improving work processes. Unique to the SNL/CA site, the ES&H, Facilities, and Security Interdisciplinary Team supports integrated safety and environmental management to ensure requirements and controls are identified during project planning. Typical operational controls used at the site include technical work documents, defined operating envelopes, approved safety case, environmental permits and compliance documents, contract specifications, and a variety of engineered controls.
Emergency preparedness and response	An established Emergency Management Program that maintains responsibility for preparedness and response supports SNL/CA's EMS. Emergency Management personnel conduct routine drills and communication tests, and annually conduct site-wide training exercises. Environmental representatives are active members of emergency response teams to ensure that potential environmental risks are managed and mitigated appropriately.
Monitoring and measurement	Each of the five SNL/CA environmental subject matter experts monitors and measures the key characteristics of site operations that can affect the environment. Data collected supports compliance requirements as well as assessment of the site's overall progress in meeting EMS objectives. Monitoring data and metrics are available to the public in annual environmental reports.
Evaluating compliance	Environmental subject matter experts evaluate compliance with all appropriate requirements through the Interdisciplinary Team process, self-assessments, and audits.
Nonconformity, corrective, and preventive action	Sandia staff documents, tracks, and verifies corrective and preventive actions with electronic assessment tracking and corrective action systems. The EMS Core Team also established a procedure for validating the effectiveness of select actions and to reduce the potential for recurrence of significant nonconformities.
Records	Most information created by conducting Sandia operations is managed as a record. ES&H records are maintained by the site ES&H Records Center or in a corporate-wide electronic database.
Management review	The top management team (VP and directors) at the SNL/CA site reviews the EMS at least annually. In 2013, one management review was conducted resulting in one recommendation related to storm water management.

4.2 Environmental Performance

Sandia measures environmental performance at SNL/CA by tracking progress towards achieving EMS objectives and corporate performance measures established jointly between Sandia and the National Nuclear Security Administration, Sandia Field Office (NNSA/SFO). The following diagrams and text summarize performance in meeting the site's ten EMS

objectives. One corporate measure applicable to SNL/CA is also addressed under Objective 1.

Although there is not a one-to-one correlation, many of the SNL/CA site EMS objectives and targets also support the objectives of the corporate Site Sustainability Plan. The corporate Site Sustainability Plan objectives, in turn, support DOE's Strategic Sustainability Performance Plan goals. SNL/CA site objectives and/or targets that support the broader corporate objectives and, consequently, DOE goals, are indicated with an SSP designator.

Objective 1: Demonstrate exceptional environmental performance and management

Sandia personnel track noncompliance with environmental requirements as a measure of our environmental management performance at SNL/CA. Figure 4-1 shows the number of findings from third-party audits (includes DOE), notices of violation, and other environmental occurrences since 2000. The Sandia goal is zero findings and zero violations. Sandia received one minor violation in 2013 for lapse of monitoring personnel certification and delay in submitting two monthly reports. As a routine element of EMS implementation, Sandia personnel identify and implement corrective and preventive actions in an effort to improve environmental performance and reach and maintain the Sandia goal of zero violations and zero findings.

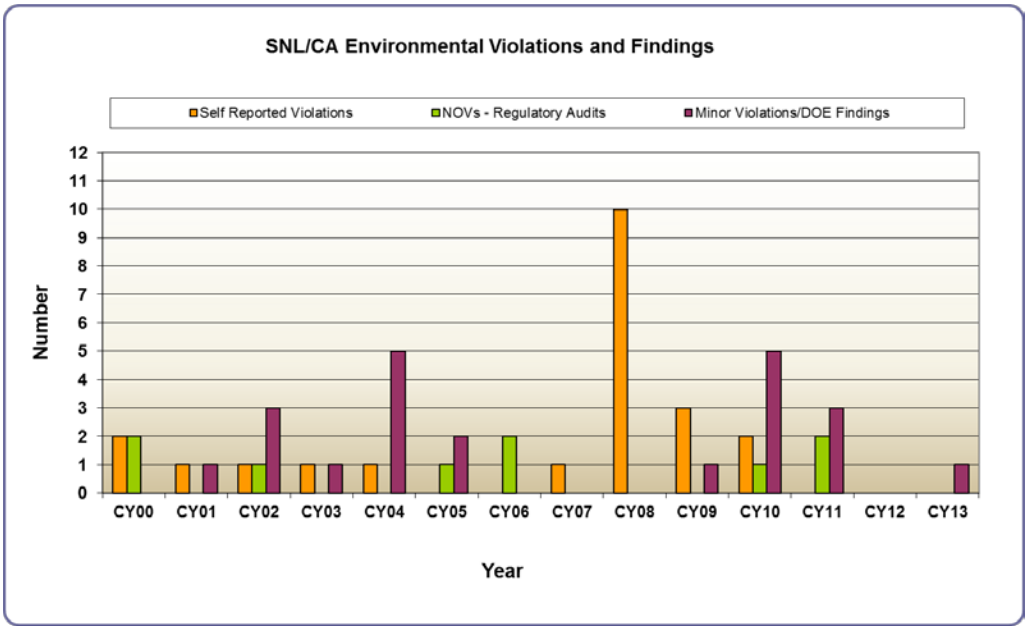

Figure 4-1 Measurement of Excellence in Environmental Management

This objective also supports a 2013 NNSA/SFO performance objective for Security, Infrastructure, Environmental Stewardship, and Institutional Management. Sandia met the NNSA/SFO expectation to deliver efficient, effective, and responsive ES&H management and processes. This performance objective is supported by maintaining ISO 14001:2004 registration of the site's EMS. By conforming to the ISO standard, sound environmental stewardship practices are integrated with regulatory compliance to reduce the environmental

footprint from site operations. Sandia received a rating of very good for this performance objective.

Hazardous Materials

Sandia personnel also measure environmental performance by effective hazardous materials management. The overall goal of the EMS is protection of the environment from the negative effects of site activities including hazardous materials use. Central to this defense of the environment, is proper chemical inventory management. Right sizing the inventory and minimizing toxicity is, therefore, key to environmentally friendly hazardous materials management. As shown in Figure 4-2 the number of hazardous materials containers peaked in 2003 and have been steadily declining since. Overall, the number of containers for higher toxicity materials (shown as NFPA Health 3&4) has also declined since 2003. These declines reduce the risk inherent to personnel and the environment from hazardous materials used and stored on site.

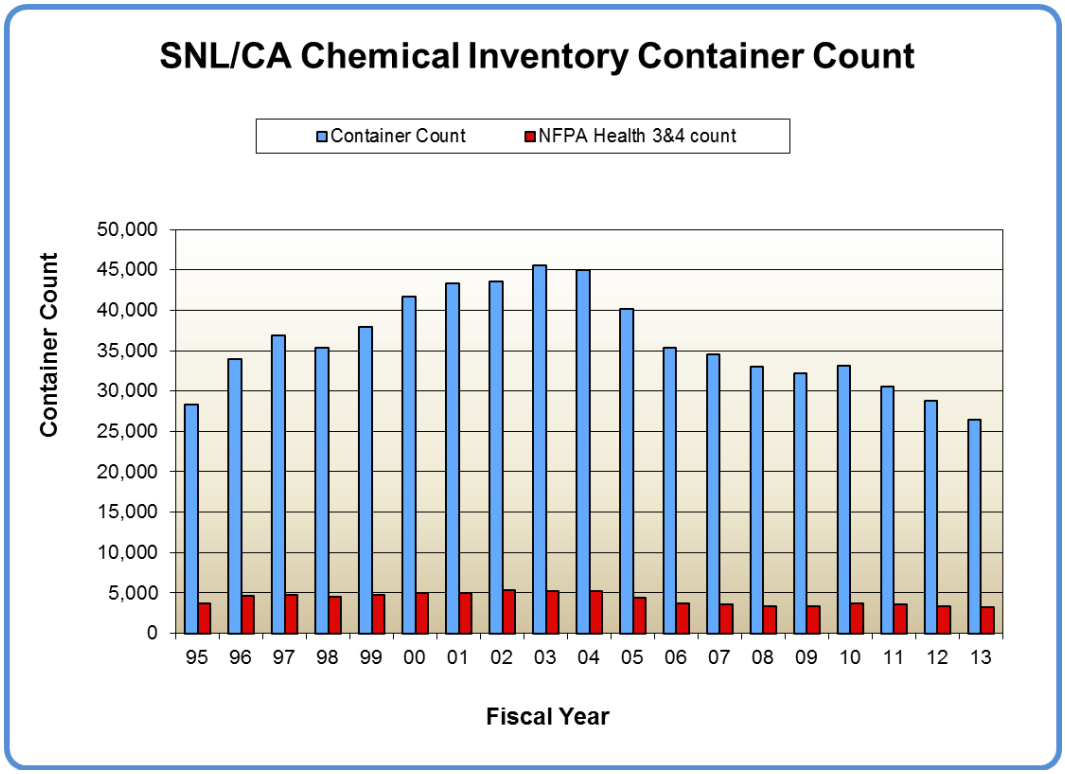

Figure 4-2 SNL/CA Hazardous Material Inventory

Also in FY13, Sandia continued to reduce the inventory of chemicals ten years old or greater, as well as expired chemicals. The target for chemicals ten to fifteen years old is 15 percent of total inventory. For chemicals greater than 15 years old, the target is 10 percent of total inventory. The target for expired chemicals is zero. Figure 4-3 shows improvements in the chemical inventory age from 2011 to 2013. Sandia met the target for chemicals ten to fifteen years old but continued efforts are needed to reduce the inventory of chemicals greater than 15 years in age and for expired chemicals.

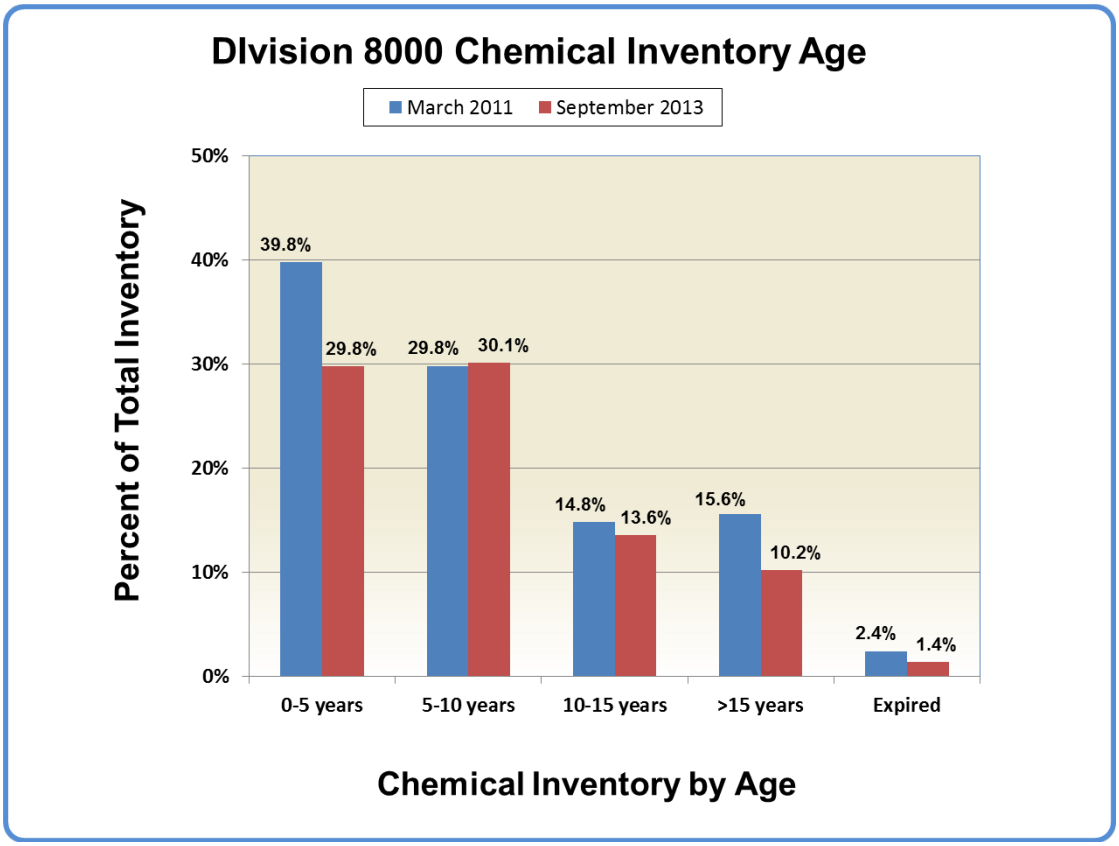

Figure 4-3 SNL/CA Chemical Inventory Age

Objective 2: Minimize consumption of resources (SSP)

Energy (SSP)

The EMS at SNL/CA supports the corporate target for energy reduction. The corporate target is to reduce energy intensity by thirty percent by the end of fiscal year 2015 from a fiscal year 2003 baseline. Figure 4-4 shows energy use and intensity at SNL/CA since 2003. Energy intensity is the amount of energy used per square foot of building space (presented as BTU/GSF/Yr). Since 2003, Sandia has reduced energy intensity at SNL/CA by 3.8%. During 2013, energy use at SNL/CA increased from 2012 levels. This increase is attributed to colder than normal weather during winter months and fine tuning of control systems installed in several high-use buildings in the last two years.

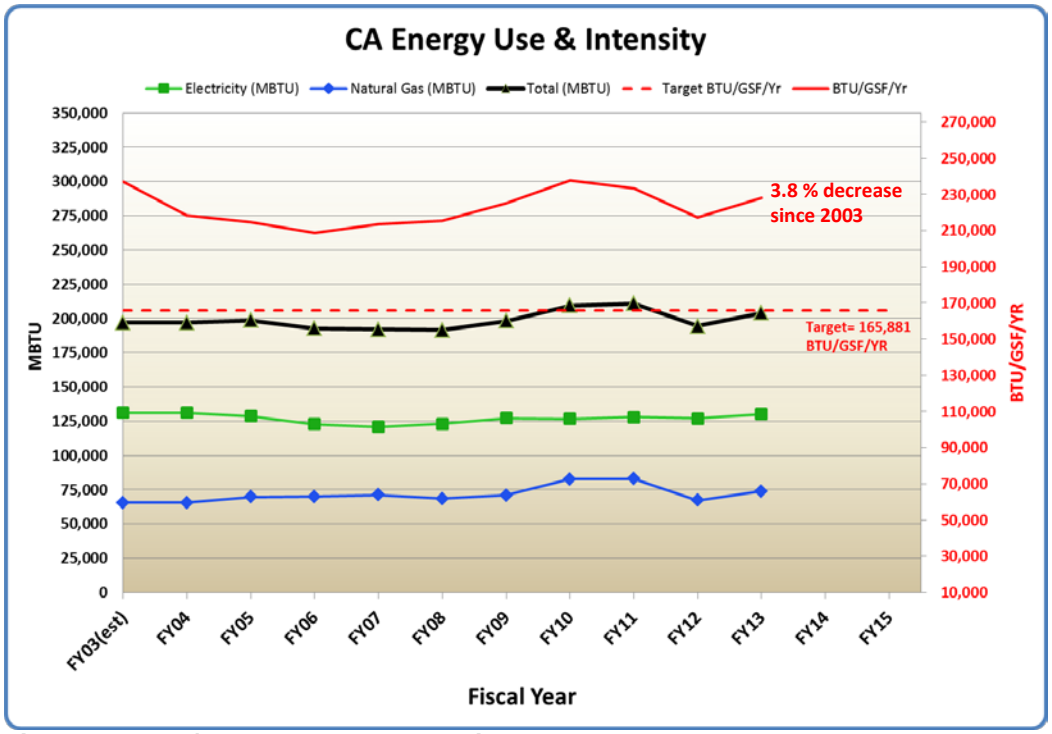

Figure 4-4 SNL/CA Energy Consumption

Water (SSP)

Figure 4-5 presents fiscal year water use data for SNL/CA since 2007. The corporate target for water use is a 26 percent reduction by fiscal year 2020, using fiscal year 2007 data as a baseline. Overall, there has been a decrease in water use and intensity at SNL/CA since 2007. The increase in 2013was likely the result of regulatory-required watering of Arroyo Seco restoration areas, and testing, repair, and adjustment of landscape irrigation systems.

