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**Sandia National Laboratories, California
Environmental Monitoring Program
Annual Report
March 2011**



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Prepared by
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Sandia National Laboratories, California Environmental Monitoring Program Annual Report for 2011

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ABSTRACT

The annual program report provides detailed information about all aspects of the SNL/California Environmental Monitoring Program. It functions as supporting documentation to the SNL/California Environmental Management System Program Manual. The 2010 program report describes the activities undertaken during the previous year, and activities planned in future years to implement the Environmental Monitoring Program, one of six programs that supports environmental management at SNL/California.

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Summary of Document Changes

Significant changes made to the 2010 edition of the Environmental Monitoring Program Report are marked with a sidebar within the document and summarized in Table 1.

Table 1 Summary of Significant Changes to Environmental Monitoring Program Report, 2010

Section	Page	Change
1.3.3	31	Updated discussion of Construction Storm Water Permits
1.3.3	31	Discussed removal of Navy Landfill from storm water sampling program
1.2.1	20	Added discussion of sampling system redesign.
5.5	50	Added requirement for construction SWPPPs to be developed and implemented by Qualified SWPPP Developer and Qualified SWPPP Practitioner respectively.

1. Program Description

DOE Orders 450.1A, 5400.5, and DOE/EH-0173T, establish environmental protection program requirements, authorities, and responsibilities. These Orders stipulate that all DOE facilities comply with Federal, State, and local environmental protection laws and regulations, and best management practices. DOE Order 450.1A replaces DOE Order 5400.1, which previously required an environmental monitoring plan to document how each facility will comply with these laws and regulations. Although an environmental monitoring plan is no longer required, this report documents Sandia's efforts not only to comply with these laws and regulations but also to comply with DOE's policy to keep emissions to the environment as low as reasonably achievable (ALARA).

This *Annual Program Report* has been prepared in accordance with DOE Order 5400.5, and DOE/EH-0173T and with consideration of DOE Order 450.1A. The primary purpose of this report is to formally document SNL/California's effluent monitoring and environmental surveillance system to ensure compliance with Federal, State, and local requirements, and DOE Orders.

This report covers only operations at the SNL/California facility.

Environmental monitoring at SNL/California consists of two major parts:

1. liquid effluent monitoring, and
2. environmental surveillance.

Effluents are monitored at the point of discharge to measure the amount of pollutants released by SNL/California. Effluent monitoring data also allow SNL/California to evaluate the effectiveness of pollution control programs and to detect unplanned releases. DOE Orders 450.1A 5400.5, and DOE/EH-173T contain the requirements for effluent monitoring. The City of Livermore Wastewater Discharge Permit contains additional requirements for liquid effluent monitoring.

Environmental surveillance is done to assess the actual impact of pollutant releases on portions of the environment that may be important pathways of exposure to the local population. Environmental samples also help identify trends in the pollutant levels. Surveillance data provide a means of evaluating the effectiveness of pollution control measures and of assuring that SNL/California conducts operations so as to preserve the quality of the environment. DOE/EH-0173T includes the types of environmental surveillance to be done around DOE facilities. The State of California Industrial Storm water Activities General Permit contains additional requirements for storm water discharge monitoring. San Francisco Bay Area Regional Water Quality Control Board (RWQCB) Order 89-184 and subsequent communication with the RWQCB, contains requirements for groundwater monitoring.

1.1. Site Background

1.1.1. Site Description

Location

SNL/California is approximately 65 km (40 miles) east of San Francisco, on the southeastern boundary of the City of Livermore. Figure 1-1 shows the location of SNL/California in the San Francisco Bay Area.

Figure 1-1 SNL/California in a regional setting



The SNL/California site covers 1.7 km² (410 acres, including a 228-acre buffer zone). It lies at the western base of the Altamont hills, which form the eastern boundary of the Livermore Valley. The Livermore Valley is an irregularly shaped lowland in the Diablo Range of the California Coastal Mountain Range. It is approximately 26 km (16 miles) long (east to west) and averages about 11 km (7 miles) wide. The Valley floor slopes to the west from high elevation in the east of approximately 200m (660 ft.) to a low of about 90 m (295 ft.) at the western end of the Valley.

The Valley's major drainage is via seasonally intermittent streams (arroyos). These arroyos generally carry water to the southwest end of the Valley and into the Alameda Creek near Sunol. Alameda Creek then continues on to the San Francisco Bay.

Geology

The geology of the Livermore Valley is complex. The northern portion of the site is on gently northwest-sloping land underlain by alluvial deposits (clay, silt, sand, gravel, and similar materials deposited by running water). These deposits are mapped as Pleistocene Epoch (up to 2 to 3 million years old). Older alluvial terrace deposits and deformed beds of Livermore gravels underlie the hilly southern portion of the site. These two areas, with contrasting physiography and stratigraphy, are separated by the Las Positas fault, which extends northeast to southwest. It runs across the site along the change in slope from the hilly southern portion to the gently sloping northern portion.

The alluvial deposits create interbedded layers of higher and lower permeability overlying the older Livermore formation. The groundwater of the Livermore Valley is in the more permeable layers, which lie between 5 and 33 m (17 and 110 ft.) below the surface. Groundwater flows generally in a northwesterly direction. Groundwater flow to the south of the fault is not as well understood.

The Arroyo Seco traverses the SNL/California site from the southeast to the northwest. It receives storm water runoff from the site and acts as the primary pathway for groundwater recharge near the site.

Climatology

The climate of the Livermore Valley consists of mild, rainy winters, and warm, dry summers. The mean annual temperature is 12.5°C (55°F), with extremes ranging from 0° to 38°C (32° to 100°F). The average annual rainfall is less than 15 in., which classifies the area as semi-arid. Rain falls primarily between October and April. The wind patterns also show a strong seasonal variation. During the summer months, the winds are predominantly from the west or southwest, flowing into the Valley from the San Francisco Bay Area through the Dublin Gap at its western end. The winds typically exit the Valley through the Altamont Pass at the eastern end. Peak winds tend to occur during the afternoon due to the "sea-breeze" effect caused by the high air temperatures in the inland valleys compared to the cooler air over the Pacific Ocean. Periods of calm occur most often during the early morning hours just before dawn. During the winter months, winds tend to blow predominantly from the south, with a secondary component from the north. Relative humidity ranges from daily lows of 40-60% in the afternoons to daily highs of 80% to over 90% in the early morning.

1.1.2. Land Use

Figure 1-2 is an aerial photograph of the SNL/California site and vicinity, showing the predominant land uses.

The SNL/California site is immediately bounded on the east, south, and west by a security buffer zone. No development is allowed in this zone, and public access is not permitted.

Lawrence Livermore National Laboratory (LLNL) lies directly to the north of SNL/California. Patterson Pass Road is the northern boundary of the LLNL site. Across Patterson Pass Road to the north is a light industrial park. A Union Pacific Railroad line runs east to west along the northern boundary of the industrial park. Land uses further north include vacant land, industrial, a Southern Pacific Railroad line, and Interstate 580 (I-580). Land northeast of the site is agricultural used primarily for grazing. Wind turbines are on the hills of the Altamont Pass further northeast of the site.

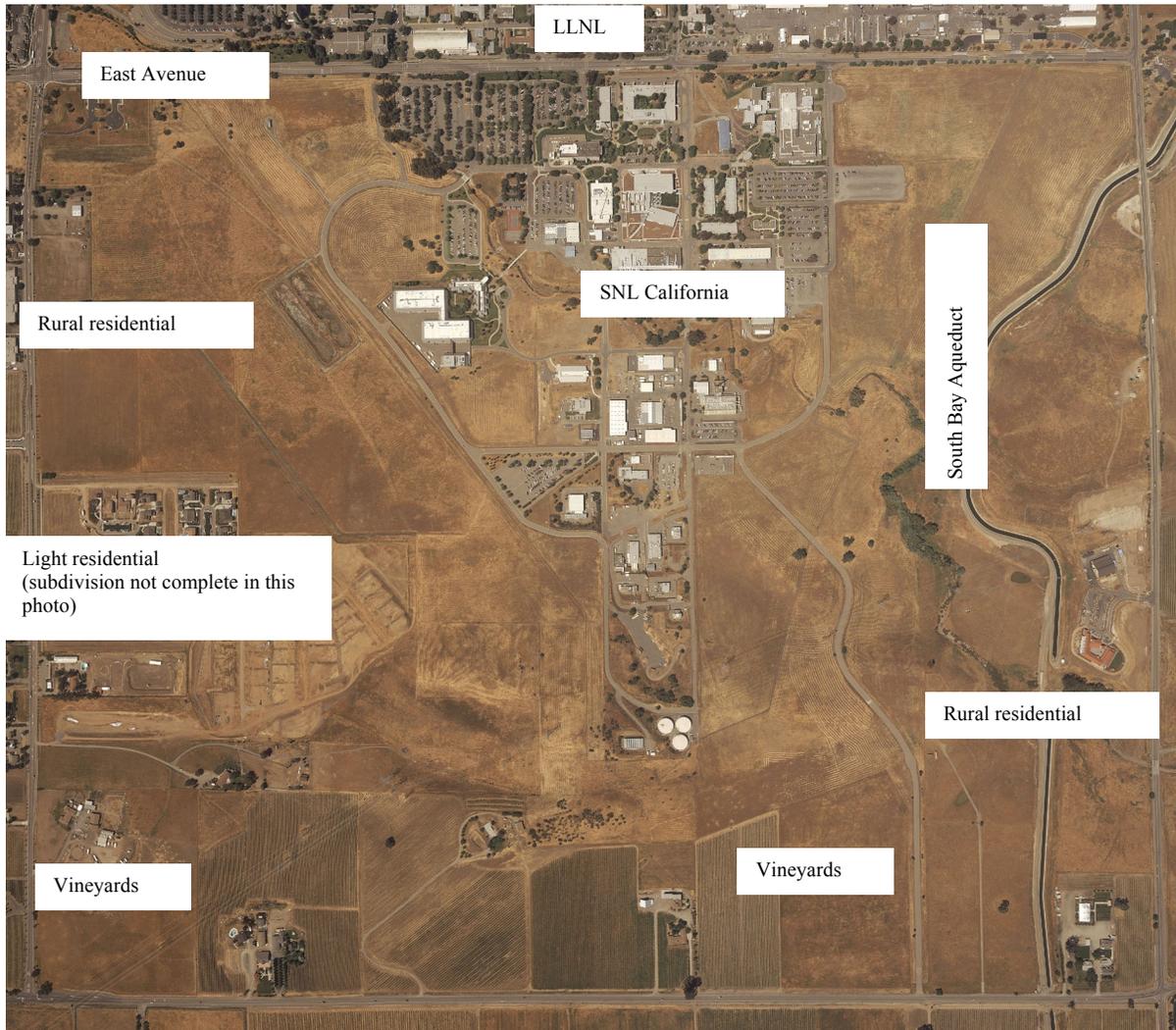
The SNL/California site is bordered on the east by private property and Greenville Road. The property east of Greenville Road is mainly agricultural, used primarily for grazing and vineyards, with a few scattered rural residences. A Western Area Power Administration electrical substation is on the southeast corner of Greenville Road and Patterson Pass Road. The South Bay Aqueduct, a branch of the California Aqueduct, traverses the land east of the SNL site from north to south and runs parallel to SNL/California's eastern boundary. The Patterson Reservoir and filtration plant for the South Bay Aqueduct are northeast of the SNL/California site along Patterson Pass Road.