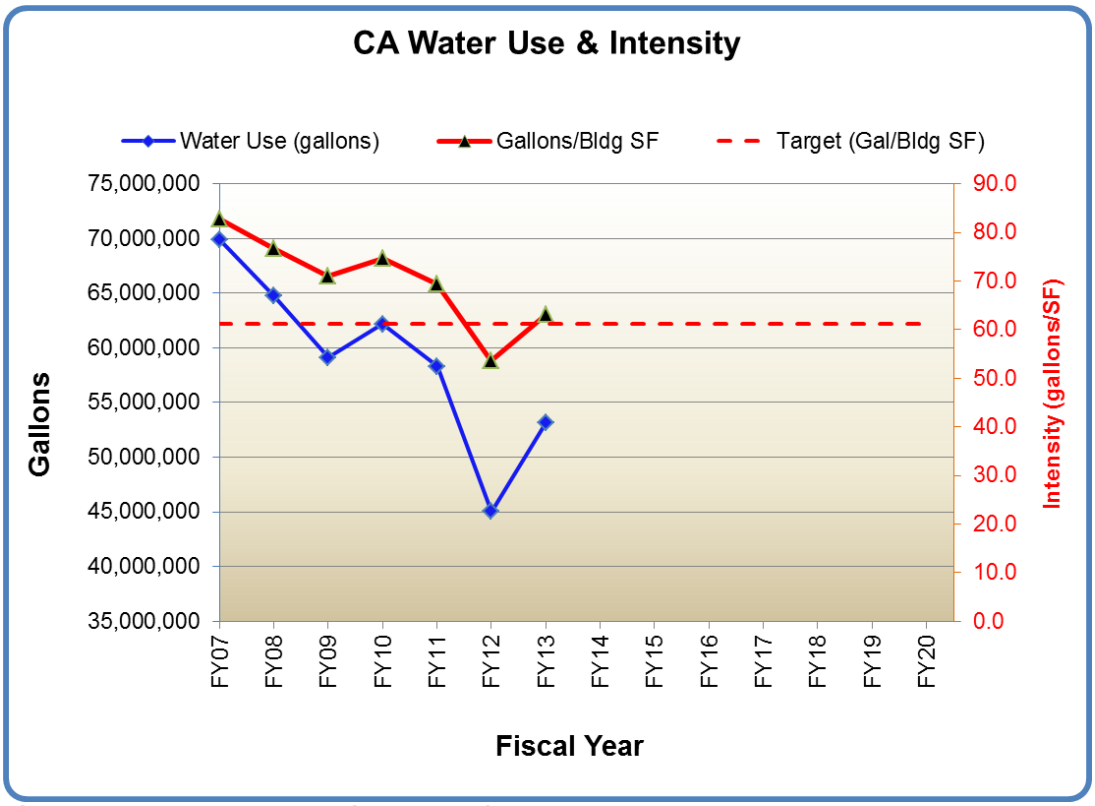

Figure 4-5 Water Consumption at SNL/CA

Objective 3: Minimize the production of waste and wastewater

Waste Water

Figure 4-6 shows volume of sewer effluent discharged by SNL/CA from 2000 through 2013. Sewer discharge in 2013 was approximately 4.7 million gallons representing a six percent decrease from 2012. SNL/CA has a stated goal of reducing the quantity of sewer effluent, although no numeric targets have been set. In 2011, a new flow meter was installed and the first full year of data using the new meter was 2012. Overtime, data to track trends in effluent discharge will be available and presented in future reports.

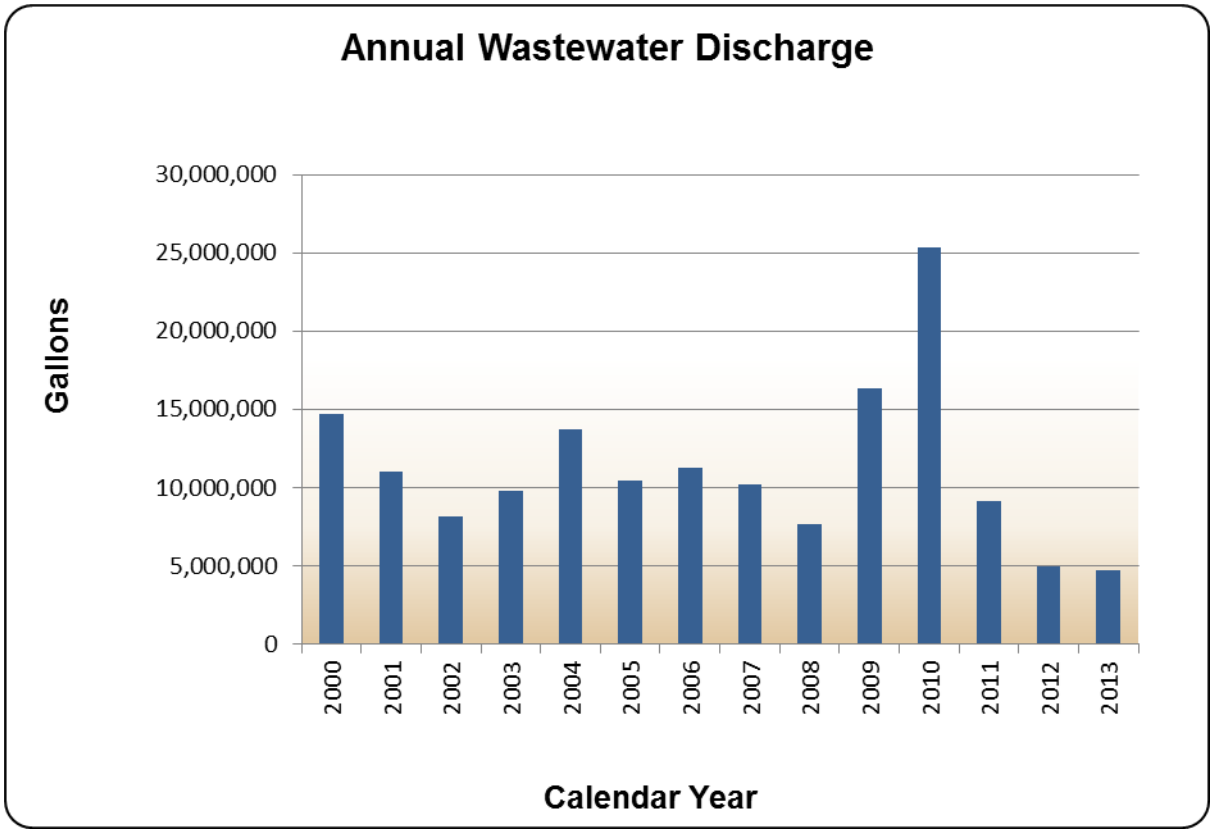

Figure 4-6 Annual Wastewater Discharges

Radioactive and Hazardous Waste

Although Sandia does not have a specific target for radioactive and hazardous waste reduction at SNL/CA, we strive to minimize generation of these wastes through process controls, recycling, and reapplication of chemicals from one activity to another. Figures 4-7 and 4-8 show hazardous and radioactive waste generated since 2005, respectively. As shown, waste generation in both categories fluctuates from year to year depending on the nature and scope of projects conducted.

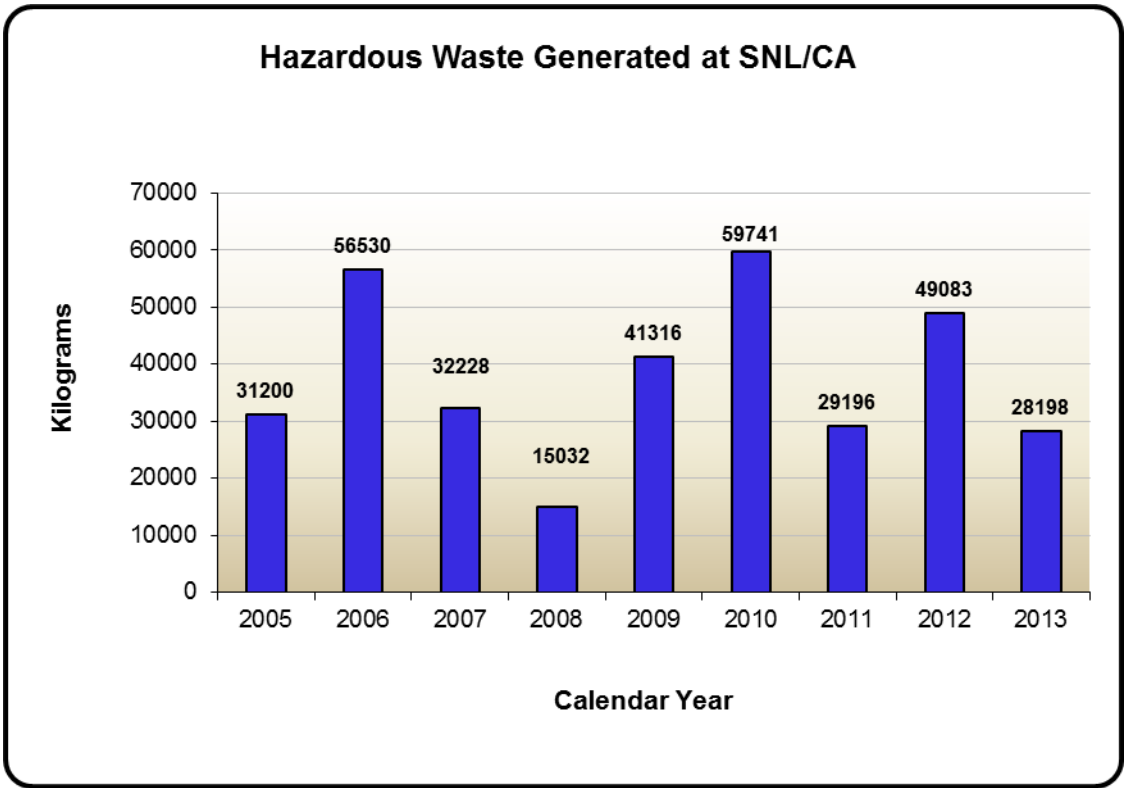

Figure 4-7 Hazardous Waste Generated at SNL/CA

In 2013, Sandia continued to remove unwanted materials and legacy hardware from the SNL/CA site. Some legacy items that contained radioactive and/or hazardous materials were dispositioned as waste and transferred offsite to approved disposal facilities.

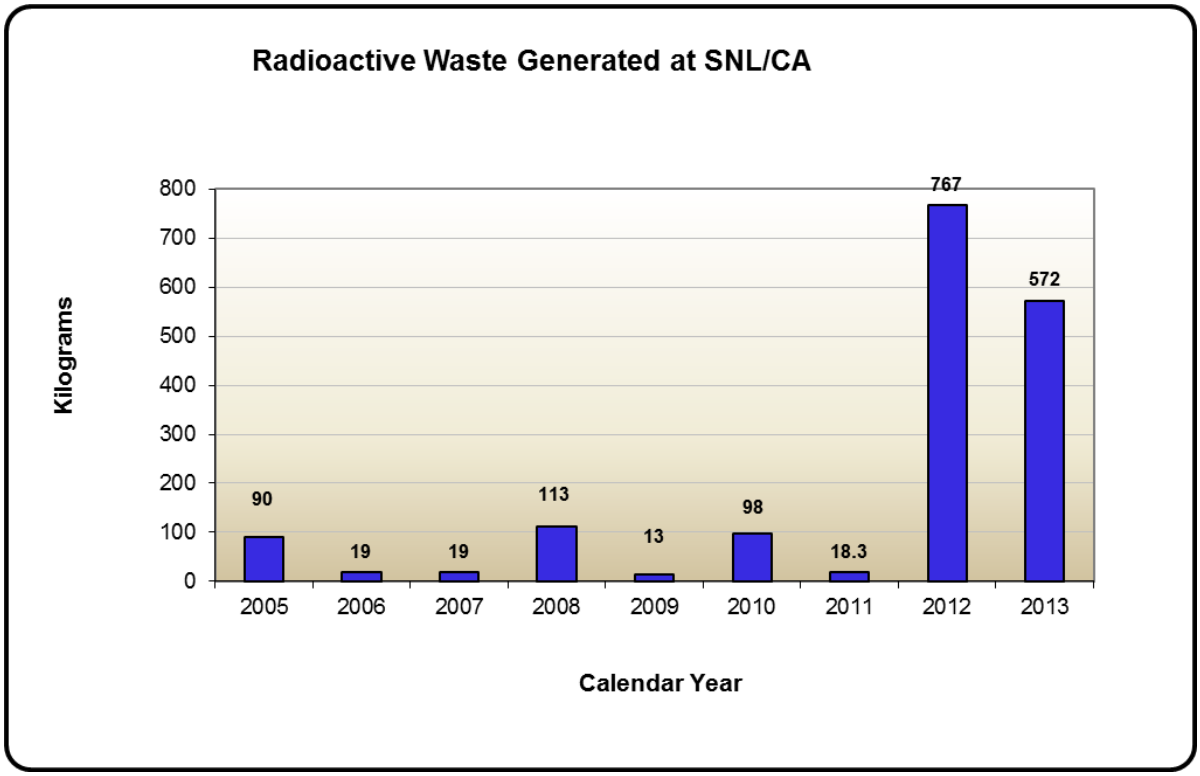

Figure 4-8 Radioactive Waste Generated at SNL/CA

Solid Waste (SSP)

Sandia management established a target to divert from disposal 65% of non-hazardous solid waste by fiscal year 2013. As shown in Figure 4-9, this target was exceeded at SNL/CA over the last four years through implementation of recycling and reuse. Starting in fiscal year 2012, Sandia management modified the target for SNL/CA to divert from disposal 80% of non-hazardous solid waste, excluding construction debris. Over the last two years, Sandia's recycling efforts have nearly achieved the 80% goal with 79.5% in 2012 and 79.6% in 2013. Additionally, Sandia personnel have diverted more than 65% of construction debris annually since 2010. Sandia personnel will continue efforts to increase recycling and reuse of routine solid waste and construction debris to achieve a diversion rate of 90% of total solid waste in future years.

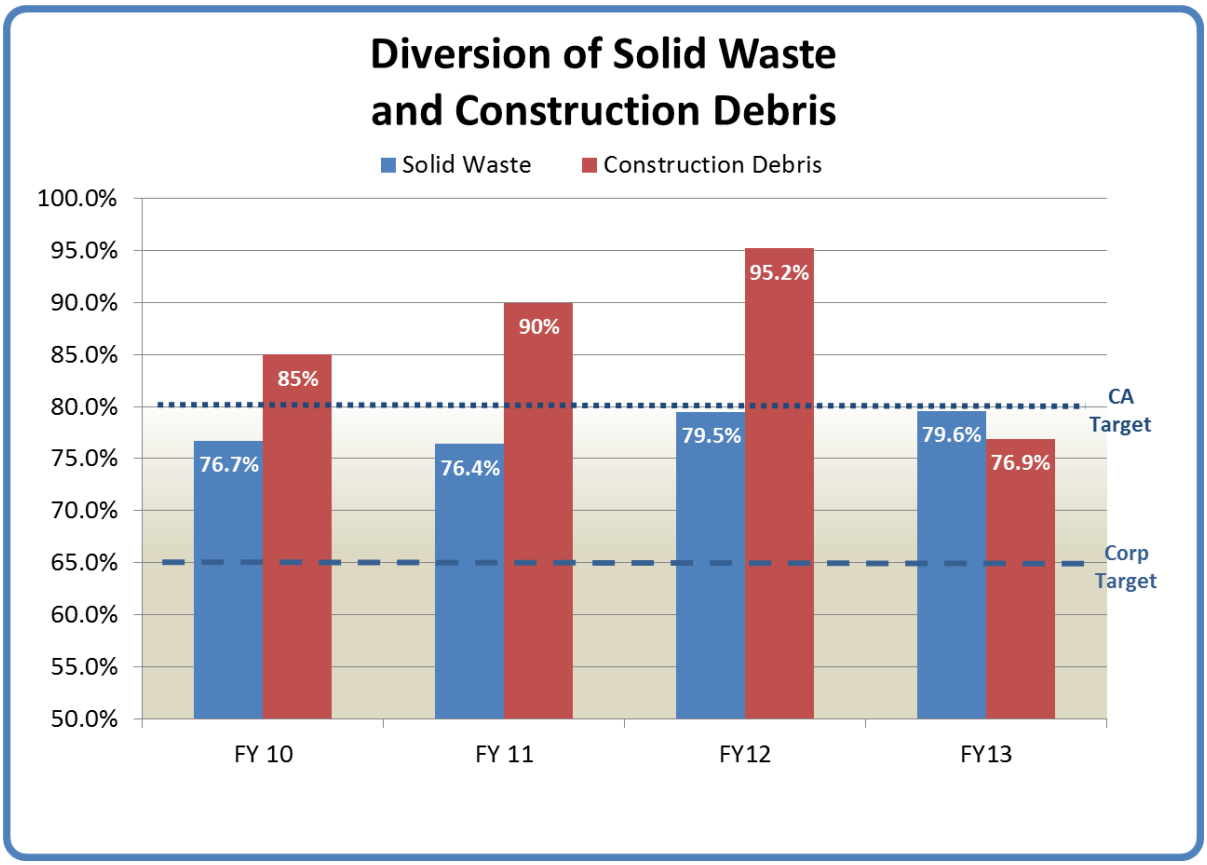

Figure 4-9 Solid Waste and Construction Debris Diverted From Landfill Disposal

Figure 4-10 presents routine landfill waste data for fiscal years 2003 to 2013. The quantity of non-hazardous solid waste sent to the landfill in 2013 decreased by 19 metric tons from 2012.

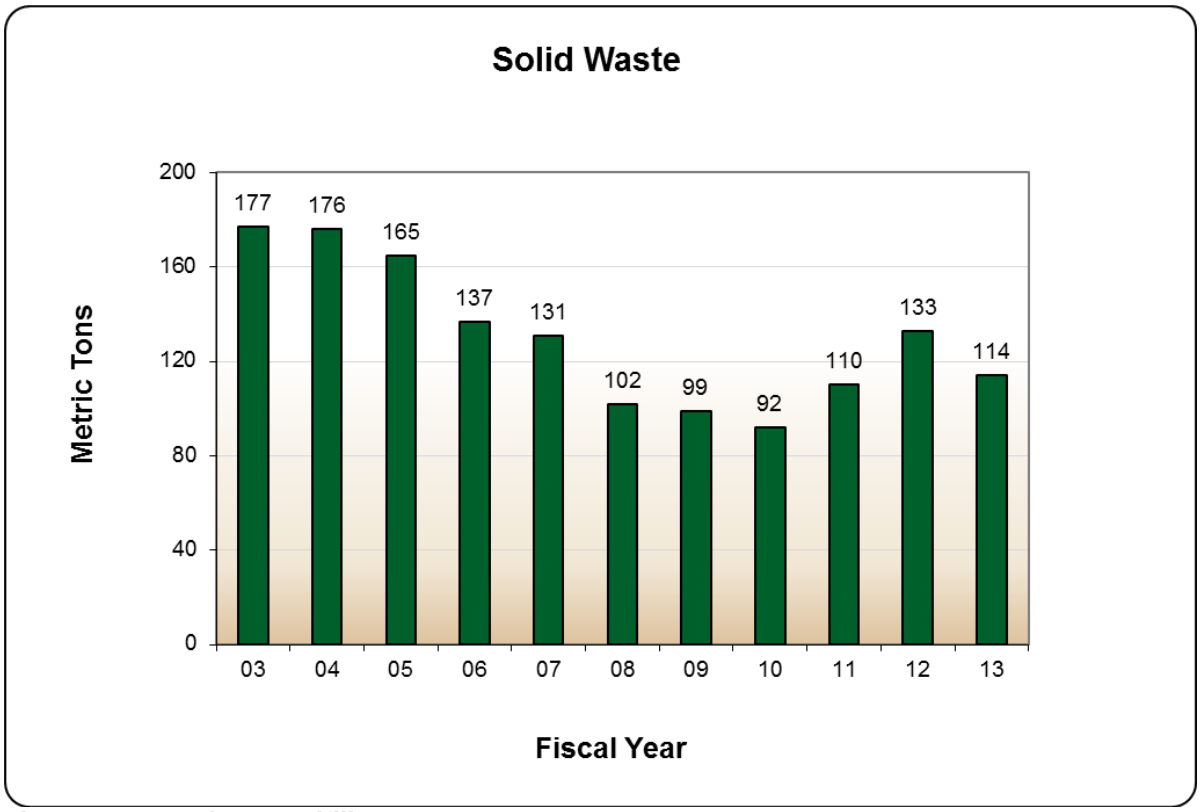

Figure 4-10 SNL/CA Landfill Waste

Objective 4: Minimize air pollutant and greenhouse gas emissions (SSP)

Targets for this objective include reducing scope 1 and 2 greenhouse gas (GHG) emissions by 28 percent and reducing scope 3 GHG emissions by 13 percent by FY 2020 from an FY 2008 baseline. Table 4-2 identifies the components of each emissions category.

Table 4-2 Green House Gas Emissions by Category

Scope 1	Scope 2	Scope 3
Natural gas consumption	Purchased electricity	Employee commuting
Stationary combustion		Business ground and air travel
Fleet fuel consumption		Transmission and distribution losses
Process gases and fugitive emissions		Contracted (off-site) waste water treatment
		Contracted (off-site) municipal waste disposal

Sandia does not measure reductions in GHG emissions separately at SNL/CA but site personnel provide input to Sandia's corporate metrics. Overall, Sandia has reduced scope 1 and 2 GHG emissions by 37 percent. However, scope 3 GHG emissions increased by 6.4 percent relative to the 2008 baseline. This increase is likely a result of increased employee commuting and business travel.

In 2013, the following activities were completed to support the corporate objective and targets:

- refurbished three SF6 insulated switchgear, bringing the total to date to six;
- continued replacement of fluorescent lamps with more energy efficient models;
- continued replacement of heating / air conditioning control systems in three buildings to allow for automatic shutdown and set-back during nonstandard work hours;
- continued implementation of automatic computer power management; and
- continued to divert solid waste from landfill disposal.

The State of California has many regulations addressing the reduction of GHG emissions. The regulations that are applicable to SNL/CA operations are:

- Sulfur Hexafluoride (SF6) Emission Reductions from Gas Insulated Switchgear
- SF6 Reductions from Non-Electric and Non-Semiconductor Applications (e.g. research applications)
- Reduction of Emissions of Fluorinated Gases from Semi-Conductor Operations
- Refrigerant Management Program: Regulation for Non-Residential Refrigeration Systems

For SNL/CA, Sandia tracks usage and emissions of GHGs, repairs leaks and equipment, and reports data to either the California Air Resources Board or the Bay Area Air Quality Management District as required by these regulations. Table 4-3 provides a summary of GHG reporting.

Table 4-3 Summary of GHG Reporting, 2013

Greenhouse Gas	Emissions
SF6 Emissions from Gas Insulated Switchgear	4.4% leak rate (3.9 kg of SF6)*
PFC for Semiconductor Operations	0.45 kg of SF6
SF6 for Research Operations	0.32 kg of SF6
Refrigerants	83 lbs of R-123

*Leak rate and kgs of SF6 emitted are calculated per CCR Title 17 Article 4 Subarticle 3.1.

Objective 5: Preserve and, when possible, enhance the site's natural habitat

In June 2006, an Arroyo Seco Improvement Program was initiated to address erosion and storm water control within the arroyo. Sandia is conducting Arroyo Seco improvements under a U.S. Army Corp of Engineers permit authorizing specific activities within a jurisdictional water of the United States. The improvement program includes restoration of riparian habitat at select locations along the arroyo. Approximately 0.05 acres of riparian habitat were restored in 2006 and 2.49 acres in 2009 by planting a variety of native trees and reseeding disturbed areas with native grasses. The goal for tree survival at all areas is 85 percent. For grasses and shrubs, the goal is 75 percent cover.

In 2013, repairs were completed at three locations along the arroyo and habitat restoration was conducted at two of the three areas. Irrigation systems were installed at each restored site to support plant growth and survival. Plant survival is evaluated annually. The most recent

evaluation was conducted in September 2013. Willow and tree survival at many of the restored sites currently meets or exceeds the overall success criteria established in the permit (85%). No replanting will be needed in 2014. Tree, grass and shrub cover was also evaluated in September 2013. The success criteria for cover have been met a several locations. For those locations that have not yet met the performance criteria, sufficient progress was noted and reseeding of native grasses and shrubs is not required at this time.

Objective 6: Design and manage all buildings and facilities using "green" principles (SSP)

Sandia's target for sustainable facility design and management is to achieve LEED (Leadership in Energy and Environmental Design) Gold certification for all new construction greater than five million in cost and to meet the Guiding Principles for Federal Leadership in High-Performance and Sustainable Buildings for projects equal to or less than five million in cost. During 2011, LEED Gold certification was achieved for the Combustion Research, Computational, and Visualization facility that was constructed in 2010. There have been no qualifying construction projects since 2010 at SNL/CA.

Objective 7: Maintain sewer effluent within regulatory discharge limits

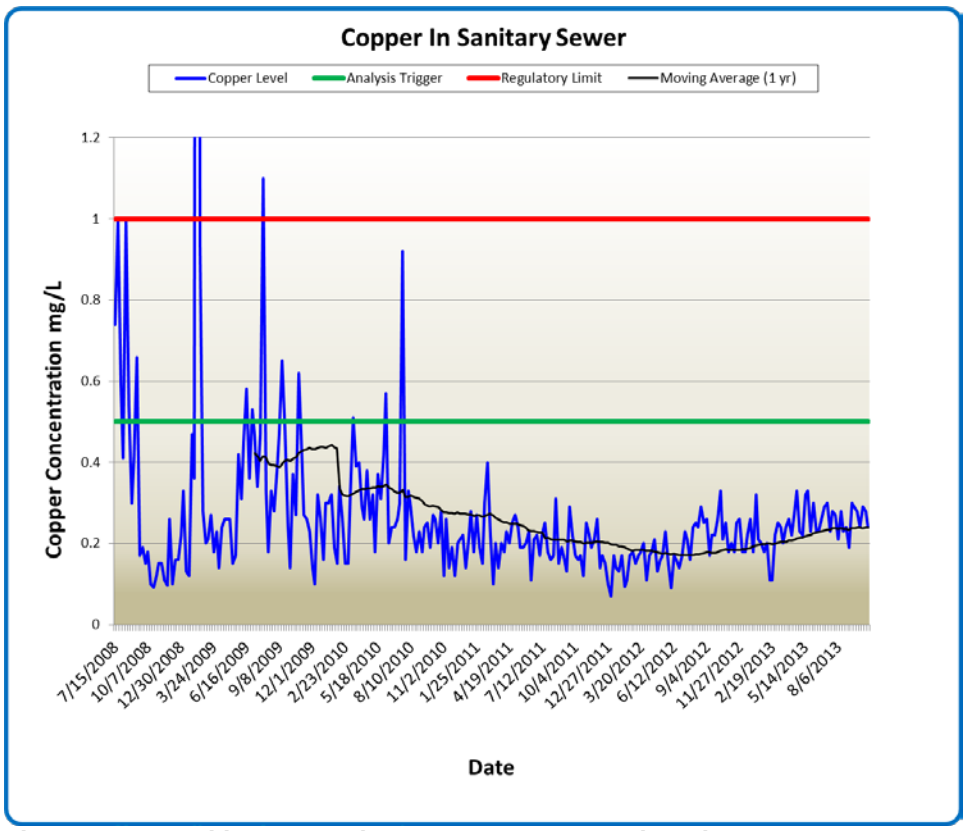

Figure 4-11 Weekly Composite Copper Concentrations in Wastewater

Equipment in place at SNL/CA continuously monitors wastewater generated on-site. Figures 4-11 and 4-12 show weekly monitoring results since 2008 for copper and zinc, respectively. Since the 2008 – 2009 period when the site experienced numerous exceedances, Sandia

continues to maintain concentrations of both metals in wastewater below the regulatory limit. Efforts that support improvement in sewer water quality are described in Chapter 5, Environmental Monitoring. Also reflected on the graphs are Sandia's goals of maintaining the level of copper and zinc below the regulatory analysis trigger level (0.5 mg/L for copper and 1.5 mg/L for zinc).

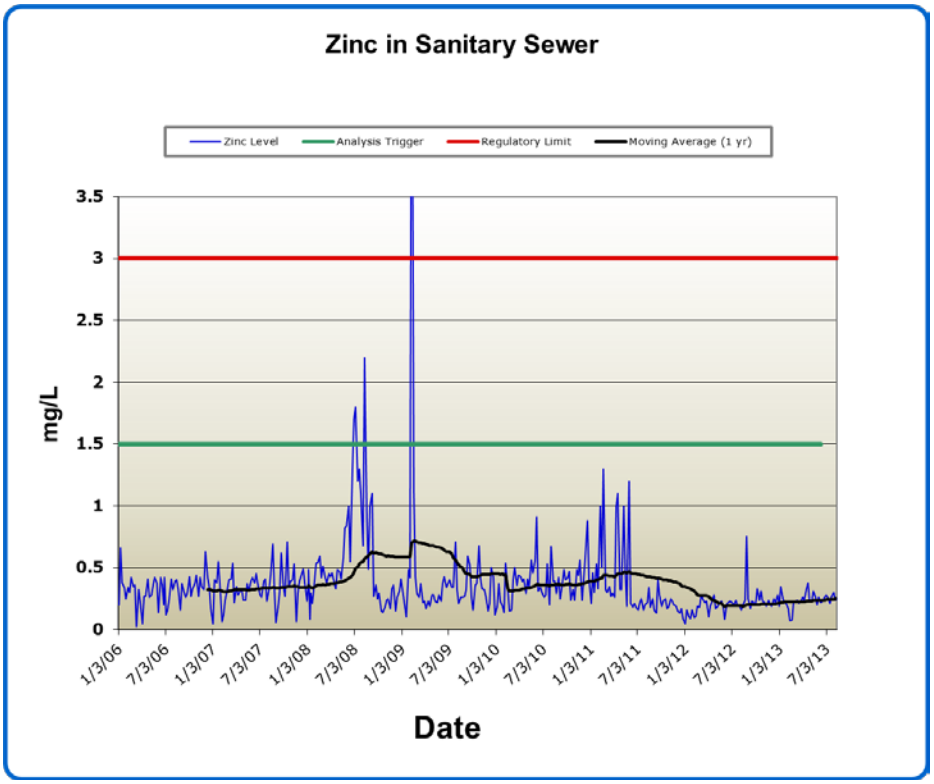

Figure 4-12 Weekly Composite Zinc Concentrations in Wastewater

Objective 8: Minimize the volume and pollution of storm water runoff and water discharges

The State of California has not yet implemented numeric limits for pollutants in storm water. However, parameters such as total suspended solids (TSS) and oil and grease (O&G) are indicative of the quality of storm water runoff from parking lots and roads at SNL/CA. Many factors can affect the quantities of TSS and O&G in the runoff, such as the length of dry weather before sample collection, volume of runoff during the storm, etc. Sandia's target for storm water is to clean debris from the entire storm water drainage system at least once per year to support minimizing pollution in the runoff. The entire storm drain system was inspected and cleaned in 2013. In addition, street sweeping is implemented as another best management practice, which also minimizes storm water pollutants. In 2013, Sandia's maintenance personnel collected approximately 198 cubic yards of debris during street cleaning efforts, thus removing potential storm water pollutants. Figure 4-13 shows the highest TSS and O&G concentrations obtained at SNL/CA storm water sampling locations during the 2012/2013 rainy season. The highest concentration of TSS in storm water during 2012/2013 (75mg/L – Station G) was lower than that obtained during the 2011/2012 rainy

season (215 mg/L). The concentration of O&G in all samples in 2012/2013 was less than 5.5 mg/L which is essentially unchanged from that observed during 2011/2012 (5 mg/L).

Reduction of storm water runoff is addressed on a project-by-project basis. Projects adding over 5,000 square feet of impervious surface are designed to retain the 95th percentile storm on site, in accordance with Section 438 of the Energy Independence and Security Act. In 2013, one SNL/CA project met these criteria and a detention basin sized to contain the 95th percentile storm was constructed.