Tesla Road borders the southern portion of the SNL/California site. Approximately 50 acres south of the SNL/California site border (between the border and Tesla Road) are vineyards. Agricultural lands south of Tesla Road and west of Greenville Road are also vineyards.

The SNL/California site is bordered on the west by private property and Vasco Road. A residential development is west of SNL/California, east of Vasco Road, and south of East Avenue. Residential housing developments are located west of Vasco Road on the north and south sides of East Avenue. A light industrial park is on the southwest corner of East Avenue and Vasco Road. Other lands to the west are rural residential and agricultural (primarily vineyards).

Several easements for utilities cross the SNL/California site. PG&E has easements for overhead high-voltage electric power transmission lines and an underground high-pressure gas line. Standard Oil Company of California has an easement for an underground oil line.

Figure 1-2 Predominant land uses around the SNL/California site



1.1.3. Operational Activities

SNL/California's engineering, research and development work requires the use of small quantities of hazardous and radioactive materials. These materials are present only in small laboratory-scale quantities. Table 1-1 lists SNL/California's facilities by building number, their description and use, and size (square footage). The following are SNL/California's activities that could release pollutants to the environment:

1. *Space Heating*-SNL/California has eleven boilers on-site for providing space heating. All of the boilers are fired by natural gas. Given the size of the boilers and one source of fuel they are exempt from BAAQMD permitting. However, beginning in 2008 they became subject to other prohibitory rules of BAAQMD that limit emissions from the boilers.

Table 1-1 SNL/California Facilities

Bldg. #	Description/Use	Sq. Ft.	Bldg. #	Description/Use	Sq. Ft.
904	Auditorium	4,789	967	Chemical and Radiation Detection Laboratory (CRDL) Office	4,573
905	Combustion Research Facility (CRF) Offices	35,521	968	CRDL	18,920
906	CRF Labs	76,748	969	CRDL Mechanical Assembly	2,500
907	Mechanical Building	4,320	970	Energy Conversion Laboratory	2,267
910	Weapons Laboratory Building	81,795	972	Centrifuge and Laboratories	10,451
911	Personnel, Purchasing	23,579	973	Firing, Support Labs, and Offices	5,356
912	Offices, Services, Computer Center	124,009	974	Explosive Assembly	754
914	NDE, Applied Mechanics Laboratories	24,674	976	Gas Applications and Systems Facility	3,319
915	DISL, offices	73,338	977	Storage and Laboratory	1,347
915-1	Emergency Generator Room	504	978	Explosive Test Facility	3,121
916	Laboratories, Offices	41,874	979	Component Development Laboratory	4,489
916-1	Mechanical Equipment Building	5,803	982	Explosives Packaging Storage	234
916-3	Equipment Room	440	983	FTU Assembly	1,447
919	Electrical Substation	3,961	M22	Education Television Center	2,035
923	Records Storage	3,475	M23	Diversity and Development, Offices	2,041
925	Medical	5,080	M24	Offices	3,113
927	Warehouse	21,297	M25	Education Outreach, Offices	2,722
928	Shipping, Receiving, Stores	48,369	M28	Instrument Issue and Repair	1,356
929	Program Development Facility	22,440	M29	Offices	1,356
940	Manufacturing and Nano Technology Laboratories (MANTL) Offices	43,369	M30	Training Classroom	1,484
941	MANTL	31,010	M32	Life Design Center/Physical Therapy	2,784
942	MANTL	25,235	M44	Facility Turn Around Space	1,361
943	MANTL	6,602	M45	General Office	1,348
955	Environmental Test Facility	12,141	M47	Restrooms	525
956	Dynamic Test Facility	2,380	M50	Offices	6,234
960	Facilities and Environmental Office	11,902	M51	Offices	9,145
961	Radiation Decontamination and Storage Facility	3,579	M53	Satellite Badge Office	672
961-1	Hazardous Material Processing	5,945			
962-2	Maintenance Shed	676		Total	905,528
962-3	Storage	676			
963	Maintenance Shops	16,192			
963-1	Maintenance Warehouse	17,424			
963-2	Welding Shop	1,340			
963-3	Warehouse/Tool Crib	11,832			
964	Security Building	10,316			
965	Laboratory	1,091			
966	High Pressure Test Facility	7,568			

2. *Waste Storage Facility*-The Hazardous Waste Treatment and Storage Facility used for storing containerized and drummed wastes consist of two buildings 961 and 9611. Both structures are completely enclosed. They are made of prefabricated, pre-engineered steel

frame with a monolithic concrete floor and metal roof. The floor is coated with a chemical resistant epoxy coating. Building 9611 also has a covered loading dock on the south side. The dock has a secondary containment trough if a spill during loading operations should occur on the west side. Waste is not stored on the dock. The requirement for containment of precipitation from a 24-25 year storm does not apply because the facility is completely under roof.

3. *Electroplating Laboratory*- The Building 943 laboratory liquid effluent is treated in a closed-loop system and reused as makeup water. The BAAQMD has issued a permit for the hexavalent chromium plating process in Building 943. The permit conditions require records of ampere-hours be maintained monthly. However, the plating process equipment has not operated in over a decade and there are no plans for its future operation. Nevertheless, the permit is still updated and reissued annually, allowing SNL/California to maintain the capability for chromium plating in case the need ever arises.
4. *Explosives Testing*-Small-scale testing of explosive devices is conducted in enclosed test cells. These sources have been archived with the BAAQMD and are no longer on the SNL/California Permit to Operate.
5. *Radiography*-Isotopic gamma ray sources (^{60}Co and ^{192}Ir) and x-ray-producing machines are used in the 941 complex. The external dose rates in and around the building were studied and were determined to slightly exceed background levels during operations. These operations do not release radioactive materials to the environment.
6. *Combustion Research Facility*-This facility houses research-scale studies of combustion processes, including research on internal combustion engines. The laboratories and processes in this facility are typically exempt from permitting due to their small scale research applications. As changes to laboratories, processes or materials occur, emissions evaluations are performed to verify that exemptions are still applicable.
7. *Maintenance Shop*-This shop maintains and repairs mechanical equipment for all SNL/California organizations. These operations entail the use of various solvents and other chemicals that may be subject to environmental regulations.
8. *Model Shop/Test Assembly*-This shop fabricates and assembles components for research and experiments. These operations may involve the use of radioactive or hazardous materials.
9. *Experimental Laboratories*-Various small, research-scale laboratories use a wide range of chemicals or hazardous substances. Airborne and liquid emissions have been evaluated and controlled as necessary. Appropriate permits or written exemptions have been obtained for these laboratories.
10. *Semiconductor Manufacturing Laboratory*-The Semiconductor Manufacturing Laboratory in Building 968 conducts the following operations: polishing, etching, cleaning of film, lithography, and film deposition. These operations use acids, caustics, and solvents. Effluent from this laboratory is directed to a treatment unit where the pH is neutralized. Prior to release to the sanitary sewer, the effluent in the LECS is analyzed to determine if it is in compliance with LWRP discharge limits. In addition, effluent from the laboratory is analyzed biannually under the requirements of the Federal Categorical pretreatment Regulation. LWRP also independently samples and analyzes the effluent from these processes.

1.1.4. Known Areas of Contamination

Several areas at the SNL/California site have been investigated to determine if environmental contamination was present. One contaminated site has been remediated and formally closed. The following discussion covers those areas where environmental contamination exists.

Fuel Oil Spill Site (FOS)

In 1975, as the result of an accidental puncture of an underground transfer line, 59,500 gallons of #2 diesel fuel spilled into the vadose zone from an aboveground reserve fuel tank.

SNL/California completed a remedial investigation of the spill site in November 1988. In-situ bioremediation was determined to be the technology of choice for clean up of the FOS.

During installation of the bioremediation facility, an interim remedial measure was implemented. This interim measure consisted of capture of groundwater and treatment with activated carbon.

The bioremediation facility operated from June 1995 through July 1999. Data collected during this time period indicated that the diesel plume was not migrating, and that natural degradation of the diesel would be sufficient to prevent negative impacts from the plume. The Regional Water Quality Control Board (RWQCB) allowed SNL/California to dismantle the bioremediation facility.

SNL/California is required to monitor two wells at the FOS semi-annually. Periodically, the Regional Water Quality Control Board may review the data, and decide if further action is required.

Navy Landfill

An inactive landfill is located at the southern end of the SNL/California site. It was used by the Navy during and shortly after World War II, and again by LLNL in the 1950s and early 1960s. A survey of historical records and landfill contents indicated that only general construction debris and machine turnings were disposed of at the site. There is no indication that hazardous materials were buried at this landfill. The landfill measures approximately 11,300 m² in area and 68,800 m³ in volume.

SNL/California investigated this site from 1988 through 1998.

In October of 1997, a risk assessment and closure plan were submitted to the Regional Water Quality Control Board. The closure request was approved in March 1998. Closure of the NLF was approved if the following conditions were satisfied:

1. Groundwater monitoring is continued on a quarterly basis at monitoring well NLF-6, where carbon tetrachloride is intermittently detected.
2. An adequate vegetative cover is applied to the landfill, such that there are no exposed areas.
3. Erosion control measures are followed in accordance with the submitted erosion control plan.

All NLF site closure activities were completed on July 9, 1998, and the site is considered closed as of that date. All of the Regional Water Quality Control Board closure conditions have been

satisfied. SNL/California will continue to monitor NLF-6 and to follow the site's erosion control plan. Continued inspections of the NLF site have shown no evidence of erosion.

SNL/California was required to continue quarterly monitoring of carbon tetrachloride at well NLF-6 until four continuous quarters of non-detectable concentrations was achieved. This was achieved during the first quarter of 2005. A request to rescind Cleanup and Abatement Order 89-184 was made to the RWQCB on April 18, 2005. In August 2005 the RWQCB approved decreasing monitoring at NLF-6 from quarterly to annually.

Trudell Auto Repair Shop

The Trudell Auto Repair Shop site is located in the Buffer Zone area on the northwest corner of the site. Hydrologic investigations at the Trudell site identified areas of soil pollution in localized areas of the site, and in two areas where waste oil was disposed of to land. All remedial actions were completed by August 1990. Since the area of contamination at Trudell was small, no monitoring wells were drilled by SNL/California. However, LLNL has three wells at or near the Trudell site; previously SNL/California sampled one of these wells (MW-406). This well was also sampled for groundwater down gradient perimeter monitoring. In early 2005, the RWQCB allowed SNL/California to discontinue monitoring this well. LLNL continues to monitor this well and at the RWQCB's request SNL/California will report these monitoring results in the Annual Site Environmental Report.

Solvent Plume from LLNL

The plume of TCE contaminated groundwater underlying LLNL property extends onto SNL/California property. The source of the TCE was from past practices at LLNL. LLNL is treating groundwater to remove the TCE. SNL/California has no responsibilities in this area. SNL/California has discontinued monitoring MW-406 annually but will continue to review LLNL monitoring results until tetrachloroethene (perchloroethene or PCE) is non detectable.

1.2. Effluent Monitoring

Effluents are monitored to demonstrate SNL/California's compliance with applicable Federal, State, and local laws, regulations, and orders. Monitoring is done through quantification of pollutant emissions at the points of discharge from facilities.

Data from effluent monitoring equipment are used to assess compliance with standards for pollutant emissions.

SNL/California is committed to conduct operations so that emissions of hazardous materials to the environment are in compliance with all applicable regulations. Moreover, Sandia strives to keep emissions to ALARA levels.

SNL/California monitors two types of effluents: process wastewater and the sanitary sewer effluent (where it leaves the site and joins the sanitary sewer effluent from LLNL).

SNL/California does not have any radiological or non-radiological emissions that require air monitoring.