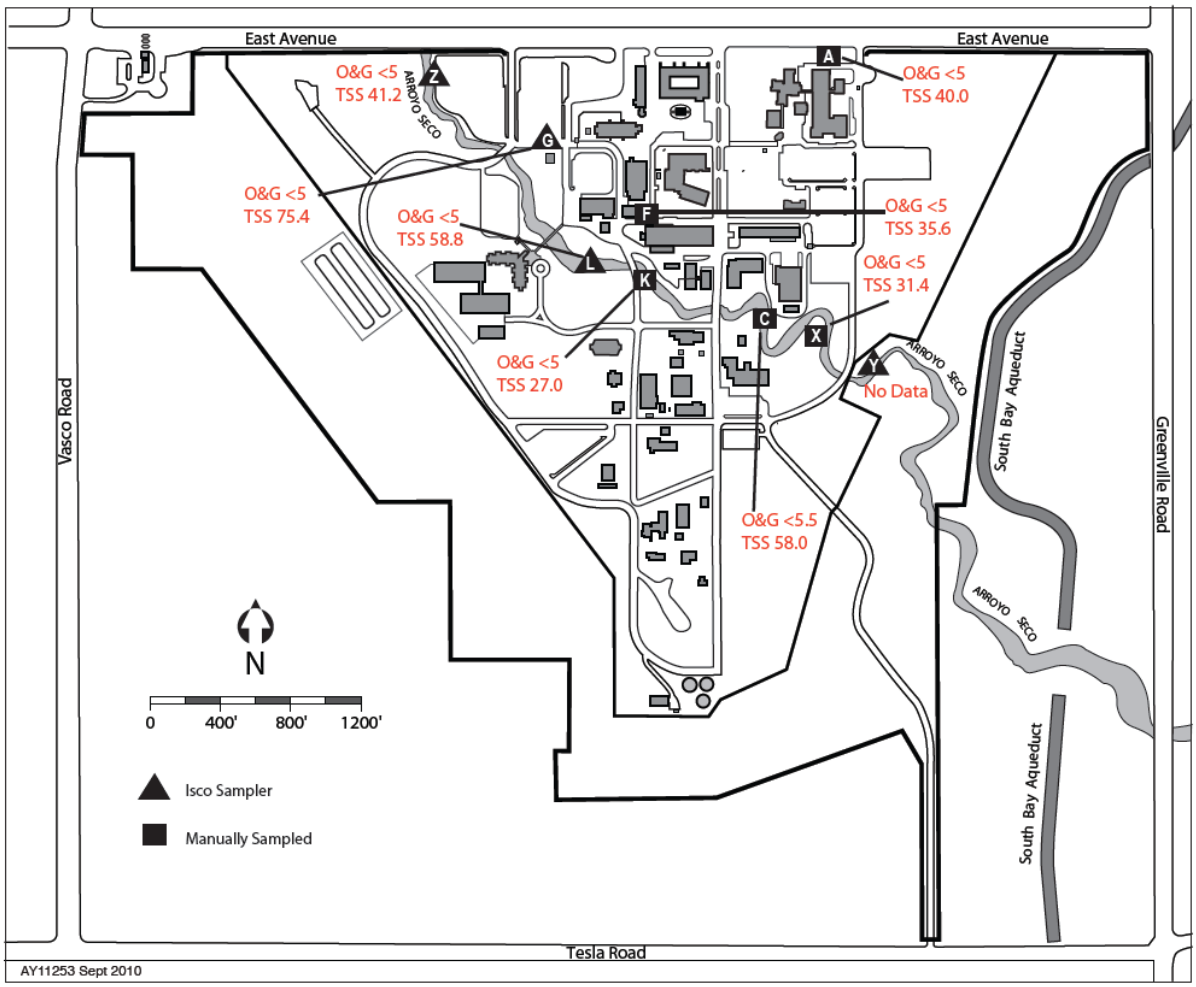

Figure 4-13 Constituents in Storm Water, 2012/2013 Rainy Season

Objective 9: Procure and use environmentally friendly products and materials (SSP)

Sandia's target for sustainable acquisition is to include a sustainable acquisition clause in 95 percent of applicable procurement contracts each year. This target also meets DOE's goals for sustainable acquisition identified in the DOE Strategic Sustainability Performance Plan (DOE 2012). Sustainable acquisition language is included in construction and maintenance contracts through an environmental specification.

In 2013, Pollution Prevention staff worked closely with the Facilities representatives to ensure purchasing of new products complies with sustainable acquisition requirements. In the Facilities Operations and Maintenance areas, sustainable acquisition activities focused on furniture and bio-based products. Pollution Prevention staff also supported a broader effort to address Electronic Product Environmental Assessment Tool (EPEAT) registry requirements for televisions and large screens.

Objective 10: Minimize pollutants released to the ground or groundwater

Sandia does not have any specific targets for minimizing pollutants released to the ground or groundwater at SNL/CA. However, personnel track chemical spills that occur throughout the year. Figure 4-13 shows the number of spills and total gallons spilled each year since 2000. Typical materials spilled include motor oil, hydraulic oil, and coolants. Small releases to the ground surface are generally cleaned-up within a few hours by the Sandia spill response team. None of the chemical spills shown in Figure 4-14 resulted in releases to groundwater or required environmental remediation.

SNL/CA personnel are also required to report sanitary sewer overflows to the California State Water Resources Control Board. In 2013, there was one sanitary sewer overflow at SNL/CA of approximately 700 gallons. See Section 3.12 for additional information.

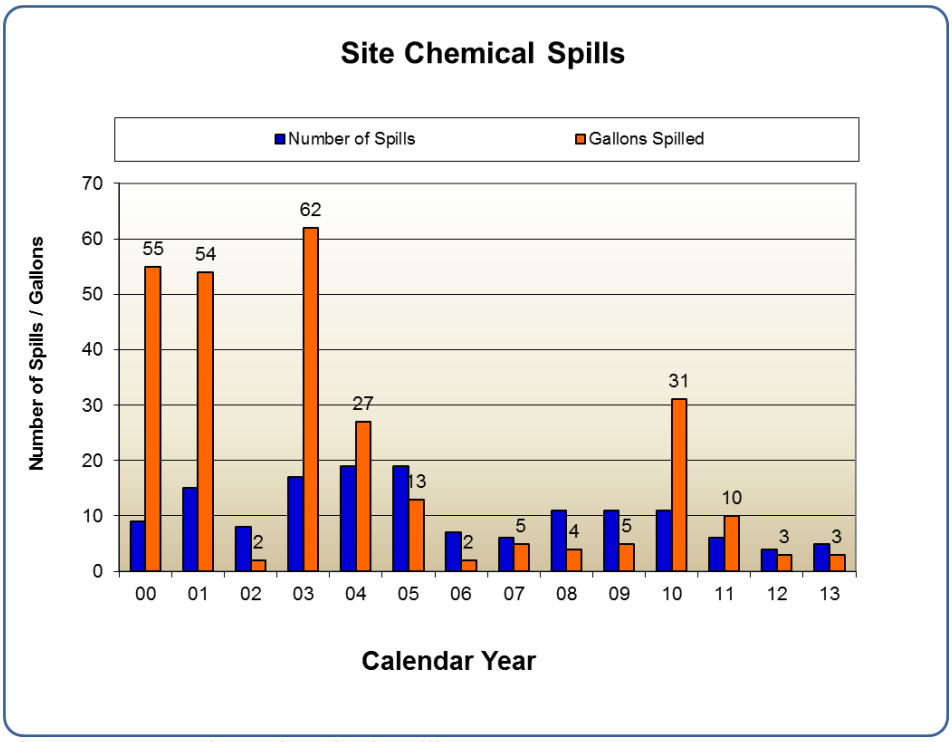

Figure 4-14 SNL/CA Chemical Spills

4.3 Environmental Highlights

Five functions support environmental management at SNL/CA, air quality, environmental monitoring and ecology, environmental planning, pollution prevention and waste minimization, and waste management. The following sections summarize the responsibilities of each function and identify the highlights that occurred during 2013.

4.3.1 Air Quality Function

The Air Quality function provides compliance assistance for all nonradiological air emission sources at SNL/CA. Air Quality staff review all directives, laws, and regulations relevant to air emissions for applicability to the site. Personnel from this function manage the air permit process, from the initial steps of preparing permit applications through implementation of permit conditions and annual renewals. Air Quality staff are responsible for evaluating proposed projects, assessing chemical use, and assessing emissions of all criteria pollutants and toxic air contaminants.

Federal, state, and local agencies continue to develop measures to reduce exposure to toxic air contaminants and criteria pollutants. In addition, the State of California is well underway in implementing many new regulations aimed at reducing emissions from diesel engines and greenhouse gases, such as sulfur hexafluoride (SF6) and other fluorinated gases. Most of the Air Quality Function efforts and accomplishments throughout 2013 were related to these topics, and are listed below:

- timely completion and submission of the BAAQMD Annual Update Package (supporting documentation and data for renewal of BAAQMD Permit To Operate);
- continued monitoring switchgear pressures, identifying switchgear with highest SF6 leakage, tracking SF6 cylinder inventory and calculating gas insulated switchgear inventory leak rate;
- submitted regulatory report quantifying usage of SF6 in site accelerator and transmission electron microscopes;
- submitted regulatory report with usage of fluorinated gases in semiconductor operations;
- maintained Off-Road Diesel Vehicle Fleet compliance with California Air Resources Board (CARB) regulation;
- maintained On-Road Diesel Vehicle Fleet compliance with CARB regulation;
- maintained Forklift Fleet compliance with CARB regulation;
- teamed with the site Facilities Engineering group to have three SF6-insulated switchgear refurbished and reinstalled, thereby reducing SF6 emissions from leaking switchgear; and
- developed and implemented program to comply with CARB's Refrigerant Management Program which requires facilities with refrigeration systems with more than 50 pounds of high-global warming potential refrigerant to conduct periodic leak inspections, promptly repair leaks, and keep service records.

4.3.2 Environmental Monitoring and Ecology Function

The Environmental Monitoring and Ecology staff routinely monitors wastewater, storm water, and groundwater systems at SNL/CA to assess the effect of site operations on the public and local environment. Monitoring of external radiation at the site perimeter is also conducted under this function. Routine monitoring activities and results are presented in Chapter 5.

During 2013, Environmental Monitoring and Ecology staff coordinated and co-hosted the 2013 DOE Annual Site Environmental Report / Environmental Monitoring Workshop. The workshop was attended by DOE and contractor representatives from across the DOE complex.

4.3.3 Environmental Planning Function

The Environmental Planning function is responsible for site level coordination associated with the National Environmental Policy Act, Endangered Species Act, and cultural and historic resources. Each year, Environmental Planning staff compares actual site operations to the maximum operations scenario presented in a site-wide environmental assessment (SWEA) and supplement analysis (SA) to determine whether SNL/CA operations remain within the bounding impact analysis. Table 4-4 presents a summary of the comparison and an evaluation of results.

Table 4-4 Comparison of 2013 Operations with SWEA / SA Envelope

Activity / Unit	SWEA / SA Envelope (maximum operations)	Calendar Year 2013	Site Operations Remain Within Impact Analysis of SWEA / SA
Proposed Action			
Site mission	Supports DOE, NNSA, DHS	No change	Yes
Arroyo Seco improvements	20 tasks	19 tasks completed as of December 31, 2013	Yes
Increase operations	Increase to 2 shifts	1 shift	Yes
New facilities	5,000 sf badge office; new 16,000 sf laboratory; 84,000 sf laboratory replacement for Building 916	9,000 sf as of December 31, 2013 (badge office trailer 500 sf, computational facility 8,500 sf)	Yes
Demolition	100,000 sf	38,376 sf as of December 31, 2013	Yes
Land Use			
Construction area	93 acres	8 acres as of December 31, 2013	Yes
Wildlife reserve	30 acres minimum	106 acres	Yes
Geology / Soil			
Solid waste management units	23 units total	22 units	Yes
Soil removed	5000 cu yd/yr	0 cu yd	Yes
Soil managed on-site	5000 cu yd/yr	<500 cu yd	Yes
Backfill material brought on-site	6000 cu yd/yr	0 cu yd	Yes

Activity / Unit	SWEA / SA Envelope (maximum operations)	Calendar Year 2013	Site Operations Remain Within Impact Analysis of SWEA / SA
Proposed Action			
Infrastructure			
Water use	91.8 million gal/yr	56.1 million gals	Yes
Sanitary sewer discharge	29.1 million gal/yr	4.7 million gals	Yes
Natural gas use	94 million cu ft/yr	72 million cu ft[e]	Yes
Electricity use	48,800 MW h/yr	38,162.6 MW hrs[e]	Yes
Biological and Ecological Resources			
Construct flood plains in Arroyo Seco	1800 linear feet	450 linear feet as of December 31, 2013	Yes
Create riparian habitat	0.2 acres	2.89 acres as of December 31. 2013	Yes
Ground disturbance in / along arroyo	10 acres	< 3 acres as of December 31, 2013	Yes
Cultural Resources	None known on-site	No change	Yes
Water Resources			
Impervious surface area	95.35 acres total	92 acres	Yes
Irrigation water use	17 million gal/yr	Not available[g]	Not available[g]
Waste Generation			
Radioactive waste	8,811 kg/yr	572 kg	Yes
Hazardous waste	133,820 kg/yr	28,198 kg	Yes
Solid waste (non-hazardous, excludes construction debris)	378.7 metric tons/yr	114 metric tons[e,f]	Yes
Transportation			
Hazardous / radioactive waste shipments	116 shipments/yr	28 shipments	Yes
Sanitary waste	80 shipments/yr	27 shipments[e]	Yes
Air Emissions			
Total criteria pollutants	8,212 kg/yr	2,851 kg[a]	Yes
Total air toxics	2,880.16 kg/yr	1,026.4 kg[a]	Yes
Radioactive	0 emissions	0 emissions	Yes
Permits	57 permits annually	14 / 14 permits[b]	Yes
Human Health			
Recordable accidents / injuries	78 accidents / injuries annually	21 accident / injuries[e]	Yes
Lost work-day cases	19 cases annually[c]	8 cases[e]	Yes
Socioeconomics			
Employment	Up to 1931 persons annually	1370 persons[d]	Yes
Operating budget	$316 million/yr	$307 million[e]	Yes

[a] Annual emissions were calculated by multiplying the daily emissions reported in the BAAQMD Permit to Operate by 365. Emissions are based on 2013 data.
[b] Data provided for the 2012/2013 and 2013/2014 permit periods. See Section 3.3.1 for more information.
[c] Extrapolated from historical average.
[d] SNL/CA employees (U.S. citizens and foreign nationals) and on-site contractors. Data from November 2013.
[e] Fiscal year data (October 1 – September 30).
[f] Routine waste sent to the landfill.
[g] Irrigation water use data unavailable for 2013 due to malfunctioning water meters.

4.3.4 Pollution Prevention and Waste Minimization Function

The Pollution Prevention and Waste Minimization function promotes the elimination or reduction of all waste types generated at SNL/CA. Sandia staff work closely with other SNL/CA organizations to establish routine and project-specific recycling programs. Pollution

Prevention staff provide guidance for resource and energy conservation and assist in identifying recycled-content products for use throughout the site. See Section 4.2 for recycling and waste minimization data.

A list of activities conducted or supported by Pollution Prevention staff in 2013 is provided below.

- Developed a new program allowing employees to implement a single stream mixed recycle process, resulting in an increase of SNL/CA site recycling to include food grade metal, plastic and paper containers, plastic bags and wraps, and aluminum foil products.
- Implemented a new process to return 3D printer cartridges to the manufacturer for re-use, resulting in cost savings for disposal and an increase in recycle waste streams.
- Performed an e-waste regulatory review that included touring accumulation areas and reviewing operating procedures, regulations, shipping documentation and certificates of destruction to ensure compliance and identify areas of improvement.
- Established a contract to reclaim 16.5 ounces of Palladium resulting in revenue of $6,887.
- Transferred recycling labor to Facilities Operations and eliminated segregation of beverage containers and cardboard.
- Worked in unison with Logistics to dispose 12,280 lbs. of soft media through incineration.
- Modified a site e-waste contract to include new cathode ray tube regulatory guidance.
- Implemented a new process for providing safety briefings for vendors coming onsite to support electronic waste and scrap metal recycling

4.3.5 Waste Management Function

The Waste Management function is responsible for managing hazardous, radioactive, and mixed wastes generated by SNL/CA operations. Waste Management personnel collect waste from the point of generation and transfer waste to on-site waste storage facilities for storage, consolidation, commingling, and packaging. Waste Management personnel establish and maintain several contracts for offsite reclamation, recycling, treatment, and disposal of wastes. Waste Management personnel provide regulatory oversight in accordance with federal, state, and local regulations, manage the Resource Conservation and Recovery Act (RCRA) and Tiered permit process, and implement RCRA and Tiered permit conditions. Waste Management personnel conduct process knowledge evaluations to characterize waste types generated from specific operations and provide waste generator training to the workforce at SNL/CA.

In 2013, Waste Management personnel continued to coordinate chemical clean-out projects at the site. A substantial clean out for chemicals greater than 10 years old was completed in two SNL/CA facilities. The cleanout was a joint effort between Waste Management, Chemical Management, and laboratory personnel to evaluate and minimize old, unneeded chemicals and biochemicals in the site inventory. Waste Management personnel also assisted the plating shop staff in the disposal of several old contaminated pieces of plating equipment.

SNL/CA personnel initiated the RCRA Hazardous Waste Facility permit renewal process in 2013, a year-long effort that involved:

- Evaluation of current and potential future waste operations;
- Update of permit documents to reflect expected operational changes (where needed);
- Coordination with DOE personnel and Sandia management to obtain application approvals for submittal;
- Notification to the public; and
- Communication with the permit engineer at the Department of Toxic Substances Control to ensure timely response to questions and requests for additional information.

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5 Environmental Monitoring

Personnel at Sandia National Laboratories, California (SNL/CA) monitor storm water, wastewater, groundwater, and gamma radiation. This chapter provides a summary of monitoring activities and results for each of these media. Both radiological and non-radiological data are presented.

Sandia personnel do not directly monitor airborne effluents. Non-radiological (chemical) emission sources do not require routine or continuous monitoring of ambient air quality concentrations. However, equipment and process usage records (e.g. hours of operation or quantity of solvents used) for emission sources are maintained. Similarly, there are no radionuclide emission sources that require routine monitoring. Sandia personnel maintain an inventory of radioactive isotopes (small quantity sealed and unsealed sources), and operate several radiation generating devices. Emission monitoring is not required for these materials and devices.