SNL/California has established the following policy for wastewater discharges:

- *Any wastewater discharged either directly to the site sanitary sewer system or to a LECS shall not have pollutant concentrations exceeding the site outfall discharge limits imposed by the City of Livermore.*
- *Wastewater effluents from categorical processes must comply with Federal Pretreatment Standards.*
- *Routine discharges from the LECS to the site sewer system must also comply with site outfall discharge limits. If LECS wastewaters inadvertently exceed these concentrations, but are below hazardous waste concentrations, the effluent may or may not be treated or shipped off-site for treatment or disposal at the discretion of the Environmental Management Department. If the effluent exceeds hazardous waste concentrations, it shall be shipped off site as a hazardous waste.*

Long-standing Sandia policy prohibits hazardous waste disposal down sanitary sewer connections.

DOE/EH-01733T and Section 13.32 of the city of Livermore Municipal Code outline the monitoring requirements for process wastewater and sanitary sewer effluents. These requirements are also included in the Wastewater Discharge Permit #1251. Table 1-2 lists the site sanitary sewer outfall discharge limits for specific pollutants.

Table 1-2 Specific Pollutant Limitations

Pollutant	Concentration Limit^a
Arsenic	0.06 mg/l ^b
Cadmium	0.14 mg/l
Copper	1.0 mg/l
Chromium (Total)	0.62 mg/l
Lead	0.20 mg/l
Mercury	0.01 mg/l
Nickel	0.61 mg/l
Silver	0.20 mg/l
Zinc	3.00 mg/l
Cyanide	0.04 mg/l
TTO ^c	1.0 mg/l
pH	5-10

^a These limits are specified in Section 13.32.100 of the City of Livermore Municipal Code and have been adopted by SNL/California as internal operating limits.

^b 1 mg/l is equivalent to 1 ppm (parts per millions).

^c TTO = Total Toxic Organics

1.2.1. Sanitary Sewer

SNL/California monitors its sanitary sewer effluent before it exits the site and joins the sanitary sewer flow from LLNL.

To provide a final check on the quality of the effluent flow, SNL/California continuously monitors, and collects samples of the effluent (see Table 1-4 for the analyses performed on the samples). This way, SNL can verify compliance with discharge limits.

Table 1-3 Sanitary Sewer Sampling Type and Frequency

Frequency	Type	Parameter	EPA Method
monthly	grab	cyanide	335.2
monthly	grab	semi-volatile organics	625
monthly	grab	volatile organics	624
monthly	grab	chlorinated pesticides	608
weekly	weekly composite	metals	200.7, 206.2, 239.2, 245.1
monthly	daily composite	TDS, TSS, BOD	150.1, 160.1, 160.2
Continuous	Continuous	pH	N/A
Continuous	Continuous	Flow	N/A

In addition, the combined effluent at the LLNL sewer outfall is monitored extensively, to include continuous monitoring for metals, pH, flow, and gamma radiation. This monitoring is supplemented by flow proportional grab samples, which are analyzed daily for gross alpha activity and gross beta activity. These composite grab samples are also analyzed monthly for metals, organics, TDS, TSS, specific conductivity, BOD, COD, and CN.

Sanitary sewer effluent samples are collected at the site sewer outfall approximately 400m northwest of the Building 941 complex (see Fig. 1-3).

The City of Livermore Wastewater Discharge Permit contains pollutant limits based on applicable Federal and State regulations. Title 17 CCR contains discharge limitations for radionuclides.

Monthly grab samples are collected manually at the outfall, upstream of the flow-measuring instrument. Continuous flow-proportional samples are collected with an ISCO refrigerated sampler. Table 1-4 shows the collection frequency of the various types of samples. A second flow proportional sampler collects daily composite samples, which is archived until results from the original sample have been received. Monthly grab samples are collected for cyanide, semi-volatile organics, and volatile organics (the organics results are compared to the TTO effluent limitation). Flow-proportional daily composites are collected monthly for TDS, TSS, and BOD. Flow-proportional weekly composites are collected for metals. A State-certified contract laboratory does these analyses.

Table 1-4 Sanitary Sewer Effluent Analyses

Frequency	Type	Parameter	EPA Method
monthly	grab/ composite	cyanide	335.2
monthly	Grab	semi-volatile organics	625 ¹
monthly	grab	volatile organics	624
Monthly	Grab	pesticides and PCBs	608
weekly	weekly composite	metals	200.7, 206.2, 239.2, 245.1
monthly	Daily composite (Monday)	TDS, TSS, SC	150.1, 160.1
monthly	Daily composite (Monday)	COD	410.4
monthly	Daily composite (Monday)	BOD	160.2

Quality Assurance/Quality control duplicate samples are collected for all parameters on a monthly basis.

In 2010, a redesign of the sanitary sewer sampling system was undertaken. The new system includes a magnetic flow meter to improve the accuracy of the sewer flow measurement, and a grinder pump for the sample stream. The grinding of the sample stream is expected to improve the homogeneity of the samples collected. The redesign was undertaken in response to exceedance of the discharge limits for copper in 2009. An environmental consulting firm was retained to provide the system design. The new design was approved in principle by the City of Livermore before implementation was initiated. Testing of the new system began in March 2011.

1.2.2. Liquid Effluent Control Systems

Liquid effluents from the major wastewater-generating operations on-site are routed to the site's liquid effluent control systems (LECS). LECS are not required by any regulations, but SNL/California has established them to provide better control of liquid effluents and to ensure compliance with regulatory discharge limits and sound management practices.

The LECS comprise large doubly-contained, level and pH-monitored, holding tanks. These tanks collect and retain the wastewater, allowing a sample to be analyzed for process constituents. (If a tank contains pollutants at levels greater than regulated permit limits, then the liquid is treated or disposed of as hazardous waste, as described in the policy statement above.)

The Environmental Management Department is responsible for managing all aspects of the LECS, including collecting and analyzing samples, disposing of wastewater, and keeping records.

Figure 1-3 shows the locations of the LECSs at the SNL/California site. They are:

- *Bldg. 906* – process wastewater is routed to a LECS consisting of two 6,000-gallon tanks (new tanks installed in 2005).
- *Bldg. 916* – process wastewater from laboratories in Bldg. 916 is routed to a LECS consisting of three 5,000-gallon tanks.
- *Bldg. 941* – process wastewater is routed to a LECS consisting of two 5,000-gallon tanks.
- *Bldg. 961* – water from decontamination operations is routed to a LECS, consisting of one 2,000-gallon tank.
- *Bldg. 968* – all floor drains and laboratory sinks are routed to four 2,000-gallon tanks.

When the liquid level in a tank reaches a pre-determined level, the tank is isolated and a sample is collected and analyzed. The tank does not receive any more wastewater before its contents are properly disposed.

To assure that a representative sample is collected, the contents of the tanks are agitated by recirculation, stirring, or by air being bubbled through them before they are sampled.

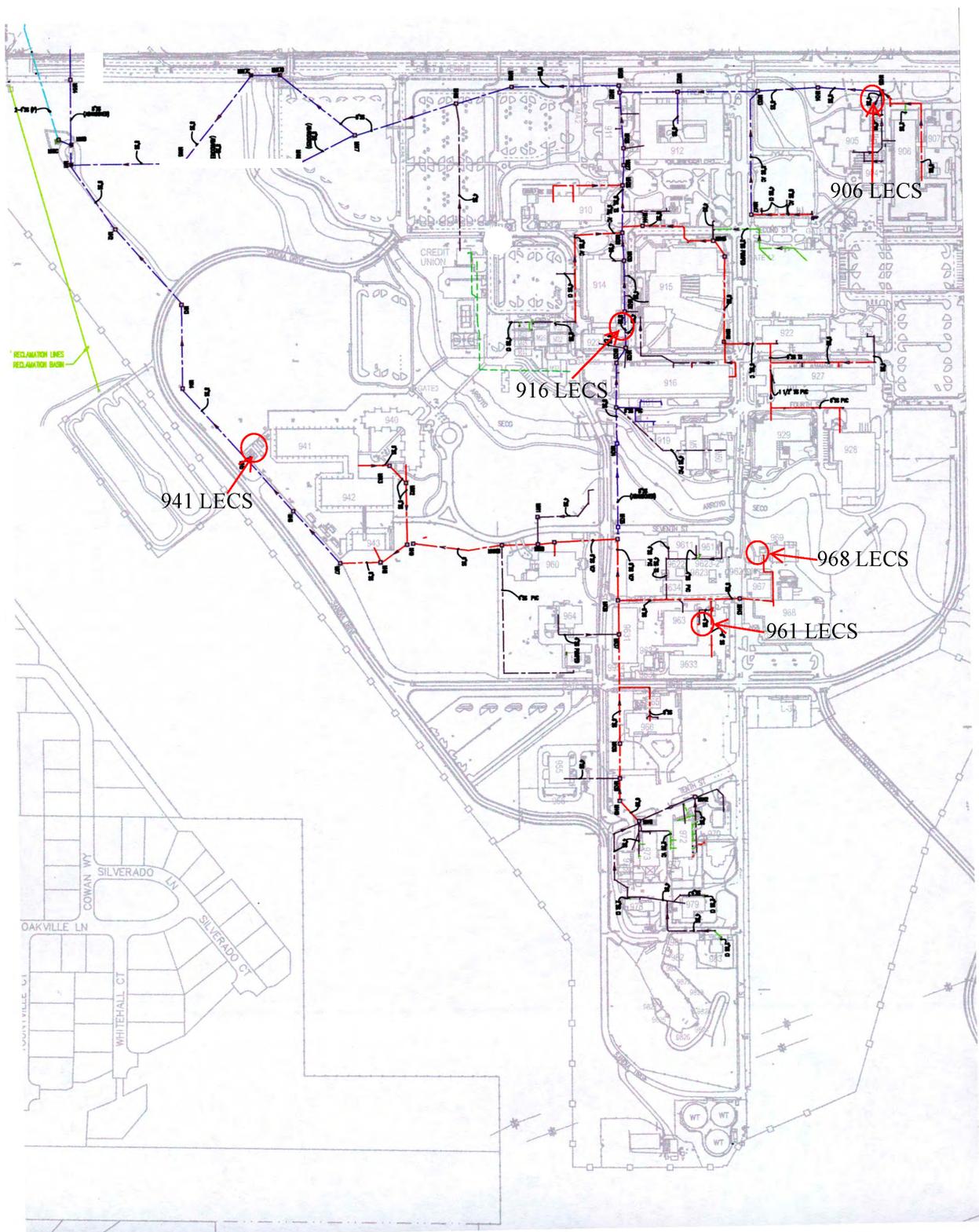
A State-certified contract laboratory analyzes all LECS samples. If needed, LECS tanks can be sampled and analyzed in the field for copper and zinc using a VVR Water Analysis System at the discretion of the program lead. The 906, 916, 941, and 968 LECS are continuously monitored for pH and liquid level. The 961 LECS receives only batch discharges; thus continuous level monitoring is not implemented here.

The analyses done on each LECS are based on the process generating the wastewater (see Table 1-5). The primary constituents of concern are metals. Procedures for collecting and analyzing samples from the LECS have been developed and implemented. The procedures also address quality assurance and control issues.

Table 1-5 LECS Wastewater Analyses

LECS	Analyses
B. 906	As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn
B. 916	As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn
B. 941	As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn
B. 961	As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn, 238U, volatiles, semivolatiles, CN ⁻
B. 968	As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn

Figure 1-3 SNL/California sanitary sewer system and locations of the liquid effluent control system



1.2.3. Federal Categorical Processes

SNL, California has three processes, which are subject to the regulation under the Federal Categorical Pretreatment Standards. The regulations for the Federal Categorical Pretreatment Standards applicable to SNL/California operations are found in 40 CFR parts 403, 433, and 469.

SNL/California operates two metal finishing categorical process subject to the EPA's pretreatment standards for point sources. The processes are the Electroplating Facility in Building 943 and the Fiber Lebensraum Laboratory in Building 906 Room 114. These processes do not discharge to the sanitary sewer, and therefore, are exempt from sampling. There is an additional laboratory in Building 942 room 1309 that may infrequently perform electroplating. It is done on a small scale, less than 50mL, and all liquid waste is handled as hazardous waste. There is no discharge from this process. SNL/California operates one semi-conductor categorical process, the Microstructures Laboratory in Building 968 Room 120, subject to the EPA's pretreatment standards for point sources.

Semiannually, SNL/California conducts special sampling procedures for the semi-conductor operation's wastewater. The compliance point for categorical processes is at the end of the process, not at the site outfall. To comply with the requirements of the Federal Pretreatment Standards and the City of Livermore Wastewater Treatment Plant wastewater permit, SNL/California collects grab samples of the wastewater from the Microstructures Laboratory semiannually. A State-certified commercial laboratory analyzes the samples for pH, arsenic and total toxic organics (TTO).

1.3. Environmental Surveillance

The primary task of the Environmental Monitoring Program is to monitor the major potential pollutant release pathways from the SNL/California site. Environmental surveillance samples also provide a means of verifying the effectiveness of environmental controls (at the source). They provide valuable data for determining SNL/California's compliance with applicable environmental regulations.

The Environmental Monitoring Program also provides surveillance for detecting and quantifying unplanned releases (e.g., in case of an accident).

SNL/California monitors external radiation and liquid effluents. Table 1-6 shows the DOE's minimum criteria for determining a need for environmental surveillance. Even though this table deals primarily with radionuclide monitoring, SNL/California uses these criteria to show that specific radionuclide monitoring is not justified at SNL/California. Table 1-7 summarizes SNL/California's environmental surveillance activities. State and local authorities also require SNL/California to perform environmental surveillance, as reflected in Table 1-7.

Table 1-6 Minimum Criteria for Determining Need for Environmental Surveillance

Topic	Criteria
Routine surveillance of all pathways (ingestion, inhalation, and immersion and submersion doses)	When feasible, all environmental media that, as determined by site-specific radiation exposure pathway analysis, might lead to a measurable annual dose of site origin at the site boundary should be routinely sampled and analyzed (for the critical radionuclides to dose) and routine measurements of penetrating radiation should be performed at those sites that, as determined by site-specific exposure pathway analysis, might result in an annual dose of site origin at the site boundary, if the total exceeds a) 5 mrem effective dose equivalent; or b) 100 person-rem collective effective dose equivalent within a radius of 80 km of a central point in the site.
Periodic confirmation	Environmental surveillance measurements may be performed periodically, but should be performed at least every five years, to confirm the low dose levels, if the projected annual effective dose equivalent of site origin is less than 0.1 mrem. The frequency and magnitude of environmental surveillance should be proportional to the potential annual dose. Where potential annual dose represents a significant fraction of the reference dose for routine surveillance, environmental sampling should be more frequent. At 20% of the reference dose (e.g., 1 mrem effective dose equivalent from emissions during a year), annual surveillance for confirmation should be considered.
Pathway measurements	Actual measurements on two media for each critical radionuclide/pathway combination, one of which might be the effluent stream, should be performed as part of the site routine effluent monitoring and environmental surveillance program.
Use of control data	Use of data should be based on statistically significant differences between the point of measurement and background (or control) data.
Unplanned releases	Provisions should be made, as appropriate, for the detection and quantification of unplanned releases of radionuclides to the environment.

Table 1-7 Environmental Monitoring Sampling Program

Media	No. of Locations	Parameters	Frequency	Requiring Authority	Authority Reported to
Groundwater	7	tritium, metals, solvents, pesticides, minerals, diesel	quarterly, bi-annual and annual	DOE Order 231.1 RWQCB Order 89-184	DOE, RWQCB
Sewer	1	metals, pH, TSS, priority pollutants, cyanide, BOD, COD, TDS	continuously, weekly, monthly	DOE Order 231.1, City of Livermore	DOE, City of Livermore
Sewer (satellite) ¹	2	Cu, Zn	Weekly	SNL	DOE, City of Livermore
Storm water	9	tritium, pH, TSS, oil and grease, cyanide, metals, COD, specific conductance, ammonia and nitrate/nitrite	two storms per year	DOE Order 231.1, State of California General Industrial Permit	DOE, State of California (RWQCB)
External radiation	4	dose	monitored continuously, analyzed quarterly	DOE Order 231.1	DOE

¹ Operated at SNL initiative, not a regulatory requirement.

1.3.1. External Radiation

The public may be exposed to external radiation from nuclear facility operations. Pathways include cloud passage of airborne effluents; previously released and deposited radionuclides on soil, vegetation, or sediments; radiation-generating facilities, especially high-energy accelerators or industrial x-ray equipment and large isotopic radiation sources; and the storage or movement of radioactive waste.

The only sources of external radiation at the SNL/California site are isotopic radiation sources used for industrial radiography operations. Thermoluminescent dosimeters (TLDs) are used to measure the dose rates near SNL/California. Dosimeters are located at the site perimeter and more distant locations near the California site. Presumably, if the Laboratory were contributing significantly to the external radiation doses, the dosimeters at the site perimeter would show a higher dose than those at more distant locations.

DOE/EH 0173T contains guidance on external radiation monitoring methods (see Table 1-6). Additional guidance on external radiation monitoring may be found in the U.S. Nuclear Regulatory Commission's (NRC's) Regulatory Guide 4.13 and ANSI-N545-1975.

SNL/California maintains four on-site TLDs (Fig. 1-4). Figure 1-4 also shows the near-field TLD locations (maintained by LLNL), and Figure 1-5 shows the distant TLD locations (also maintained by LLNL).

The TLDs used on-site at SNL/California are Harshaw Model 8807. Environmental Management Department personnel collect them quarterly and send them to SNL/New Mexico, for analysis by the Health Instrumentation Division. In the field, the TLDs are put in plastic vials, which are placed in waterproof, light sealed containers at the sampling location.

The off-site TLDs are collected quarterly by LLNL's Environmental Monitoring Group and are processed by LLNL's Hazards Control Division. They are kept in mylar bags while in the field. The sampling locations have been chosen to avoid interference from large or massive objects nearby.

Each phosphor of LLNL's TLD must read within $\pm 5\%$ of the other three phosphors upon calibration to be acceptable for placement in the field. Dosimeters with a known exposure are introduced as blind samples during processing of the field dosimeters. These are equivalent to spiked pseudosamples for the purpose of establishing the accuracy of the system.

Duplicate dosimeter packets are placed at random locations and are analyzed with the routine dosimeters. The dosimeters are calibrated using NIST-traceable standards. Potential doses to the TLDs during collection and transit are assessed by the use of transit or trip controls.

Figure 1-4 Near-field thermoluminescent dosimeters (external radiation monitoring)

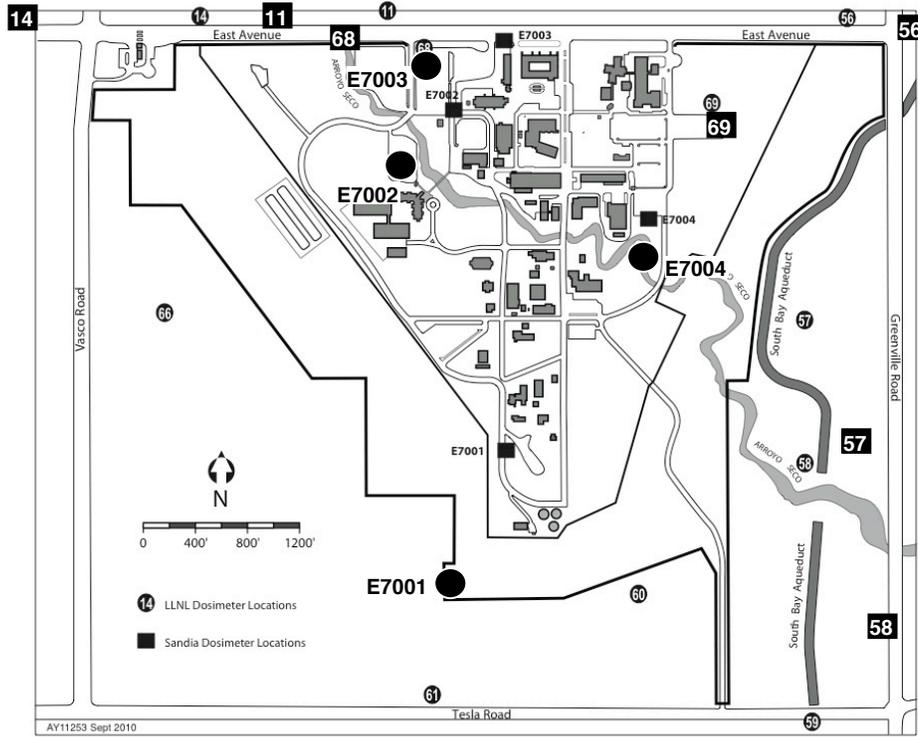
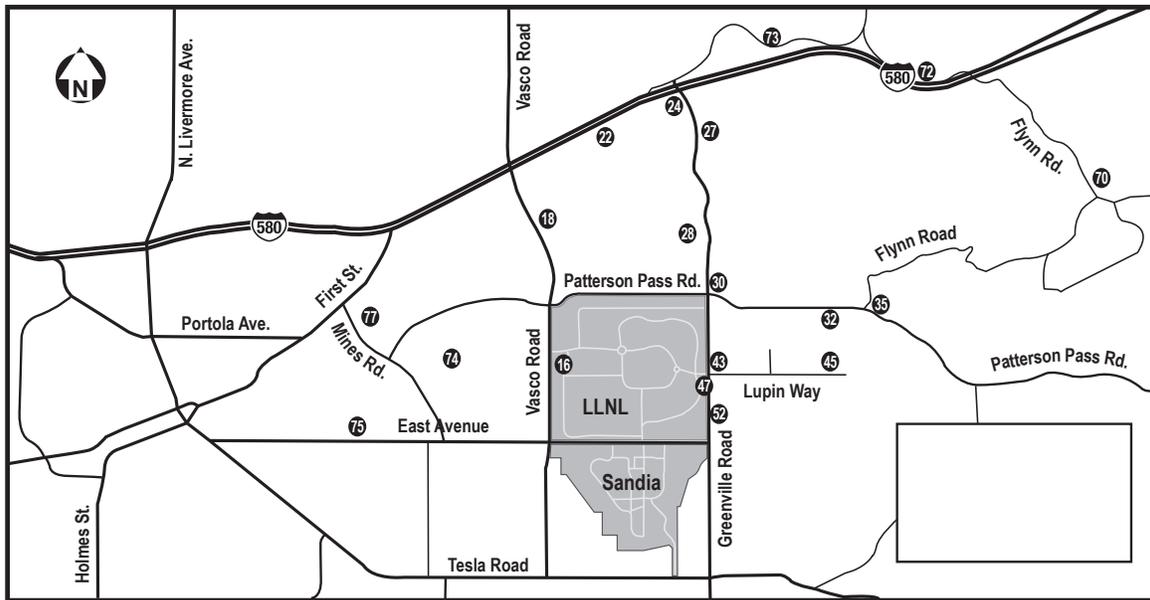


Figure 1-5 Locations of distant thermoluminescent dosimeters (external radiation monitoring)



1.3.2. Biological Dose Assessment

In accordance with DOE Orders 5400.5 and 450.1, SNL/California performs a biological dose assessment (BDA) annually. This assessment is performed utilizing DOE's graded approach as presented in DOE Standard 1153-2002 "A Graded Approach for Evaluating Doses to Aquatic and Terrestrial Biota."