Typically, radiological emission data that would be obtained from radionuclide effluent monitoring is used to evaluate the potential effect that a particular site's operations may have on local populations and the environment. Because there are no radionuclide emission sources and no monitoring data for site operations, calculations for maximum individual dose or collective population dose are not possible. As an alternative to these calculations, Sandia personnel compare gamma radiation data collected at the site perimeter to offsite data. Results of this comparison are presented in Section 5.4.

Monitoring of biota or vegetation is not required for SNL/CA operations. The Department of Energy (DOE) RAD-BCG Calculator, a computer tool developed by DOE, is used each year to determine the need and level of monitoring required. The results from applying the tool in 2013 are presented in Section 5.4.

5.1 Storm Water

All storm water runoff from SNL/CA is conveyed to the Arroyo Seco, which discharges into Alameda Creek and eventually to the San Francisco Bay. Storm water that flows off buildings, material-handling areas, parking lots, and other impervious surfaces, may pick up pollutants, such as oil and grease, soil, litter, pesticides, and fertilizers. During heavy or continuing storms, runoff may transport pollutants to Arroyo Seco before the storm water has time to evaporate or infiltrate into the ground.

To assess the impact of site operations to storm water discharges, Sandia personnel collect samples of surface runoff at nine locations around the SNL/CA site. These locations, identified on Figure 5-1, were selected because they provide the best representation of drainage areas and activities on-site.

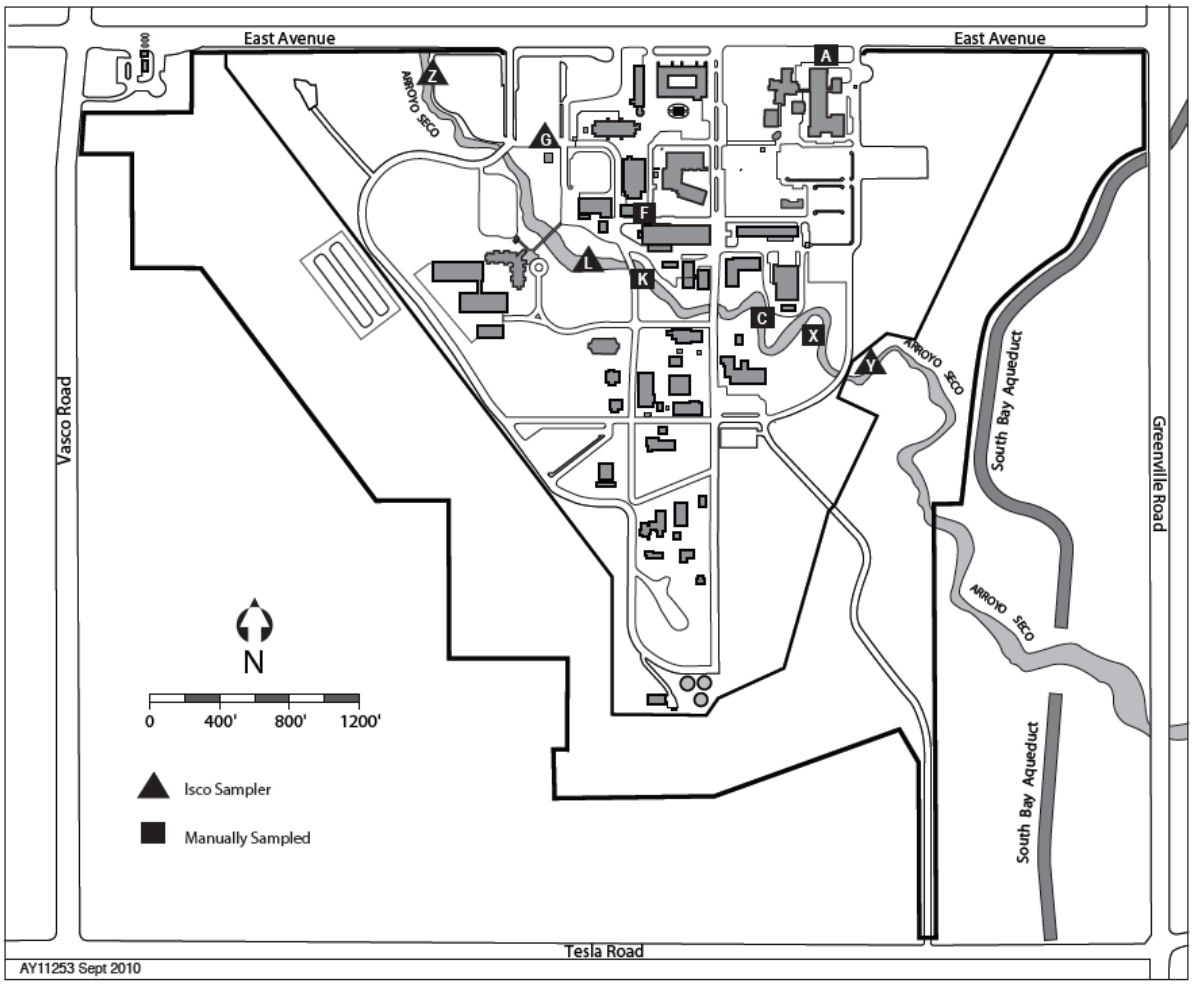

Figure 5-1 Storm Water Sampling Locations

Each of the nine locations is sampled twice each wet season, once each during two separate storm events, provided there is sufficient runoff. The wet season is from October 1 through May 31. Because any one storm may not produce enough runoff to allow for sample collection at all nine locations, sampling during more than two storm events is generally required.

Analytical Parameters – Storm Water

- Specific conductivity
- pH
- Total suspended solids
- Oil and grease
- Cyanide
- Metals
- Chemical oxygen demand
- Nitrite + nitrate
- Ammonia
- Tritium

Storm water discharges from SNL/CA are covered under the State of California National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharge Associated with Industrial Activities (General Industrial Permit) (California Water Resources Control Board 1997). The General Industrial Permit does not establish water quality standards for storm water discharges. Consequently, a comparison of analytical results with regulatory standards cannot be made. Instead, the analytical data obtained from

monitoring storm water discharge is compared to EPA storm water benchmark values to optimize storm water pollution prevention activities at SNL/CA.

Analytical results of storm water sampling for the 2012/2013 wet season are presented in Table 5-1. No pollutants were detected in storm water runoff at a level to cause concern.

Table 5-1 Summary of Analytical Results for Storm Water, 2012/2013 Wet Season

Parameter	Number of Samples Analyzed	Number Found Below Detection Limit	Detection Limit	Minimum Concentration	Maximum Concentration
Total suspended solids	8	0	1 mg/L	7.2 mg/L	75.4 mg/L
Specific conductivity	8	0	10 μmho/cm	14.5 μmho/cm	43.3 μmho/cm
pH	8	NA	None	7.11	8.34
Oil and grease	8	8	5 mg/L	<5.0 mg/L	<5.5 mg/L
Chemical oxygen demand	8	0	10 mg/L	12 mg/L	79 mg/L
Cyanide	8	0	0.001 mg/L	0.0017 mg/L	0.0029 mg/L
Tritium	8	8	896 pCi/L	<896 pCi/L	896 pCi/L
Aluminum	8	0	0.05 mg/L	0.28 mg/L	2.4 mg/L
Arsenic	8	4	0.0005 mg/L	<0.0005 mg/L	0.0011 mg/L
Cadmium	8	6	0.00025 mg/L	<0.00025 mg/L	0.00076 mg/L
Iron	8	0	0.02 mg/L	0.42 mg/L	2.5 mg/L
Lead	8	0	0.0005 mg/L	0.0011 mg/L	0.0057 mg/L
Magnesium	8	0	0.02 mg/L	0.38 mg/L	2.3 mg/L
Mercury	8	7	0.000025 mg/L	<0.000025 mg/L	0.000053 mg/L
Selenium	8	8	0.0005 mg/L	<0.0005 mg/L	<0.0005 mg/L
Silver	8	7	0.00019 mg/L	<0.00019 mg/L	0.00025 mg/L
Zinc	8	0	0.005 mg/L	0.069 mg/L	0.47 mg/L
Ammonia-N	8	0	0.05 mg/L	0.17 mg/L	0.35 mg/L
Nitrite + nitrate	8	1	0.1 / 0.1 mg/L	<0.1 / <0.1 mg/L	0.73 + <1 mg/L

Annually, Sandia personnel evaluate storm water pollution prevention practices at each drainage location as part of its monitoring activities. No practices that would cause a threat to the storm water were observed.

During years of sufficient runoff, Sandia personnel compare the analytical results from storm water entering the site to storm water exiting the site. For the 2012/2013 storm season, a sample of storm water entering the site was not able to be collected due to insufficient runoff at sampling station Y (Figure 5-1).

5.2 Wastewater

Wastewater effluent generated at SNL/CA consists of sanitary and laboratory discharges. Sanitary effluent is discharged directly to the sewer system. Sewer discharges exit the site through a sewer outfall located at the northern boundary, and join with the Lawrence Livermore National Laboratory (LLNL) sewer system. Laboratory discharges are generated from general research activities, and from operations that qualify as categorical processes subject to Federal pretreatment standards. Laboratory effluent from most laboratory areas is

diverted to liquid effluent control system (LECS) holding tanks prior to discharge to the sanitary sewer. Sandia personnel monitor wastewater at the sewer outfall, LECS tanks, and at categorical process point sources.

5.2.1 Sewer Outfall

A sewer outfall and monitoring station is operated at the northern SNL/CA boundary to continuously monitor wastewater for flow and pH. Samples are also collected at the outfall to monitor compliance with wastewater discharge limits established in the Sandia *Wastewater Discharge Permit* for SNL/CA. The outfall sampling schedule and analytical parameters are presented in Table 5-2. Consistent with permit requirements, wastewater samples collected at the sewer outfall are not monitored for radioactive constituents.

Table 5-2 Sewer Outfall Sampling Schedule

Frequency	Sample Type	Analytical Parameter
Daily	Composite	Archive sample; analyzed only when weekly composite sample shows concentration greater than or equal to 50% of discharge limit for metals.
Weekly	Composite	Metals
Monthly	Composite	Total dissolved solids Total suspended solids Biochemical oxygen demand Chemical oxygen demand[a]
Monthly	Grab	Cyanide EPA priority organic pollutants

[a] Chemical oxygen demand analyses are not required by the Wastewater Discharge Permit.

A summary of analytical results for physical parameters and metals from the SNL/CA sanitary sewer outfall is presented in Table 5-3. In 2013, all liquid effluent from the outfall complied with the site outfall discharge limits for regulated physical parameters and most metals. There were no exceedances of the discharge limit during 2013.

Sewer outfall samples are also analyzed for priority pollutants that are listed by the U.S. Environmental Protection Agency (EPA) as toxic organics. Because the list is lengthy, Sandia personnel report only positively identified organic constituents. In 2013, sewer outfall samples showed concentrations of Chloroform (<0.5 – 7.5 µg/L), Bromoform (0.20 – 0.69 µg/L), Toluene (0.3 – 2.2 µg/L), Bromo-dichloromethane (<0.2 - 1.2 µg/L), Dibromochloromethane (<0.3 – 0.77 µg/L), and Phenol 9.2 – 55 µg/L). All other constituents on the EPA toxic organic list were below minimum detection limits. The toxic organic discharge limit for the site is 1000 µg/L. In 2013, SNL/CA operations did not exceed this discharge limit. Detailed sewer analyses results are provided in Section 9.

Table 5-3 Weekly Composite Sewer Outfall Monitoring Results – Physical Parameters and Metals, 2013

Parameter	Number of Samples Analyzed	Quantity Found Below Detection Limit	Detection Limit	Sewer Discharge Limit	Minimum Concentration	Maximum Concentration
Total suspended solids	12	0	1 mg/L	None	250 mg/L	588 mg/L
Total dissolved solids	12	0	10 mg/L	None	230 mg/L	540 mg/L
Biochemical oxygen demand	12	0	4 mg/L	None	200 mg/L	470 mg/L
Chemical oxygen demand[a]	12	0	10 mg/L	None	260 mg/L	1700 mg/L
Cyanide	12	1	0.002 mg/L	0.04 mg/L	<0.002 mg/L	0.026 mg/L
Arsenic	52	16	0.00007-0.01 mg/L	0.06 mg/L	0.0013 mg/L	0.020 mg/L
Cadmium	52	18	0.00002-0.005 mg/L	0.14 mg/L	<0.00025 mg/L	0.00066 mg/L
Chromium	52	17	0.00008-0.01 mg/L	0.62 mg/L	<0.0005 mg/L	0.0067 mg/L
Copper	52	0	0.00004-0005 mg/L	1 mg/L	0.11 mg/L	0.4 mg/L
Lead	52	16	0.00002-0.01 mg/L	0.2 mg/L	<0.00082 mg/L	0.0074 mg/L
Mercury	52	33	0.000025-0.005 mg/L	0.01 mg/L	<0.000025 mg/L	0.00083 mg/L
Nickel	52	15	0.00006-0.01 mg/L	0.61 mg/L	<0.0005 mg/L	0.013 mg/L
Silver	52	17	0.00002-0.0038 mg/L	0.2 mg/L	<0.00019 mg/L	0.0013 mg/L
Zinc	52	0	0.005-0.0005 mg/L	3 mg/L	0.069 mg/L	0.38 mg/L

[a] Chemical oxygen demand analyses are not required by the Wastewater Discharge Permit.

5.2.2 Liquid Effluent Control System

Effluent from major laboratory facilities is diverted to LECS holding tanks where wastewater can be sampled and analyzed prior to release to the sewer system. Five LECS were operated at SNL/CA during 2013. Wastewater from LECS tanks is typically analyzed for metals. Analyses for other parameters associated with the process generating the wastewater may also be done. Four of the five LECS tanks are also continuously monitored for pH. One LECS tank that is used infrequently is monitored prior to discharge for tritium and uranium. The tank did not require discharge in 2013; consequently, analyses for radioactive constituents were not necessary.

Wastewater that does not meet the discharge limits at the sewer outfall is transferred to the Hazardous Waste Facility for disposal. Depending on the constituents of the wastewater, it may be disposed as hazardous or non-hazardous waste. In 2013, there were no disposals of wastewater through Sandia's Hazardous Waste Facility.

5.2.3 Categorical Processes

Three research operations at SNL/CA are defined as federal categorical processes subject to the EPA's pretreatment standards for point sources (40 CFR Part 403, 40 CFR Part 433). These categorical processes include two metal finishing operations and a semiconductor manufacturing operation. Wastewater from the semiconductor manufacturing operation is sampled semiannually. The two metal finishing operations are closed-loop systems that do not discharge effluent to the sanitary sewer, and, therefore, wastewater monitoring is not required. There is an additional laboratory that may infrequently use metal cyanide complexes for electroplating, but this is done on a very small scale (less than 50 mL), and all liquid waste is handled as hazardous waste. There is no discharge from this process. Samples collected from the semiconductor manufacturing operation are analyzed for pH, arsenic, and toxic organic pollutants. Table 5-4 presents a summary of semiannual monitoring results for the semiconductor manufacturing operation. In 2013, all wastewater from this operation met the pretreatment standards.

Table 5-4 Monitoring for Semiconductor Manufacturing Categorical Process, 2013

Parameter	Number of Samples Analyzed	Number Found Below Detection Limit	Detection Limit	Minimum Concentration	Maximum Concentration	Permit Limit[a]
pH	2	--	None	7.7	8.35	5-10
Arsenic	2	2	0.00007-0.0005 mg/L	<0.0005 mg/L	<0.00015 mg/L	2.09 mg/L
Total toxic organics	2	--	Range[b]	All below detection limit	All below detection limit	1.37 mg/L[c]

[a] Permit limit for site outfall.
[b] Detection limits for the various organics included in this value range from 0.005 to 0.130 mg/L.
[c] The limit for total organics is a daily maximum concentration.

5.3 Groundwater

There are seven groundwater monitoring wells at SNL/CA. Sandia personnel monitor groundwater at two former restoration areas and along Arroyo Seco. Three groundwater monitoring wells are used to monitor residual contamination at former restoration areas under a 1989 site clean-up order issued by the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). Two of these wells are located at the Fuel Oil Spill site, and one at the Navy Landfill. Four monitoring wells are located along Arroyo Seco to monitor the effect of site operations on groundwater quality. Well AS-4 is located up gradient of the developed area of the site and provides background data about local groundwater quality. Groundwater monitoring well locations are shown on Figure 5-2. MW-406, an LLNL well, is also shown on Figure 5-2. Sandia discontinued monitoring at this location in 2005, but continues to report the results of LLNL's monitoring efforts that occur every two years. Table 5-5 provides the sampling schedule for each well location.