The technical standard includes spreadsheets that include models for calculating doses from sediment and water radionuclide concentration data. The first step in the graded approach is a general screening, which 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 unity, then further analyses are required.

The radionuclides handled in greatest quantity at SNL, California during present or past operations are tritium and depleted uranium. Tritium in storm water runoff was the only radiological data available for SNL/California. However, because tritium was not detected above analytical detection limits in storm water samples collected in 2010, the detection limit value was used in the RAD-BCG Calculator, a computer tool developed by DOE to calculate doses and determine the need for and level of monitoring required. The sum of fractions from storm water data totaled 2.72×10^{-9} . This small fraction indicates that further analysis is not required and that SNL/CA is not required to monitor aquatic or terrestrial biota are input into the spreadsheet.

SNL/CA and LLNL did not collect uranium data in Arroyo Seco Sediments during 2010, so this data was not included in the BDA.

1.3.3. Storm Water Runoff

Storm water may pick up various pollutants, such as oil and grease, soil, litter, pesticides and fertilizer, as it runs off rooftops, material handling areas, parking lots, and other impervious areas on-site. The SNL/California site has a storm drain system that transports surface runoff to the Arroyo Seco directly or via a ditch along East Avenue. Generally, any flow in the Arroyo Seco during wet months discharges into Alameda Creek, which eventually flows into San Francisco Bay. During dry months, any non-storm water discharge would eventually evaporate or infiltrate before reaching the Bay; however, pollutants may still be transported to San Francisco Bay when the Arroyo Seco flows again.

SNL/California is governed by California's General Industrial Activities Storm Water NPDES General Permit (general industrial storm water permit). This permit regulates storm water discharges from "industrial activities" (as defined by the EPA's Phase I November 1990 regulations). It requires that SNL/California do the following:

- effectively eliminate non-storm water discharges,
- prepare and implement a Storm Water Pollution Prevention Plan (SWPPP),
- develop and conduct a Storm Water Monitoring Program.

In response to the permitting requirement of the Federal Clean Water Act for municipal storm water discharge, the City of Livermore and Alameda County Flood Control & Water Conservation District adopted ordinances that also require SNL/California to manage storm water discharges to the municipal storm drainage system. However, under a memorandum of understanding with the Regional Water Quality Control Board (RWQCB), the RWQCB is the lead regulatory agency for federal facilities such as SNL/California.

SNL/California has prepared and maintains a Storm Water Pollution Prevention Plan that identifies activities that result in non-storm water discharges to the storm drain system and describes how these discharges are eliminated. It identifies sources and activities that could allow pollutants to be deposited on impervious surface and picked up by storm water runoff. It also

describes how SNL/California minimizes these pollutant sources discharged with storm water runoff by implementing best management practices.

The purpose of the Storm Water Monitoring Program is to optimize SNL/California storm water pollution prevention activities. It consists of extensive visual inspection and sampling activities, which include:

- quarterly visual inspection for non-storm water discharges,
- wet weather visual inspection,
- storm water sampling, and
- annual site inspection.

Storm water monitoring information is used to identify potential sources of pollutants and non-storm water discharges.

SNL/California prepares an “Annual Report for Storm water Discharges Associated With Industrial Activities.” This report is submitted to the State Water Resources Control Board and details the results of the storm water monitoring program for the year, including the inspections listed above, corrective actions taken, and the storm water analyses.

If construction activities onsite disturb one acre or more SNL/California must file a Notice of Intent (NOI) to be covered under California’s General Permit for Storm Water Discharges Associated with Construction Activities (general construction storm water permit). Sites between one and three acres, and that only have construction occurring during the dry season may be eligible for a Small Site Erosivity Waiver. During 2010, activities associated with the Combustion Research Computation and Visualization Facility (CRCV) was permitted with the State. The East Avenue Entrance Improvement Project received a Small Site Erosivity Waiver. The Environmental Monitoring Program will continue to ensure that BMPs for construction activities less than one acre are implemented under its current Industrial Activities SWPPP.

The California Small Municipal Separate Storm Sewer System (MS4) General Permit was adopted in 2003 to meet EPA Phase II storm water regulations. In anticipation of being regulated as a non-traditional small MS4, SNL/California has incorporated the six minimum control measures required by the Small MS4 General Permit into SNL/California’s existing Storm Water Management Program. The site has not yet received notification from the RWQCB to apply for coverage under the Small MS4 General Permit.

Storm water sampling and analysis are conducted at nine locations on-site. Sampling locations were selected based on the best representation of the drainage areas and types of activities conducted (Fig. 1-6).

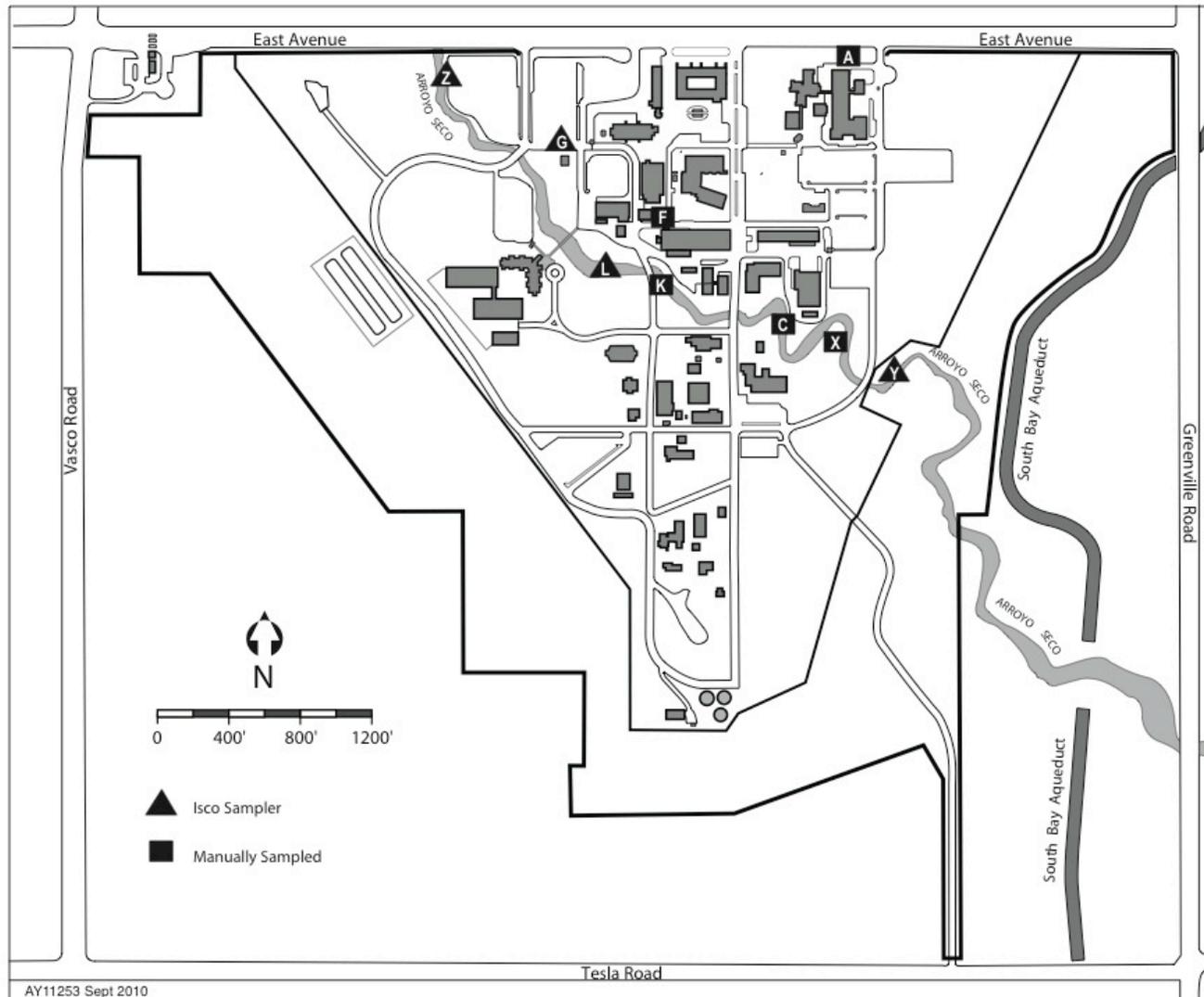
SNL/CA received permission from the RWQCB to cease sample collection at the Navy landfill during 2010. The landfill will continue to be monitored for erosion.

Storm water samples are also collected in the Arroyo Seco as it flows onto the site and immediately before it leaves the site.

All storm drain outfalls are visually inspected once a month during the wet season, when surface runoff results in a continuous discharge of storm water for approximately one hour or more. Visual observations help identify if pollutants, such as oil and grease or floating and/or suspended materials, are discharged with storm water.

All storm water outfalls are inspected quarterly during dry weather to identify if non-storm water is being discharged. Visual observations are also done to detect any evidence, such as stains or odors that may indicate a past or intermittent non-storm water discharge.

Figure 1-6 SNL/California site storm water sampling locations



The site is inspected at least once a year to identify outdoor areas or activities that may potentially contribute pollutants to the storm drain system. The site inspection also helps determine if best management practices (BMPs) identified in the SWPPP are being implemented properly and are achieving the objectives of the general industrial storm water permit.

Storm water sampling and sample preservation is done in accordance with EPA standard methods described in Title 40 CFR, Part 136. Samples are analyzed to identify the following parameters, as required by the general industrial storm water permit:

- pH
- total suspended solids
- oil and grease
- tritium
- cyanide
- specific conductance
- nitrate/ nitrite
- metals (As, Cd, Pb, Hg, Ag, Zn, Al, Fe, Mg, Se)
- ammonia
- chemical oxygen demand

Storm water normally is sampled twice during wet seasons, as specified in the general industrial storm water permit. In some years it is not possible to get two samples from each location. This may be due to low rainfall, timing of the storms (during off-work hours), or lack of sampling personnel.

Duplicate samples are collected at random outfalls during each storm in which a sample is collected. Blank samples also are collected to assess the potential for sample contamination.

1.3.4. Groundwater

The migration of pollutants to groundwater could expose the public if the contaminated groundwater is used for drinking water or irrigation. The primary area of groundwater recharge on the Sandia site is the Arroyo Seco. Pollutants that could be released to the Arroyo are metals, pesticides, and priority pollutants (organics). The Groundwater Surveillance Monitoring Plan, details groundwater monitoring at the Sandia site.

DOE/EH-01735T provides guidance on the type of groundwater monitoring DOE facilities should be doing. Groundwater monitoring requirements also are specified by RWQCB Orders 88-142 and 89-184 and subsequent letters from the RWQCB.

1.3.4.1 Environmental Restoration/Long Term Environmental Stewardship

As discussed in Section 1.1.4 there is one area of known groundwater contamination on the SNL/California site, the Fuel Oil Spill Site (FOS). The site is being monitored for natural biodegradation of the diesel. Currently SNL/California is required to monitor two wells at the FOS for TPH-diesel. It is anticipated that the monitoring of the FOS will continue indefinitely. This monitoring comprises the Long Term Environmental Stewardship (LTES) at the

SNL/California site. SNL/California also identified an inactive landfill onsite, the Navy Landfill (NLF). The NLF is a closed site but SNL/California continues to monitor one well (NLF-6) for carbon tetrachloride. Carbon tetrachloride concentrations have been detected in the groundwater. For comparison, the concentrations exceeded the State's drinking water maximum contaminant level (MCL), but do not exceed the Federal MCL.