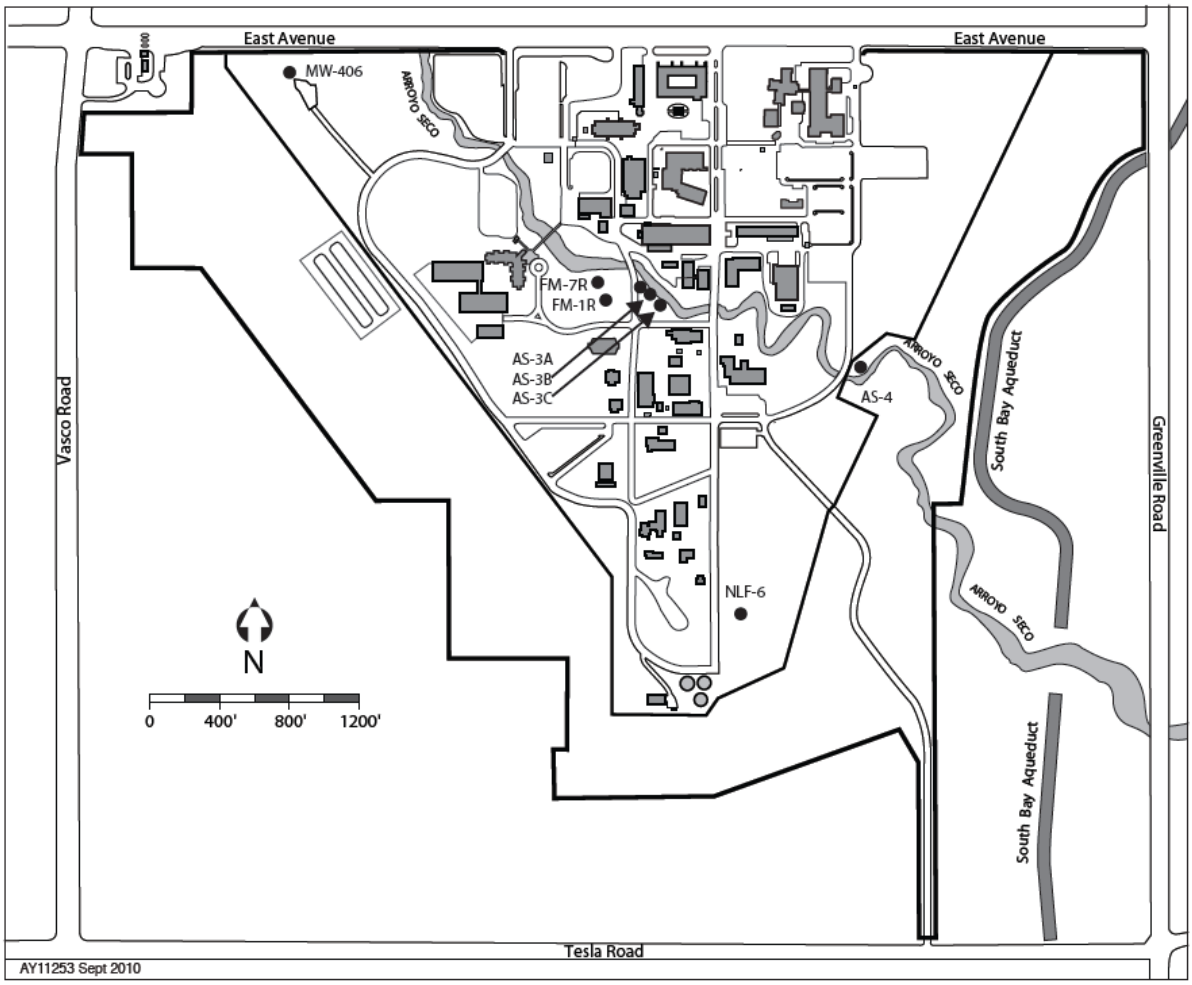

Figure 5-2 Groundwater Monitoring Well Locations

Table 5-5 Groundwater Sampling Schedule

Well location	Sampling frequency	Analytical parameter
Fuel Oil Spill site (Wells FM-1R, FM-7R)	Semi-annually	Total petroleum hydrocarbons diesel-methane (TPHD) (8015); Benzene, Ethylbenzene, Toluene, Xylenes (BTEX); Napthalene[1]; water elevation
Navy Landfill (Well NLF-6)	Annually	Volatile halogenated organics (EPA 624); water elevation
Arroyo Seco (Wells AS-3A, AS-3B, AS-3C, and AS-4)	Annually	Metals, volatile halogenated organics (EPA 624), total petroleum hydrocarbons-diesel (8015), tritium, water elevation
Arroyo Seco (Wells AS-3A, AS-3B, AS-3C, and AS-4)	Every two years	General minerals

[1] BTEX and Napthalene were inadvertently excluded from the analytical suite for the past several years. Special sampling for these parameters was undertaken in 2013. BTEX and Napthalene will be included in all future semi-annual sampling events.

Table 5-6 presents a summary of groundwater analytical results for the Navy Landfill. Table 5-7 presents a summary of groundwater analytical results for the Fuel Oil Spill wells. Groundwater analytical results for Arroyo Seco wells are summarized in Table 5-8 and 5-9. LLNL personnel last sampled MW-406 in March 2012. The only constituent of interest detected was tetrachloroethene at 1.8 μg/L. Complete groundwater analytical results are provided in Chapter 9. As a point of reference, analytical results are compared to federal and state maximum contaminant levels (MCLs), which are applicable for drinking water sources. There are no wells at SNL/CA used as a source for drinking water and MCLs are not standards applied to groundwater at the site.

As in past years, sample results continued to show carbon tetrachloride at the Navy Landfill well (NLF-6) in 2013. The concentration was above the state MCL of 0.5 μg/L, but below the federal MCL of 5.0 μg/L. The result is similar to that detected in past years. The presence of carbon tetrachloride in this well has been noted since well completion. The State Water Resources Control Board has required SNL/CA to monitor this well for carbon tetrachloride even though the Navy Landfill is considered a closed site. It should be noted that well NLF-6 is not completed in a drinking water or irrigation aquifer. The MCLs are shown for comparison only. A further comparison would be to EPA's Suggested No-Adverse Response Level (SNARL), that of 200 μg/L for a ten-day exposure. A Mann-Kendall test for trend shows that the carbon tetrachloride shows an upward trend from 2005 to 2013, yet the level remains well below a level that would require action by SNL/CA.

Table 5-6 Summary of Groundwater Analyses – Navy Landfill, 2013

	Date	Trichloromethane[a] (chloroform) μg/L	Carbon Tetrachloride[a] μg/L	Tetrachloroethene[a] (PCE) μg/L
Detection limit		0.2	0.3	0.4
MCL – California			0.5	5
MCL – Federal		100	5	5
Navy Landfill				
NLF-6	5/29/13	0.67	1.9	<0.4

[a] All other EPA 601 parameters were non-detectable.
MCL – Maximum contaminant levels.

Table 5-7 Summary of Groundwater Analyses – Fuel Oil Spill, 2013

	Date	TPH-D µg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes µg/L
Detection limit		50	0.3	0.2	0.2	0.5
MCL – California		-	1	150	300	1750
MCL – Federal		-	5	1000	700	10000
Fuel Oil Spill						
FM-1R	2/14/13	<50	-	-	-	-
FM-7R	2/14/13	<50	-	-	-	-
FM-1R	9/16/13	<50	-	-	-	-
FM-7R	9/16/13	<50	-	-	-	-
FM-1R	11/07/13	-	<0.3	<0.2	<0.2	<0.5
FM-7R	11/07/13	-	<0.3	<0.2	<0.2	<0.5

MCL – Maximum contaminant levels.

Table 5-8 Summary of Groundwater Analyses at Arroyo Seco Wells - Metals, 2013

				CCR Metals								
	Date	EPA 624	Diesel (8015) µg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Molybdenum mg/L	Nickel mg/L	Selenium mg/L	Thallium mg/L	Tritium pCi/L
Detection limit			50	0.003	0.0003	0.004	0.004	0.0005	0.0008	0.001	0.002	125
MCL - California				1	0.01	0.05	1			0.01		20000
MCL – Federal				2	0.005	0.1	1		0.1	0.05	0.002	
AS-3A	a	-	-	-	-	-	-	-	-	-	-	-
AS-3B	5/29/13	ND	ND	0.12	0.00036	0.0011	0.0057	0.0086	0.00087	<0.001	0.012	<125
AS-3C	5/29/13	ND	ND	0.15	0.00034	0.0061	<0.004	0.0076	0.0011	0.002	0.0069	-
AS-4	5/29/13	ND	ND	0.15	0.00034	0.0061	<0.004	0.0076	0.0076	0.002	0.0069	<127

[a] Well AS-3A was dry during the May 2013 sampling event.
MCL – Maximum contaminant levels.
ND – Non-detectable.

Table 5-9 Summary of Groundwater Analyses at Arroyo Seco Wells – Minerals, 2013

General Minerals

	Date	Specific Conductance µmho/cm	Total Dissolved Solids mg/L	Bicarbonate Alkalinity as CaCO3 mg/L	Carbonate Alkalinity as CaCO3 mg/L	Hydroxide Alkalinity as CaCO3 mg/L	Total Alkalinity as CaCO3 mg/L	Hardness, Total mg/L	Nitrate as NO3 mg/L	Chloride mg/L	Sulfate as SO4 mg/L	pH
Detection limit		-	50	0.1	0.1	0.1	0.1	0.1	0.05	0.1	2	-
AS-3A	a	-	-	-	-	-	-	-	-	-	-	-
AS-3B	5/29/13	980	780	260	<0.05	<0.05	260	414	13	130	170	7.59
AS-3C	5/29/13	560	350	<0.05	30	5	35	129	23	67	140	7.79
AS-4	5/29/13	1900	1400	400	<0.05	<0.05	400	678	1.4	260	400	10.94

[a] Well AS-3A was dry during the May 2013 sampling event.

5.4 Biological Dose Assessment

SNL/CA personnel conduct a biological dose assessment each year using the graded approach presented in DOE Standard 1153-2002, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2002). The technical standard includes models for calculating doses from radionuclide concentration data obtained from sediment and water analyses. In 2013, the RAD-BCG Calculator, a computer tool developed by DOE, was used to calculate doses and determine the need for and level of monitoring required.

The first step in the graded approach is a general screening that compares concentrations of radionuclides in environmental media with derived concentration guides. The ratios of the concentrations to the concentration guides are then summed. If the total equals or exceeds one, then additional analyses are required.

The radionuclides handled in greatest quantity at SNL/CA during past or present operations are tritium and depleted uranium. Tritium was not detected above analytical detection limits in any storm water samples collected in 2013. Therefore, the detection limit value (896 pCi/L) was used in the RAD-BCG Calculator. The sum of fractions from storm water data totaled 3.39×10^{-6}. This small fraction indicates that further analysis is not required, nor is monitoring of aquatic or terrestrial biota.

5.5 Radiation Monitoring

SNL/CA personnel monitor gamma radiation to ensure that site operations are not contributing significantly to the ambient radiation dose in the surrounding environment. On-site sources that could contribute to gamma radiation include small, unsealed radioactive isotopes, sealed sources, and several radiation generating devices. Four monitoring stations equipped with thermoluminescent dosimeters are maintained at SNL/CA. Monitoring stations are shown on Figure 5-3. The dosimeters are collected and evaluated quarterly. The data obtained from Sandia monitoring stations is combined with that from LLNL monitoring stations located around the perimeter of the SNL/CA site to determine the average annual gamma radiation dose at the site perimeter. The combined dose is then compared to the average annual gamma radiation dose at more distant locations in the Livermore Valley, shown on Figure 5-4. If site operations were contributing significantly to the gamma radiation dose, the dosimeters at the site perimeter would show a higher dose than those at more distant locations.

In 2013, the average annual perimeter dose was 66.1 mrem (0.66 mSv). The average annual dose measurement for distant locations was 55.8 mrem (0.56 mSv). The 2013 data for both perimeter and distant locations are within the range measured over the last ten years. Over the last ten years, the annual dose at the SNL/CA perimeter ranged from a low of 42.5 mrem to a high of 78.5 mrem. The ten-year average annual dose at the SNL/CA perimeter is 60.0 mrem (0.60 mSv). Over this same period, the annual dose measured at distant locations ranged from a low of 43.5 mrem to a high of 65.0 mrem. The ten-year average annual dose

measured at distant locations is 55.4 mrem (0.554 mSv). The difference between the perimeter and distant location measurements for 2013 is statistically significant. However, since both numbers are within the historical range, and there are no known sources of new or increased radiation exposure at SNL/CA, the difference is not considered to be indicative of increased radiation from Sandia operations.

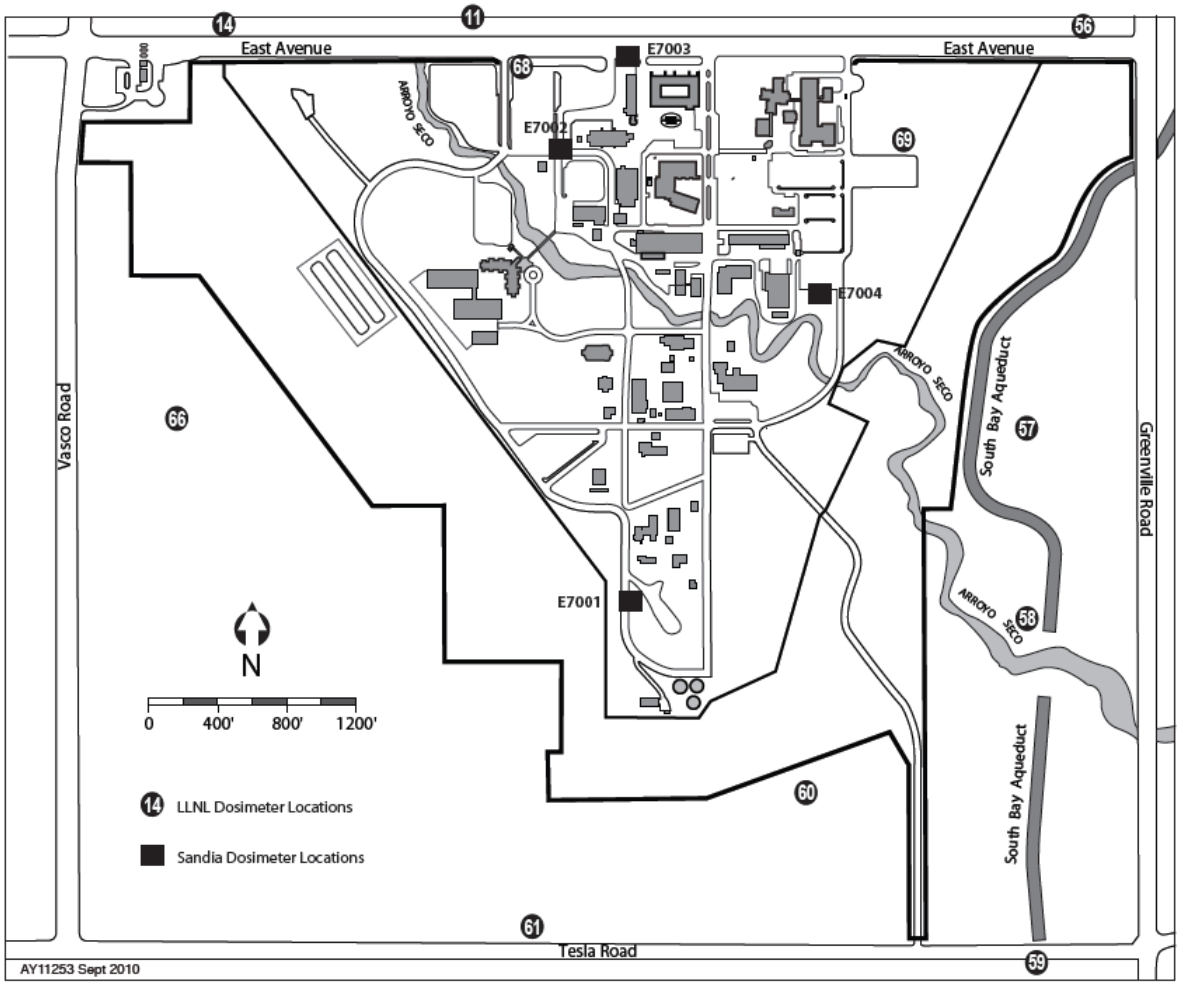

Figure 5-3 Dosimeter Locations at SNL/CA and Around Site Perimeter

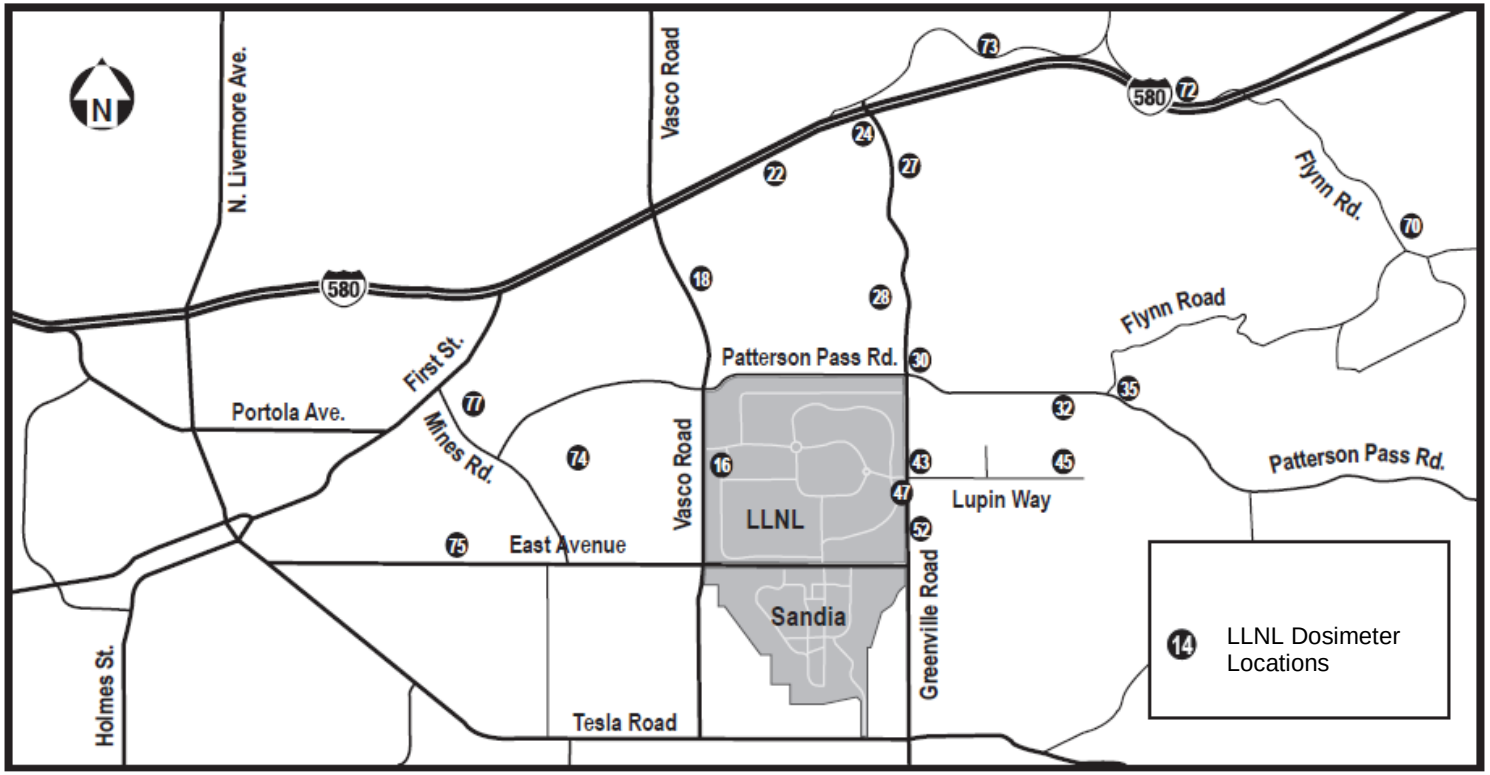

Figure 5-4 Dosimeter Locations in Livermore Valley

6 Quality Assurance

Sandia National Laboratories, California (SNL/CA) personnel follow the Sandia Corporate Process for quality assurance, CG100.5, *Ensure Quality* (SNL 2013b). Compliance with the corporate quality process satisfies the requirements established in the Department of Energy (DOE) Nuclear Safety Management Regulations, Subpart A, Quality Assurance Requirements (10 CFR 830), and DOE Order 414.1D, *Quality Assurance* (DOE 2011a). The Environmental Management Department implements specific quality requirements through functional area operating procedures.

DOE Order 414.1C identifies ten criteria that are integral to a quality program:

- Quality assurance program
- Personnel training and qualification
- Quality improvement process
- Documents and records
- Established work processes
- Established standards for design and verification
- Established procurement requirements
- Inspection and acceptance testing
- Management assessment
- Independent assessment

6.1 Environmental Monitoring Quality Assurance

The Environmental Monitoring and Ecology Function ensures quality in its activities through implementation of quality assurance plans and procedures. An Environmental Monitoring-specific quality assurance project plan (QAPP) addresses each of the ten criteria listed above, and documents quality assurance activities performed for the function (SNL/CA 2005). Additional operating procedures specify training requirements, establish work processes, define data verification and validation processes, and identify reporting and records management requirements. The operating procedures are reviewed by subject matter experts and approved by the Environmental Management Department Manager.

6.2 Environmental Sampling

Protocols for environmental sampling at SNL/CA are contained in activity specific operating procedures. Elements of these protocols include appropriate sampling methods and equipment; sampling frequency; sampling locations; and sample handling, storage, and packaging. Implementation of established protocols ensures that samples are representative of the environmental medium monitored and that monitoring requirements outlined in permits, DOE Directives, and regulations are met. Chain-of-custody protocols are also used to ensure quality control through proper transfer of samples from the point of collection to the analytical laboratory.

6.3 Sample Analyses

Analyses of samples collected at SNL/CA are performed using one of three avenues, depending on the sample medium or constituent analyzed. The three avenues are: a State accredited laboratory; the SNL/CA Health Protection Laboratory; or the Sandia National Laboratories, New Mexico (SNL/NM) Health Instrumentation Laboratory.

6.3.1 Accredited Laboratory

A State of California accredited laboratory performs analyses of non-radiological samples collected at SNL/CA. To receive accreditation, a laboratory must implement a quality assurance plan. These laboratories are periodically inspected by the California Environmental Protection Agency to ensure that they are operating within regulatory and quality assurance requirements. Consistent with industry standards, non-radiological samples are processed according to federal Environmental Protection Agency methods.

6.3.2 SNL/CA Health Physics Laboratory

Tritium analyses of storm water are performed by the Sandia personnel in an on-site laboratory. These samples are analyzed by liquid scintillation counting, a standard technique for tritium analysis. The Health Physics Laboratory follows the guidance in the Sandia National Laboratories (SNL) Radiation Protection Department Quality Assurance Plan (SNL 2013c), and meets the Sandia and DOE quality criteria.

6.3.3 SNL/NM Health Instrumentation Laboratory

Thermoluminescent dosimeters used to measure gamma radiation are owned, issued, and processed by the Radiation Protection Dosimetry Program (RPDP) at SNL/NM. The technical basis for the environmental dosimeter monitoring program is provided in *Description and Procedures of the Environmental Radiation Dosimetry Program* (SAND87-1916, 1987). Dosimeters are issued and processed quarterly following established protocols and quality assurance/quality control requirements specified in RPDP operating procedures and the RPDP Quality Assurance Plan. Automated dosimeter processing equipment are used to process environmental dosimeters. Data reduction and dose calculations are performed by the RPDP external dosimetry technical staff.

6.4 Data Verification and Validation

Sandia personnel conduct data verification and validation to ensure that environmental data is precise, accurate, representative, comparable, and complete. Verification and validation are accomplished through analyses of quality control samples and by conducting statistical analyses.

6.4.1 Quality Control Samples

Types of quality control samples prepared for the Environmental Monitoring Function include duplicate, spiked, and blank samples. A definition of each sample type follows.

Duplicate samples are collected at the same time and location, and follow the same method, as a routine sample. These samples are used to assess the precision of sample collection and analytical processes.

Spiked samples resemble a routine sample, but contain a known amount of one or more of the constituents of interest. These samples are obtained from an independent laboratory that certifies the concentration of the constituents.

Blank samples resemble a routine sample matrix (e.g. deionized water is used for blank water samples), but lack the constituents of interest. These samples are used to assess background levels of constituents, and possible contamination of the samples in the laboratory or in the field.

Sandia's goal for number of quality control samples at SNL/CA is 20 percent of the total sample load, where feasible. This includes quality control samples initiated at the laboratory. In 2013, Sandia personnel collected 12 wastewater quality control samples and submitted one blind spike sample, representing 25 percent of the sample load. Three groundwater quality control samples were collected representing 37 percent of the sample load. Two storm water quality control samples were collected during the 2012/2013 wet season, representing 25 percent of the sample load.

6.4.2 Statistical Analyses

Statistical analyses are used to determine completeness, precision, and accuracy of monitoring and surveillance data. Prior to performing statistical analyses, the data is normalized to ensure that valid results are obtained. Descriptions of the statistical tests follow.

Completeness is evaluated by determining the ratio between the number of samples collected and the number of samples scheduled for collection. The data quality objective for completeness is 85 percent.

Precision is evaluated using three methods: determining the ratio between routine and duplicate samples; tests of significant difference; and calculating the 95 percent confidence interval. Data quality objectives vary for precision depending on the results of laboratory analyses.

Accuracy is also evaluated using three methods: determining the ratio between sample results and known values of spiked samples; tests of significant difference; and calculating the 95 percent confidence interval. Data quality objectives vary for accuracy depending on the results of laboratory analyses.

Table 6.1 summarizes the results of statistical analyses conducted in 2013. As shown, some data quality objectives failed during the year. The four failed storm water precision tests were

for metals (aluminum, iron, lead) and COD. COD is a parameter that is easily influenced by the heterogeneous nature of the storm water. An investigation was not initiated since Sandia changed contract laboratories shortly after these analyses were performed.

Table 6-1 Summary of Statistical Analyses, 2013

Sample Medium	Completeness Test	Precision Test		Accuracy Test	
	Results	# of Tests	Results	# of Tests	Results
Wastewater (sanitary sewer)	100%	6	6 passed	14	14 passed
Storm water	44%[a,b]	10	6 passed	-	-
Groundwater	100%	1	1 passed	-	-

[a] Storm water samples are required to be collected during normal business hours, and be preceded by three dry days. The timing of rain events did not allow for all samples to be collected.
[b] The low percentage of samples collected was due to an unusually dry year, not a failure of the sampling system. A nonconformance report was not required.

7 References

17 California Code of Regulations (CCR), Subchapter 10, Article 4, Subarticle 3.1, *Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulating Switchgear*.

19 CCR, Division 2, Chapter 4, *Hazardous Material Release Reporting, Inventory, and Response Plans*.

22 CCR, Division 4.5, *Environmental Health Standard for Management of Hazardous Waste*.

10 Code of Federal Regulations (CFR) Part 830, Department of Energy, *Nuclear Safety Management, Subpart A, Quality Assurance Requirements*, Federal Register Vol. 66, Number 7.

10 CFR Part 1021, Department of Energy, *National Environmental Policy Act Implementing Procedures*.

40 CFR Part 61, Environmental Protection Agency, *National Emissions Standards for Hazardous Air Pollutants, Subpart H – National Emissions Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities*.

40 CFR Part 70, Environmental Protection Agency, *State Operating Permit Programs*.

40 CFR Part 262.41, Environmental Protection Agency, *Standards Applicable to Generators of Hazardous Waste, Subpart D, Record-keeping and Reporting*.

40 CFR Part 403, Environmental Protection Agency, *General Pretreatment Regulations for Existing and New Sources of Pollution*.

40 CFR Part 433, Environmental Protection Agency, *Metal Finishing Point Source Category*.

7 United States Code (USC) §136, *Federal Insecticide, Fungicide, and Rodenticide Act*, 1972.

15 USC §2601 et. seq., *Toxic Substances Control Act of 1976*.

16 USC § 470, *National Historic Preservation Act of 1966.*

16 USC § 703 et. seq., *Migratory Bird Treaty Act of 1918.*

16 USC §1531 et. seq., *Endangered Species Act of 1973.*

33 USC §1251, *Clean Water Act of 1977.*

42 USC § 2011 et. seq., *Atomic Energy Act of 1954.*

42 USC § 4321 et. seq., *National Environmental Policy Act of 1970.*

42 USC § 6901 et. seq., *Resource Conservation and Recovery Act of 1976.*

42 USC § 6961, *Federal Facility Compliance Act of 1992.*

42 USC § 7401, *Clean Air Act Amendments of 1990.*

42 USC § 8201 et, seq., *National Energy Conservation Policy Act.*

42 USC § 9601, *Comprehensive Environmental Response, Compensation, and Liability Act of 1980.*

42 USC §11001 et. seq., *Superfund Amendments and Reauthorization Act of 1986, Emergency Planning and Community Right-to-Know Act.*

42 USC §13101 et. seq., *Pollution Prevention Act of 1990.*

42 USC §15801, *Energy Policy Act of 2005.*

42 USC §17001, *Energy Independence and Security Act of 2007.*

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California Health and Safety Code, Division 20, Chapter 6.95, § 25500, et. Seq., *Hazardous Materials Release Response Plans and Inventory.*

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8 Glossary

Ambient air	The surrounding atmosphere, usually the outside air, as it exists around people, plants, and structures. It does not include the air next to emission sources.
Biochemical oxygen demand	A measure of the amount of dissolved oxygen that microorganisms need to break down organic matter in water. Used as an indicator of water quality.
Categorical process	An industrial process that discharges wastewater and is regulated under 40 CFR, Part 403.
Chemical oxygen demand	The amount of oxygen required to degrade the organic compounds of wastewater. Used to measure the overall level of organic contamination in wastewater.
Dose	A term denoting the quantity of radiation energy absorbed.
Dosimeter	A portable detection device for measuring the total accumulated exposure to ionizing radiation.
Effluent	A liquid or gaseous waste discharged to the environment.
Emission	A gaseous or liquid stream containing one or more contaminants.
Ephemeral stream	A stream that flows only for a short duration during and following rainfall.
External radiation	Radiation originating from a source outside the body.
Fluvial sediments	A sedimentary deposit consisting of material transported by, suspended in, or laid down by a river or stream.
Lacustrine sediments	Sediments formed in, or relating to, a lake.
Mixed waste	Waste that contains both radioactive and hazardous constituents.
pH	A measure of hydrogen ion concentration in an aqueous solution. Acidic solutions have a pH less than 7, basic solutions have a pH greater than 7, and neutral solutions have a pH of 7.
Riparian	Pertaining to, situated in, or adapted to living on the banks of rivers and streams.

Specific conductivity	Measure of the ability of a material to conduct electricity.
Strike-slip fault	A fault with horizontal movement along the break where slipping is parallel with the strike of the fault.
Thermoluminescent dosimeter	A type of dosimeter. After being exposed to radiation, the material in the dosimeter (lithium fluoride) luminesces upon being heated. The amount of light the material emits is proportional to the amount of radiation (dose) to which it was exposed.
Total dissolved solids	Solids in water that pass through a filter. A measure of the amount of material dissolved in water.
Total suspended solids	Solids in water that can be trapped in a filter. Solids can include silt, decaying plant and animal matter, industrial wastes, and sewage.
Transverse fault	A fault that strikes obliquely or perpendicular to the general structural trend of the region.

9 Groundwater Analytical Results, Well Completion Data, and Sanitary Sewer Analytical Results

Table 9-1 Results of Groundwater Analyses at SNL/CA, 2013

	Date	Chloromethane µg/L	Vinyl Chloride µg/L	Bromomethane µg/L	Chloroethane µg/L	Methylene Chloride µg/L	Trans-1,2-Dichloroethene µg/L	1,1 Dichloroethane µg/L	Trichloromethane (chloroform) µg/L	1,1,1-Trichloroethane µg/L	Carbon Tetrachloride µg/L	1,2 Dichloroethane µg/L	Trichloroethene µg/L	1,2-Dichloropropane µg/L
Detection limit		0.4	0.4	0.2	0.4	0.5	0.3	0.2	0.2	0.3	0.3	0.2	0.2	0.2
MCL - California			0.5				10	5		200	0.5	0.5	5	5
MCL - Federal			2			5	100		100	200	5	5	5	5
Well ID														
NLF-6	5/29/13	ND	ND	ND	ND	ND	ND	ND	0.67	ND	1.9	ND	ND	ND
Field Dup	5/29/13	ND	ND	ND	ND	ND	ND	ND	0.67	ND	2.0	ND	ND	ND
Field Blank	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trip Blank	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3A [1]	5/29/13	-	-	-	-	-	-	-	-	-	-	-	-	-
AS-3B	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3C	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-4	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FM-1R	2/14/13	-	-	-	-	-	-	-	-	-	-	-	-	-
FM-1R	9/16/13	-	-	-	-	-	-	-	-	-	-	-	-	-
FM-7R	2/14/13	-	-	-	-	-	-	-	-	-	-	-	-	-
FM-7R	9/16/13	-	-	-	-	-	-	-	-	-	-	-	-	-

MCL – Maximum contaminant level.
ND – Non-detectable.