All remedial actions were completed at the Trudell Auto Repair Shop site, located in the Buffer Zone area, in 1990. SNL/California discontinued sampling a LLNL monitoring well (MW-406) near the Trudell site. SNL/California will continue to review and report LLNL monitoring results at MW-406 to ensure no contaminants have been release to the groundwater.

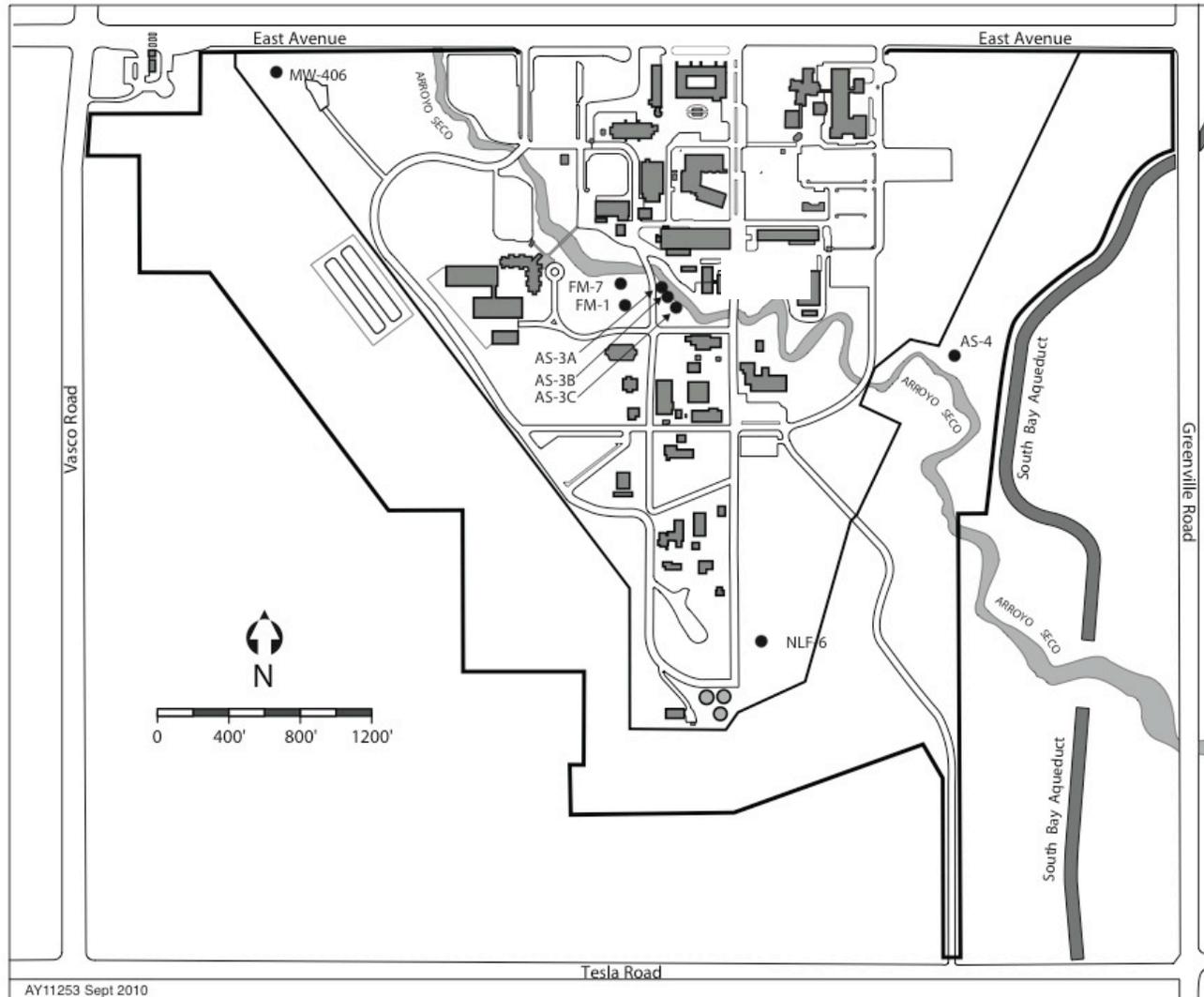
Monitoring wells located at each of these sites are shown in Figure 1-7.

1.3.4.2 Surveillance Monitoring

SNL/California has established four monitoring wells along the Arroyo Seco. One of these wells is upgradient of the site (for background sampling), and the other three are downgradient (for indicator sampling).

Each quarter, a sampling team collects groundwater samples from as many as 7 monitoring wells across the site, including both Long Term Environmental Surveillance and Surveillance Monitoring wells (some wells may not be sampled if the well does not contain enough water). Sample containers, with the appropriate preservatives already added, are provided by the contract laboratory used to perform the analyses. Groundwater samples are stored on ice while in transit to the analytical laboratory.

Figure 1-7 Groundwater monitoring wells on the SNL/California site



2. Program Drivers

SNL/California is required to meet all Federal, State, and local regulations, and DOE Orders concerning protection of the environment. DOE Order 450.1A replaces DOE Order 5400.1 in establishing the requirement to implement sound stewardship practices that are protective of the air, water, and land resources impacted by DOE operations. The *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE/EH-01735T) specifies the elements needed for an adequate environmental monitoring program at DOE sites. This guide provides generic performance criteria for protecting the public and the environment. It specifies actions, equipment, and operating methods DOE facilities should use to assure compliance with Federal regulations and DOE policy.

The following sections list the rules and regulations governing environmental monitoring.

2.1. Department of Energy Requirements

The following DOE Orders apply to SNL/California's environmental monitoring activities:

1. Order 450.1A, *Environmental Protection Program*-establishes environmental protection requirements, authorities, and responsibilities.
2. Order 5400.5, *Radiation Protection of the Public and Environment* (Jan. 1993, latest revision).
3. DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*-establishes guidance and mandatory requirements for effluent monitoring and environmental surveillance.
4. Order 0 231.1A, *Environment, Safety, and Health Reporting*-ensures collection, reporting, analysis, and dissemination of information on environment, safety, and health that is required by law or regulation, or that is essential for evaluating DOE operations.

2.2. Federal Regulations

The following Federal regulations apply to SNL/California's environmental monitoring activities:

Title 10, Energy:

1. Title 10 CFR, Part 835, *Radiological Protection*-regulates radiological does to workers at DOE facilities.
2. Title 10 CFR, Part 830.120, *Quality Assurance*-regulates quality assurance activities at DOE facilities.

Clean Water Act, as amended:

1. Title 40 CFR, Parts 112, *Oil Pollution Prevention and Response; Non-Transportation-Related Onshore and Offshore Facilities; Final Rule*-regulates the above ground fuel tanks.
2. Title 40 CFR, Parts 122-25, *National Pollutant Discharge Elimination System (NPDES)*-regulates the discharge of liquid effluents into bodies of water, including storm water discharge.
3. Title 40 CFR, Part 129, *Toxic Pollutant Effluent Standards and Prohibitions*-adds to the provisions of Title 40 CFR, Part 129 by restricting the discharge of listed toxic pollutants.
4. Title 40 CFR, Part 403, *General Pretreatment Regulations for Existing and New Sources of Pollution*-establishes the government's responsibility to prevent the discharge of waste that would reduce the treatment efficiency of a Publicly-Owned Treatment Works (POTW).
5. Title 40 CFR, Part 433, *Metal Finishing Point Source Category*-establishes discharge standards for metal finishing operations; SNL/California has two processes that fall into this category but do not discharge to the sanitary sewer.
6. Title 49 CFR 469.12(2) establishes discharge standards for semiconductor operations.
7. Title 40 CFR, Part 61, *National Emission Standards for Hazardous Air Pollutants- Subpart H- Department of Energy Facilities* – established standards for the release of radioactive air pollutants from DOE facilities.

Executive Order:

1. Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, January 26, 2007 – establishes environmental management goals for agencies, including water consumption intensity reduction.
2. Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, October 5, 2009 – establishes goals for reducing water consumption intensity.

2.3. California Regulations

The following State regulations, among others, apply to SNL/California's environmental monitoring activities:

1. Title 23 CCR, Division 3, Chapter 1, *State Water Resources Control Board and Regional Water Quality Control Boards*-establishes the authority and procedures of the boards; adopts EPA standards (Title 40 CFR, Part 122-125) for NPDES permitting and reportable quantities of hazardous materials.
2. Title 23 CCR, Division 3, Chapter 9, *Designation, Reportable Quantities, and Notification*-defines the standards for detection and monitoring associated with waste management units.
3. Title 17 CCR, *Public Health*, Chapter 5, Subchapter 4, "Radiation"-covers the form and function of the California Department of Health Services (DHS), and regulations for the implementation of State environmental acts.
4. *Safe Drinking Water and Toxic Enforcement Act of 1986*-prohibits any chemical that the State of California certifies as a known carcinogen or reproductive toxin

from being discharged into an actual or potential source of drinking water; requires the Governor to publish and annually update a list of chemicals determined to cause cancer or reproductive toxicity; and requires employers to notify workers of the presence and potential exposure to chemicals on the list.

2.4. Local Regulations

The following are the principal local regulations that apply to SNL/California's environmental monitoring activities:

1. City of Livermore, Municipal Code Section 13.32, *General Discharge Prohibitions*—contains regulations concerning wastewater discharges to the sanitary sewer, including processes covered by the Federal Categorical Pretreatment Standards. This section also contains limitations of discharge of specific pollutants.
2. City of Livermore, Municipal Code Section 13.45, *Storm Water Management and Control Program*—contains regulations controlling storm water discharge to the municipal storm drain system. As a federal facility outside the City boundary, Sandia/California is not regulated by the City's local storm water program, however, the site strives to remain a good environmental citizen in its local community.
3. Alameda County Health Department, California Health and Safety Code Division 20, Chapter 6.7, 25280-25299.8-establishes standards for construction, operation, maintenance, inspection and testing of underground storage tanks (USTs).

2.5. Legal Changes and Modifications to Program

Federal Regulations 40 CFR part 112 were revised October 15, 2007. The new regulations define Spill Prevention Control and Countermeasure (SPCC) Plan requirements for a new group of Qualified Facilities. The Plan and new requirements were implemented in 2009. However, the Environmental Monitoring Program updated the site Plan in 2009.

SNL/California has filed for coverage under the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems as requested by State Board staff. This General Permit will require the site to develop and implement a Sewer System Management Plan (SSMP) and report Sanitary Sewer Overflows (SSOs) monthly in a state database. The SSMP was completed by the due date of August 2, 2010.

The State Water Resources Control Board released an updated Construction Activities General Permit in 2009. The new version of the General Permit has new hydromodification project requirements, sampling requirements, effluent triggers and/or limits, NOI/SWPPP public review process and qualifications for SWPPP developers and practitioners. The new requirements became effective July 1, 2010.

In December 2009, the EPA issued guidance on complying with the Energy Independence and Security Act of 2007 section 438. This section requires that any development or significant redevelopment on federal property in excess of 5,000 square feet not change the runoff characteristics from what would be expected from the area in its natural state.

2.6. Process to Maintain Legal Requirements

With the loss of contract support at the end of 2009, keeping informed of regulatory changes has become much more challenging. SNL/NM Org. 4135 is responsible for informing the Environmental Monitoring Program Lead of any changes in federal regulations that would affect one of the program areas. The Program Lead maintains memberships in professional associations pertinent to the Environmental Monitoring Program including the California Water Environment Association, the California Storm water Quality Association, and the Water Environment Federation. The Program Lead receives email bulletins from the State Water Quality Control Board and shares a subscription to the California Environmental Insider.

3. Operational Controls

The Environmental Monitoring Program uses technical work documents, administrative and engineered controls, and specialized equipment as operational controls. Table 3-1 lists the technical work documents applicable to Environmental Monitoring Program operations. They include corporate policies and procedures, operating procedures, preliminary hazard screening documents, hazard assessments, and other site-specific requirements. Fume hoods are used as engineered controls to minimize contact with hazardous chemicals used to preserve samples. Administrative controls include signs stating that only authorized personnel shall access potentially hazardous areas, such as the LECS pits.

3.1. Operating Procedures

Environmental monitoring activities are described and documented in the Operating Procedures listed in Table 3-1. In addition to monitoring activities Environmental Monitoring Program staff have developed several documents to address quality control, data review and management practices for the portions of the environmental monitoring system under SNL/California's direct control.

3.2. Laboratory Procedures

Accurate laboratory analyses are critical to any environmental monitoring program. SNL/California's laboratory analyses include an appropriate number of blanks, duplicates, and spiked pseudosamples in order to assess accuracy and precision.

Contract laboratories used by SNL/California also must be accredited under either the National Environmental Laboratory Accreditation Program (NELAP), or by the State of California's Environmental Laboratory Accreditation Program (ELAP), or both. 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. Sandia personnel do not audit the laboratories.

SNL/California performs the tritium analyses of storm water. The SNL/California Health Physics Laboratory follows the guidance in the SNL Radiation Protection and Laboratory Services Quality Plan (SNL 2002), and meets the Sandia and DOE quality criteria.

The following sections summarize the analyses done on samples from each of the environmental media. More detailed information is available in the referenced procedures.

3.2.1. External Radiation

TLDs collected by SNL/California personnel are processed by the Health Instrumentation Department at SNL/New Mexico following established protocols and quality assurance/quality control requirements under the SNL Radiation Protection and Laboratory Services Quality Plan (SNL 2002). These TLDs are stored in a lead shield until they are processed. The readout data are analyzed with software that allows the systematic and uniform processing of data for each location. The net field results are compared to the calibration values. This comparison yields the field exposure in microrentgen (μR) per hour.

The TLDs collected by LLNL personnel are processed by LLNL's Hazards Control Department using automated equipment. The TLDs are stored in a lead shield until they are processed.

Table 3-1 Program Technical Work Documents

Corporate Business Rules	
ESH100.2.ENV.4	Manage Oil and Fuel Storage
ESH100.2.ENV.6	Control Discharges to the Sanitary Sewer System
ESH100.2.ENV.9	Implement Requirements for Reporting a Potential Past Waste Release Sites
ESH100.2.ENV.10	Manage Surface and Storm Water Discharges
ESH100.2.ENV.14	Comply with Radionuclide National Emissions Standards for Hazardous Air Pollutants (NESHAPs)
Primary Hazard Screen (PHS)	
SNL8A00186-015	Environmental Monitoring
Operating Procedures	
Sanitary Sewer Monitoring	Sanitary Sewer Outfall Monitoring (OP471410)
	Incident Reporting (OP471608)
	Categorical Process Monitoring (OP471409)
	Satellite Sanitary Sewer Automatic Sampler Operating Procedure (OP472228)
	Safe Operating Procedure for Entry into Sanitary Sewer Manholes (SP473630)
Liquid Effluent Control System Operation and Monitoring	968 Liquid Effluent Containment System (OP471097)
	906 Liquid Effluent Control System (LECS) (OP471452)
	916 Liquid Effluent Control System (LECS) (OP471454)
	941 Liquid Effluent Control System (LECS) (OP471455)
	Operating Procedure for In-Field Metals Analysis (OP471790)
Storm water Monitoring	Non-storm water Discharge Visual Observations (OP471089)
	Storm water Discharge Visual Observations (OP471090)
	Storm Water Sampling and Analysis (OP471091)
	Annual Comprehensive Site Compliance Evaluation (OP471724)
	Preventative Maintenance of Storm Drain System (OP471791)
	Storm Drain Spill Prevention and Control (OP471741)
External Radiation	Quarterly Replacement of Thermoluminescent Dosimeters (OP471305)
Groundwater	Groundwater Sampling (OP471701)
General Programmatic	Environmental Monitoring Program Database (OP471716)
	Data Validation and Verification for the Environmental Operations (OP471131)
	Data Analysis for the Environmental Surveillance Program and Wastewater/Storm water Program (OP471304)
	Control of Samples by the Environmental Operations Department (OP471310)
	Nonconformance Reporting, Form Logging and Tracking (OP471411)

3.2.2. Storm Water Runoff

The SNL/California Health and Safety Protection Department analyzes tritium samples by liquid scintillation counting, a standard technique for tritium analysis.

The non-radiological samples are sent to a State-certified contract laboratory, where they are processed according to EPA standards.

3.2.3. Groundwater

Groundwater samples from the monitoring well sites are sent to a State-certified commercial laboratory for analysis. They are processed according to EPA methods. The analyses performed are (depending on the location) volatile organics, semi-volatile organics, title 22 CCR organics, diesel, minerals, metals (As, Ba, Be, Cd, Cr, Pb, Hg, Se, Ag), and tritium.

3.2.4. Liquid Effluent Control Systems

Samples from the LECS may be sent to a State-certified laboratory for analysis. The samples are analyzed using appropriate EPA methods. Analyses are performed for regulated constituents used in the process generating the effluent.

The contents of the Bldg. 961 LECS are analyzed for radionuclides, metals, cyanide, volatiles, and semi-volatiles as indicated by process knowledge.

3.2.5. Sanitary Sewer

A State-certified contract laboratory using standard EPA methods conducts all metals, organics, and physical analyses.

4. Documents Produced

4.1. Data Management

Environmental monitoring data from the LECS analyses, storm water analyses, direct radiation, and sewer outfall analyses are kept in an electronic database. Reviewed data is stored in the Corporate file management system.

4.2. Reports and Permits

Table 4-1 lists the permits held by SNL/California for discharge of effluents, the category for each discharge, the regulatory agency and regulations governing each discharge, and the permit status. Table 4-2 lists other documents and reports generated by the Environmental Monitoring Program.

The Environmental Monitoring Program provides input to the Annual Site Environmental Report (ASER). This report summarizes all environmental monitoring data and all environmental activities at the SNL/California site. The ASER is the only mechanism for reporting groundwater and external radiation data.

Table 4-1 SNL/California Environmental Permits

Category	Regulation/Authority	Permit Status
Wastewater Discharge	City Ordinance, City of Livermore	Permit for the site sanitary and industrial wastewater discharge; Permit renewed annually
Industrial Storm Water Discharge	Clean Water Act (Title 40 CFR 122-124), EPA National Pollutant Discharge Elimination System, State Water Resources Control Board (SWRCB), Regional Water Quality Control Board (RWQCB), City Ordinance, City of Livermore	SNL/California has a Notice of Intent (NOI) on file with the SWRCB. As a result, Sandia is covered by the State's NPDES General Permit for Discharge of Storm Water Associated with Industrial Activities. Permit renewed every five years.
Construction Activities Storm Water Discharge	Clean Water Act (Title 40 CFR 122-124), EPA National Pollutant Discharge Elimination System, State Water Resources Control Board (SWRCB), Regional Water Quality Control Board (RWQCB), City Ordinance, City of Livermore	A permit must be obtained for any construction project that disturbs more than 1 acre of ground surface. During 2010, the construction of Building 903 was permitted. The modifications to East Avenue project was issued a small site waiver.
Underground Storage Tank	RCRA and California Health and Safety Code	Renewed annually with Alameda County Environmental Health Department
Above-ground Storage Tank	Title 40 CFR 112, RCRA and California Health and Safety Code	Renewed every 2 years with SWRCB
Sanitary Sewer System	State Water Resources Control Board (SWRCB), Regional Water Quality Control Board (RWQCB)	SNL/California has a Notice of Intent (NOI) on file with the SWRCB. As a result, SNL/CA is covered by the State's General Permit for Sanitary Sewer Systems
Streambed Alteration	Clean Water Act (Title 40 CFR 122-124)/U.S. Army Corps of Engineers (ACOE), RWQCB	Permit valid until 2018.

Table 4-2 Environmental Monitoring Program Documents and Reports

Document	Due Date	Frequency of Distribution	Distribution	Required by
Wastewater Discharge Permit Application	7/1/2011	Annual	City of Livermore	City of Livermore
Categorical Process Report	Jan. 20, July 20	Semi-annual	City of Livermore	City of Livermore
Spill Prevention Control and Countermeasure Plan (SPCC)	7/1/2014	Every 5 years	DOE/SSO	RWQCB
Wastewater Discharge Report	25 th of each month	Monthly	City of Livermore	City of Livermore
Annual Sanitary Sewer Overflow Summary Report	March 15, 2011	Annual	SFRWQCB	SFRWQCB
Spill/Slug Plan	6/30/2011	Every 2 years	DOE/SSO	City of Livermore
Groundwater Surveillance Monitoring Program Plan	September 2015	Every 3-5 years	DOE/SSO	DOE/SSO
Storm water General Industrial Permit (Notice of Intent (NOI))	Renewed July 1997	One time only	RWQCB	SWRCB
Storm water Pollution Prevention Plan	Continually updated	Reviewed annually	RWQCB	RWQCB
Storm water Discharge Report	7/1/2011	Annual	RWQCB	RWQCB
NESHAPs Letter Report	6/30/2011	Annual	EPA Region IX	EPA Region IX
Sanitary Sewer System General WDR (NOI, Legally Responsible Official Registration Form and Data Submitter Registration Form for the SSO Database) Sewer System Management Plan Parts i, ii Parts iii, iv, vi, iiv Parts vi, viii, ix, x, xi	1/2008 5/2/2008 2/2/2010 8/2/2010	One time only One time only	SWRCB SWRCB	SWRCB SWRCB
Arroyo Seco Improvement Program Annual Report	January 31, 2011	Annual	ACOE, RWQCB	ACOE, RWQCB

4.3. Document Control

DOE Environmental Regulatory Guide EH-0173T requires that auditable records of the environmental surveillance and effluent monitoring programs be maintained. The records are to include calculations, computer programs, procedures, and raw data.

Sandia National Laboratories, California Environmental Management Department, 8516 Quality Assurance Project Plan (QAPP) (March 23, 2006) includes details of a document control system. The system includes guidance on safeguarding, handling, and archiving documents. Each Department is responsible for determining which of its records are to be classified as Quality Assurance Records.

The Site Operations Center has established a Document Control Center. Procedures have been written for document submittal, storage, and use.

All environmental monitoring plans, procedures, and data were designated quality assurance records during the data archiving process.

5. Approved Job Descriptions, Qualifications, and Job Specific Training

The Environmental Monitoring Program staff consists of the Program Lead, and an Environmental Management Technologist. Program staff rely on additional help from other department staff to conduct storm water sampling. Storm water sampling locations on site are extensive (9 locations with duplicate and blank samples) and the sampling is time critical (permit requirements to attempt sampling during the first hour of discharge, sampling all locations during the same storm event, and time limitations on transporting samples to the contract laboratory). The program staff assignments and responsibilities are described below. Personnel assignments are presented in Appendix A.