[1] Well was dry.
- Not required to analyze or sample not collected.

Table 9-1 Results of Groundwater Analyses at SNL/CA, 2013 (continued)

	Date	Bromodichloromethane µg/L	Cis-1,3-Dichloropropene µg/L	Trans-1,3-Dichloropropene µg/L	1,1,2-Trichloroethane µg/L	Tetrachloroethene µg/L	Dibromochloromethane µg/L	Chlorobenzene µg/L	Bromoform µg/L	1,1,2,2-Tetrachloroethane µg/L	1,3-Dichlorobenzene µg/L	1,4-Dichlorobenzene µg/L	1,2-Dichlorobenzene µg/L	8015-Diesel (w/silica gel clean-up) µg/L
Detection limit		0.2	0.2	0.2	0.3	0.4	0.3	0.2	0.2	0.3	0.2	0.2	0.2	50
MCL - California			0.5		32	5		30		1		5		
MCL - Federal		100			5	5	100	100	100		600	75	600	
Well ID														
NLF-6	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Field dup	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Field blank	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trip Blank	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3A[1]	5/29/13	-	-	-	-	-	-	-	-	-	-	-	-	-
AS-3B	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-3C	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AS-4	5/29/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FM-1R	2/14/13	-	-	-	-	-	-	-	-	-	-	-	-	ND
FM-1R	9/16/13	-	-	-	-	-	-	-	-	-	-	-	-	ND
FM-7 R	2/14/13	-	-	-	-	-	-	-	-	-	-	-	-	ND
FM-7R	9/16/13	-	-	-	-	-	-	-	-	-	-	-	-	ND

MCL – Maximum contaminant level.
ND – Non-detectable.

[1] Well was dry.
- Not required to analyze or sample not collected.

Table 9-1 Results of Groundwater Analyses at SNL/CA, 2013 (continued)

	Date	Antimony mg/L	Arsenic mg/L	Barium mg/L	Beryllium mg/L	Cadmium mg/L	Chromium mg/L	Cobalt mg/L	Copper mg/L	Lead mg/L	Mercury mg/L	Molybdenum mg/L	Nickel mg/L	Selenium mg/L	Silver mg/L	Thallium mg/L	Vanadium mg/L	Zinc mg/L	Tritium pCi/L
Detection limit		0.0006	0.0007	0.003	0.0002	0.0003	0.004	0.0003	0.0004	0.02	0.00006	0.0005	0.0008	0.001	0.0005	0.002	0.008	0.008	125
MCL - California			0.01	1		0.01	0.05		1	0.05	0.002			0.01	0.05			5	20000
MCL - Federal		0.006	0.01	2	0.004	0.005	0.1		1		0.002		0.1	0.05	0.1	0.002		5	
Well ID																			
NLF-6	5/29/13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field dup	5/29/13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field blank	5/29/13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AS-3A[1]	5/29/13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AS-3B	5/29/13	ND	ND	0.12	ND	0.00036	0.0011	ND	0.0057	ND	ND	0.0086	0.00087	ND	ND	0.012	ND	ND	<125
AS-3C	5/29/13	ND	ND	0.15	ND	0.00034	0.0061	ND	ND	ND	ND	0.0076	0.0011	0.002	ND	0.0069	ND	ND	-
AS-4	5/29/13	ND	ND	0.15	ND	0.00034	0.0061	ND	ND	ND	ND	0.0076	0.0011	0.002	ND	0.0069	ND	ND	<127
FM-1R	2/14/13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FM-1R	9/16/13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FM-7 R	2/14/13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FM-7R	9/16/13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

MCL – Maximum contaminant level.
ND – Non-detectable.

[1] Well was dry.
- Not required to analyze or sample not collected.

Table 9-1 Results of Groundwater Analyses at SNL/CA, 2013 (continued)

	Date	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	Xylenes (total) µg/L
Detection limit		0.3	0.2	0.2	0.5
MCL -California		1	150	300	1750
MCL - Federal		5	1000	700	10000
Well ID					
NLF-6	5/29/13	-	-	-	-
Field dup	5/29/13	-	-	-	-
Field blank	5/29/13	-	-	-	-
AS-3A	5/29/13	-	-	-	-
AS-3B	5/29/13	-	-	-	-
AS-3C	5/29/13	-	-	-	-
AS-4	5/29/13	-	-	-	-
FM-1R	11/7/13	ND	ND	ND	ND
FM-7R	11/7/13	ND	ND	ND	ND

MCL – Maximum contaminant level.
ND – Non-detectable.
- Not required to analyze or sample not collected.

Table 9-2 Well Depth and Screen Period Interval

Area	Well ID	Well Depth (ft)	Screen Period Interval (ft)
Fuel Oil Spill Site	FM-1R	129	99 – 129
	FM-7R	129	99 - 129
Arroyo Seco	AS-3A	112.58	100 – 110
	AS-3B	124.97	118 – 123
	AS-3C	157	150 – 155
	AS-4	28.57	15 – 25
Trudell Auto Repair Shop	MW-406	94	87[a]
Navy Landfill	NLF-6	110	87 – 102

[a] Start of screen interval. Length of screen interval is unknown.

Table 9-3 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2013

Date	Laboratory ID #[a]	BOD[c] SM5210B	COD[c] (mg/L) E410.4	TDS[c] (mg/L) SM2540C	TSS[c] (mg/L) SM2540D	Oil & Grease (mg/L)[d]	Cyanide[d] (mg/L) Kelada-01
		All results reported in mg/L					
January							
January 2	1301017	210	550	265	296	[f]	0.010
February							
February 5	1302073	270	520	374	546	[f]	0.0078
March							
March 5	1303084	380	610	316	588	[f]	0.026
April							
April 2	1304052	200	330	355	371	[f]	0.016
May							
May 7	13E0325	470	750	540	460	[f]	0.0051
June							
June 4	13F0216	250	1700	340	520	[f]	0.0042
July							
July 2	13G0132	230	490	300	310	[f]	0.0023
August							
August 6	13H0339	220	700	370	300	[f]	<0.0020
September							
September 3	13I0119	200	430	230	260	[f]	0.0066
October							
October 1	13J0097	240	540	370	300	[f]	0.0046
November							
November 5	13K0282	250	260	300	250	[f]	0.0045
December*							
December 3	13L0259	340	680	370	440	[f]	0.0064
Discharge Limit[b]		N/A[e]	N/A[e]	N/A[e]	N/A[e]	100	0.04

* Site shutdown from December 25, 2013 through January 1, 2014.

[a] Analyses performed by an off-site, state certified laboratory.

[b] Discharge concentration limits, City of Livermore Municipal Code 13.32.

[c] Weekly composite sample. The dates indicate the day the sample was collected. The sample represents a representative composite for the previous week.

[d] Grab sample.

[e] N/A indicates not applicable; i.e., there is no specific discharge limit for this parameter.

[f] The monitoring requirement for oil and grease has been suspended until such time as the City of Livermore Municipal Code 13.32 can be modified to remove references regarding specific analytical methods effective May 3, 1999.

Table 9-4 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, Method E200.8, 2013

Date[a]	Laboratory ID #[b]	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
		All results reported in mg/L								
January										
January 2	1301017-001A	<0.010	<0.0050	<0.010	0.18	<0.010	<0.0050	<0.010	<0.0038	0.19
January 8	1301131-001A	<0.0050	<0.00025	0.011	0.32	0.0057	<0.00025	0.0057	<0.0019	0.35
January 15	1301318-001A	<0.010	<0.0050	<0.010	0.21	<0.010	<0.00050	<0.010	<0.0038	0.25
January 22	1301508-001A	<0.0050	<0.00025	<0.0050	0.20	<0.0050	<0.00025	<0.0050	<0.0019	0.22
January 29	1301694-001A	<0.010	<0.0050	<0.010	0.18	<0.010	<0.00050	<0.010	<0.0038	0.21
February										
February 5	1302073-001A	<0.0050	<0.0025	<0.0050	0.20	<0.0050	<0.00025	<0.0050	<0.0019	0.17
February 12	1302287-001A	0.0013	<0.00025	0.00062	0.11	0.00082	<0.000025	<0.0005	<0.00019	0.069
February 19	1302689-001A	<0.0050	<0.0025	<0.0050	0.11	<0.0050	<0.00025	<0.0050	<0.0019	0.077
February 26	1302743-001A	<0.010	<0.0050	<0.010	0.22	<0.010	<0.00050	<0.010	<0.0038	0.23
March										
March 5	1303084-001A	<0.010	<0.0050	<0.010	0.25	<0.010	<0.00050	<0.010	<0.0038	0.23
March 12	1303340-001A	<0.010	<0.0050	<0.010	0.24	<0.010	<0.00050	<0.010	<0.0038	0.24
March 19	1303528-001A	0.0019	0.00037	<0.0005	0.20	0.0025	0.00020	0.0040	0.00092	0.21
March 26	1303722-001A	<0.0050	<0.0025	<0.0050	0.24	<0.0050	<0.00025	<0.0050	<0.0019	0.24
April										
April 2	1304052-001A	<0.0050	<0.0025	<0.0050	0.26	<0.0050	<0.00025	<0.0050	<0.0019	0.26
April 9	1304276-001A	<0.010	<0.0050	<0.010	0.22	<0.010	<0.00050	<0.010	<0.0038	0.24
April 16	1304533-001A	<0.0050	<0.0025	<0.0050	0.28	<0.0050	<0.00025	<0.0050	<0.0019	0.33
April 23	1304701-001A	<0.0050	<0.0025	<0.0050	0.33	<0.0050	<0.00025	0.0056	<0.0019	0.38
April 30	1304915-001A	<0.0050	<0.0025	<0.0050	0.23	<0.0050	<0.00025	<0.0050	<0.0019	0.23
May										
May 7	13E0322-01	0.0028	0.00041	0.0025	0.22	0.0032	<0.0002	0.0056	0.00037	0.23
May 14	13E0719-01	0.0054	0.00054	0.0019	0.32	0.0036	0.00007	0.0047	0.00040	0.31
May 21	13E1055-01	0.020	0.00046	0.0033	0.33	0.0054	0.00007	0.0056	0.00051	0.26
May 28	13E1256-01	0.0054	0.00034	0.0024	0.23	0.0028	<0.00006	0.0045	0.00028	0.20

Table 9-4 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, Method E200.8, 2013 (continued)

Date[a]	Laboratory ID #[b]	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
		All results reported in mg/L								
June										
June 4	13F0215-01	0.0051	0.00040	0.0020	0.30	0.0029	<0.00006	0.0048	0.00053	0.26
June 11	13F0579-01	0.0050	0.00051	0.0016	0.23	0.0023	0.00083	0.0035	0.00030	0.22
June 18	13F0914-01	0.0055	0.00059	0.0018	0.23	0.0034	<0.00006	0.0067	0.00026	0.26
June 25	13F1252-01	0.0051	0.00047	0.0019	0.26	0.0033	<0.00002	0.0049	0.00034	0.26
July										
July 2	13G0129-01	0.0039	0.00050	0.0016	0.28	0.0039	<0.00006	0.0049	0.00052	0.28
July 9	13G0425-01	0.0037	0.00047	0.0032	0.30	0.0026	0.00006	0.0038	0.00059	0.26
July 16	13G0890-01	0.0029	0.00042	0.0015	0.23	0.0021	0.00020	0.0036	0.00031	0.21
July 23	13G1249-01	0.0033	0.00066	0.0018	0.28	0.0060	0.00007	0.0056	0.00043	0.27
July 30	13G1570-01	0.0033	0.00050	0.0053	0.27	0.0065	0.00014	0.0058	0.00072	0.30
August										
August 6	13H0341-01	0.0033	0.00038	0.0019	0.21	0.0048	<0.00006	0.0048	0.00052	0.24
August 13	13H0857-01	0.0045	0.00051	0.0029	0.28	0.0041	0.000070	0.0050	0.00035	0.25
August 20	13H1235-01	0.0034	0.00037	0.0023	0.23	0.0035	0.00024	0.0049	0.00031	0.20
August 27	13H1682-01	0.0043	0.00042	0.0017	0.24	0.0031	0.00009	0.0040	0.00038	0.22
September										
September 3	13I0124-01	0.0043	0.00039	0.0014	0.19	0.0026	<0.00006	0.0032	0.00042	0.19
September 10	13I0663-01	0.0043	0.00059	0.0023	0.30	0.0038	<0.00006	0.0052	0.00063	0.26
September 17	13I1112-01	0.0042	0.00049	0.0025	0.29	0.0050	<0.00006	0.0050	0.00049	0.26
September 24	13I1489-01	0.0040	0.00049	0.0035	0.28	0.0045	0.00012	0.0053	0.00075	0.25
October										
October 1	13J0102-01	0.0066	0.00047	0.0026	0.24	0.0033	<0.00006	0.0063	0.00047	0.27
October 8	13J0638-01	0.0062	0.00049	0.0026	0.29	0.0038	<0.00006	0.0056	0.00011	0.26
October 15	13J1112-01	0.0045	0.00052	0.0026	0.28	0.0041	<0.00006	0.0056	0.0013	0.25
October 22	13J1518-01	0.0053	0.00050	0.0027	0.24	0.0036	0.00012	0.0053	0.00080	0.21
October 29	13J1919-01	0.0093	<0.00015	<0.0020	0.29	<0.010	0.00006	0.0057	0.00085	0.23

Table 9-4 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, Method E200.8, 2013 (continued)

Date[a]	Laboratory ID #[b]	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn
		All results reported in mg/L								
November										
November 5	13K0279-01	0.0056	0.00051	0.0040	0.28	0.0043	0.000090	0.0067	0.0012	0.27
November 12	13K0753-01	0.0082	0.00046	0.0031	0.33	0.0040	0.000070	0.0070	0.00070	0.24
November 19	13K1163-01	0.0080	0.00034	0.0025	0.20	0.0027	0.000070	0.0054	0.00047	0.17
November 26	13K1760-01	0.0057	0.00052	0.0038	0.24	0.0040	<0.000060	0.0076	0.00062	0.25
December*										
December 3	13L0254-01	0.0047	0.00049	0.0031	0.25	0.0038	<0.00006	0.0062	0.0013	0.23
December 10	13L0755-01	0.0044	0.00052	0.0047	0.29	0.0089	0.000060	0.010	0.00056	0.24
December 17	13L1214-01	0.0031	0.00040	0.0035	0.27	0.0042	<0.000060	0.0096	0.00063	0.25
December 24	13L1633-01	0.0027	0.00046	0.0067	0.40	0.0074	0.000080	0.013	0.00092	0.25
December 31	14A0321-01	0.0086	0.00022	0.0018	0.15	0.0024	0.000090	0.0044	0.00036	0.21
Discharge Limit[c]		0.06	0.14	0.62	1.0	0.20	0.01	0.61	0.20	3.0

* Site shutdown from December 25, 2013 through January 1, 2014.

[a] Samples are collected as a weekly composite.

[b] Analyses performed by an off-site, independent laboratory.

[c] Discharge concentration limits, City of Livermore Municipal Code 13.32.

Table 9-5 Routine Monitoring Results for SNL/CA Sanitary Sewer Outfall, 2013

Date	EPA Method 624 Purgeable Priority Pollutants (µg/L)	EPA Method 625 Extractable Priority Pollutants (µg/L)	EPA Method 608 Organochlorine Pesticides (µg/L)
January 2	Chloroform - 1.2	None	None
February 5	Chloroform – 4 Toluene – 0.65 Bromodichloromethane – 1.2 Bromomethane – 0.53 Dibromochloromethane – 0.77	None	None
March 5	Chloroform – 5.5 Toluene – 2.2	None	None
April 2	Chloroform – 4.2 Toluene – 6.2	None	None
May 2	Chloroform – 13	None	None
June 4	Phenol – 54	None	None
July 2	Chloroform – 7.5 Bromoform – 0.69 Toluene – 2 Phenol - 19	None	None
August 6	Chloroform – 2.4 Bromoform – 0.47 Toluene – 0.39 Phenol – 8.5	None	None
September 3	Chloroform – 1.4 Phenol – 55	None	None
October 1	Chloroform – 2	None	None
November 5	Chloroform – 3.7	None	None
December 3	Chloroform – 3.4 Toluene – 0.59	None	None

This table reports all positively identified organic constituents designated as total toxic organics (TTO) by the United States Environmental Protection Agency. All other compounds comprising the EPA toxic organic list were below minimum detection limits, and therefore were not listed. The toxic organic discharge limit for SNL/CA is 1000µg/L. The total toxic organic number is derived by summing up all organic constituents greater than 10 µg/L. Also, note that Chloroform is reported in this table although it is a common constituent of chlorinated water.

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