5.1. Environmental Monitoring Program Lead

The Environmental Monitoring Program Lead is responsible for managing and overseeing operations and monitoring, administering permits, reporting requirements, final review of analytical data and developing special studies as needed (e.g. satellite sewer sampling, emergent chemical groundwater sampling, etc.). Specifically the Environmental Monitoring Program Lead is responsible for:

- managing and overseeing sewer outfall operations that include administering permit and reporting requirements. The Environmental Monitoring Program Lead is responsible for addressing significant changes in the discharge parameters, and for investigating potential source(s) of pollutants in the wastewater, and identifying the actions necessary to prevent recurrence. The Environmental Monitoring Program Lead is also responsible for final review of analytical results.
- managing and overseeing LECS operations, which include data review and authorizing the discharge of LECS wastewater. The Environmental Monitoring Program Lead is responsible for investigating the source of unexpected pollutants in the LECS wastewater and identifying the actions necessary to prevent the reoccurrence of the discharge. The Environmental Monitoring Program Lead also coordinates the disposal of the wastewater if it is unsuitable for discharge to the sanitary sewer system.
- implementing the groundwater monitoring operations, which include reporting requirements. The Environmental Monitoring Program Lead is responsible for final review of analytical results.
- initiating activities to identify the source of non-storm water and other pollutant discharges to the storm drain system. The Environmental Monitoring Program Lead assists Environmental Management Technologists with the collection of storm water samples. The Environmental Monitoring Program Lead works with site organizations to prevent non-storm water and pollutant discharge to storm drains.

- The Environmental Monitoring Program Lead also has the responsibility for the environmental restoration program at SNL/California. In this capacity, the Program Lead is responsible for addressing any erosion issues at the NLF, and continuing monitoring of the Fuel Oil Spill site.
- determining the locations of the site TLDs. The Program lead is also responsible for obtaining and analyzing results from the laboratory, completing non-conformance reports, preparing data for the Annual Environmental Report, and archiving data.
- managing and overseeing the data collection process. The EM Program Lead is responsible for final review of all data from the above mentioned programs.
- evaluating, trending, archiving and ensuring the quality of data from the analytical laboratories including radiological monitoring data from Health Physics.
- entering the electronic laboratory results into the Environmental Monitoring database and making periodic back-ups of the database. The Environmental Monitoring Program Lead is responsible for assuring the consistency and quality of the data in the database.
- reviewing and reporting on sources of radioactive air effluents in accordance with 40CFR61 (NESHAPS).
- verifying the SPCC Plan is accurate and being implemented.
- coordinating completion of the SSMP and entering SSO data into the State database.

5.2. Environmental Management Technologist

The Environmental Management Technologist is generally responsible for sampling activities, maintaining records, such as analytical data and logs, maintaining equipment, preparing samples for shipment and informing the Environmental Monitoring Program Lead of any unusual condition, situation or possible violations of limits. These responsibilities are included for all program areas, LECS, sewer outfall, groundwater, storm water, TLDs and any special studies being conducted, such as the satellite sewer sampling and potable water sampling. Specifically the Environmental Management Technologist is responsible for:

- conducting the routine operations and monitoring activities for the LECS, including sampling and maintaining any LECS records such as analytical data, sampling logs and pH meter calibration records. The Technologist is also responsible for preparing the samples for shipment. It is the responsibility of the Environmental Management Technologist to advise the Environmental Monitoring Program Lead of any unusual condition or situation that could require the shut down of the LECS.
- conducting the quarterly sampling of the groundwater monitoring wells, and maintenance of all groundwater monitoring equipment. The Technologist is also responsible for preparing the samples for shipment. It is the responsibility of the Environmental Management Technologist to advise the Environmental Monitoring Program Lead of any unusual condition or situation that could affect the groundwater monitoring or reporting requirements.

- conducting the sampling of the sewer outfall, conducting the sampling of the sanitary sewer satellite locations, maintaining all sewage monitoring equipment, and keeping an inventory of supplies at the sanitary sewer monitoring facility. In addition, the Technologist is responsible for initial review of the analytical results and notifying the Environmental Monitoring Program Lead of potential violations of permit limits or other unusual conditions. Finally, the Technologist is responsible for maintaining records such as log books, analytical data, and calibration records.
- performing storm water visual inspections, collecting the storm water samples, notifying the contract laboratory of the potentially large sample load, completing the sampling documentation (i.e. storm water sampling event form, sampling log book, and chain of custody form), and maintaining documentation. The Technologist is also responsible for preparing the samples for shipment. The Technologist is also responsible for informing the Environmental Monitoring Program Lead of 1) any evidence observed while conducting the sampling that may indicate a non-storm water or other pollutant discharge and 2) any evidence of erosion at the (NLF) area.
- distributing and collecting TLDs, completing chain-of-custody forms, and shipping TLDs to SNL/NM;
- inspect construction sites for proper operation and maintenance of BMPs

5.3. Staff Qualifications

Environmental Monitoring Program personnel have a responsibility to effectively implement environmental requirements and objectives in a range of areas including storm water, wastewater, groundwater, radioactivity, and above ground fuel storage tanks. Staff must have a knowledge of environmental monitoring and environmental regulations and be able to work with disciplines across all site operations. Environmental Monitoring Program personnel must meet the following qualifications.

Table 5-1 Environmental Monitoring Program Staff Qualifications

Job Title	Education	Experience	Required	Recommended
Environmental Management Technologist	AA and/or five years of relevant environmental experience	environmental, science, or engineering	X	
Environmental Monitoring Program Lead	BS and/or five years of relevant environmental experience	environmental, science, or engineering	X	
	Environmental Certification	Professional Certification (e.g. Certified Environmental Auditor or Registered Environmental Manager from the National Registry of Environmental Professionals)		X

5.4. Training

All program staff must meet all required corporate training.

All personnel who conduct storm water sampling and wet weather observations receive annual training before the start of the wet season (October) by an Environmental Monitoring Program staff. Training records are kept by the Environmental Monitoring Program.

The Program Lead and the Environmental Management Technologist responsible for conducting the groundwater sampling must have, at least, 24 hour Hazwoper training.

Other job specific training required is offered by the Corporate Education Development and Training (CEDT) program. The table below presents all of the activity-specific required and recommended training. The Environmental Management Technologist, Program Lead and any other personnel providing backup for the specific program activities below must have the required training.

Table 5-2 Training Requirements

Training Requirement	Training Method	Environmental Monitoring Program Lead	Environmental Management Technologist
Storm water sampling and wet weather observations	Classroom	•	•
ENV 100 24 Hour HAZWOPER	Commercially available	•	•
ENV 103 OSHA Health & Safety Refresher (Hazwoper)	Commercially available online	•	•
ENV 112 CA Hazardous Waste Generator Training	Classroom	•	•
ESH 300 Self Assessment Training	Classroom	•	
LAB 100 Lab Standard Information & Training	Online	•	•
PKX 100 Basic Hazardous Material Transportation	Online	•	
MED 113 Bloodborne Pathogens	SNL classroom	•	•
BIO 105 CA Biosafety in microbiological and biomedical laboratories at SNL/CA	SNL classroom	•	•
FPP 105CA Fall Protection and Prevention ¹	SNL classroom	•	•
CNF 105 Confined Space Awareness	SNL classroom	•	•
CNF 107 Confined Space Entry	SNL classroom, field	•	•
RAD 102 General Employee Radiological Training	Online	•	•
RSP 215 Air-purifying Respiratory Protection	Online & hands-on		•
FKL 153 Forklift Operator Training	Classroom, hands-on		•
FKL 153R Forklift Refresher	Online & hands-on		•
HAZ 103 Site-specific Hazcom	Classroom	•	•

¹ EM Program staff is working with safety staff to determine if this course is required for certain storm water sampling locations during sampling or automatic sampler set-up.

5.5. Specialized Assignments / Certifications

The Building 964 Underground Storage Tank (UST) owner designates one or more individuals to have responsibility for training facility employees and conducting monthly visual inspections at the underground storage tank facility. Designated UST operators shall possess a current certificate issued by the International Code Council (ICC) indicating he or she has passed the California UST System Operator exam. The individual shall renew the ICC certification, by passing the California UST System Operator exam, every 24 months. Currently the Designated UST operator is a Maintenance Department Technologist.

Storm Water Pollution Prevention Plans (SWPPPs) for construction activities must be prepared by a Qualified SWPPP Developer. SWPPPs for construction activities must be

implemented by a Qualified SWPPP Practitioner. The Environmental Monitoring Program Lead will ensure that SWPPPs are prepared and implemented as required by State regulations.

6. Performance Measures

Environmental Management System (EMS) environmental targets and objectives are reviewed and updated for the Environmental Monitoring Program annually. The performance measures are used to indicate the degree of success in meeting those targets. The targets for the Environmental Monitoring Program for 2010 were:

- 100% of new construction will have post-construction runoff coefficients equal to or less than pre-construction runoff coefficients;
- 100% inspection/cleaning of on-site storm drain system including drop structure by October 1 of each year;
- Achieve concentrations of copper and zinc in the sanitary sewer of less than 50% of the discharge limit.

The results for meeting these targets in 2010 can be expressed numerically through the use of metrics, as seen below in the four graphs (Fig. 6.1-6.4), for some targets or qualitatively for other targets. Some of these targets require actions by other departments. Activities performed directly by Environmental Monitoring Program staff to reach the targets are:

- Inspect construction sites for compliance with storm water regulations.
- Work with facilities to develop implementation methods for targets

In 2009, The Facilities Strategic Planning and Facilities Project Engineering and Operations Departments were briefed concerning the State of California's General Storm Water Discharge Permit for Construction Activities that was adopted in 2009. The provisions of the new permit became enforceable July 1, 2010. The Environmental Monitoring Program Lead is responsible for providing the necessary input to obtain the Permit, with input from the Facilities organizations, and certification by DOE/SSO.

Maintenance Department staff provides records for inspection/cleaning of the storm drain system. In 2010 the inspection/cleaning target for storm drain inlets was not met. The 100% inspection/cleaning target for storm channels was met.

The Environmental Monitoring Program has performance measures that are continuously used to assess the performance and effectiveness of the program. The measures are:

- Meet all regulatory monitoring requirements (GW, WW, SW)
- Meet regulatory report due dates (semi-annual categorical report, wastewater permit application, annual storm water report, monthly wastewater discharge reports)
- Direct involvement with staff from the various Facilities Departments about wastewater and storm water issues.

- Meet quality assurance accuracy, precision and completeness goals
- Compliance with storm water BMP requirements in the site's Industrial SWPPP
- Compliance with wastewater permit limits at the outfall

Currently the Program is meeting all monitoring requirements, and regulatory report due dates. The quality assurance accuracy, precision and completeness goals will be reported for calendar year 2010 in the Annual Site Environmental Report. The site is currently in compliance with wastewater discharge permit limits. In February 2010, an exceedance of the site effluent limits for copper was caused by manual pumping of storm and sanitary sewer sumps into the SNL/CA sanitary sewer during a planned power outage. The manual pumping caused an unusually high volume of solids to be entrained during the pump out. Cleaning of the sumps was performed in October 2010, and the sumps have been placed on a routine preventive maintenance schedule.

Investigations have lead to a better understanding of the source of high metals in the sewer effluent. Installation of a new sewer sampling system is in process. As a preventive maintenance measure, the sewer mains will be pressure cleaned annually. The fist cleaning was performed during the week of July 19, 2010.

The most recent quarterly non-storm water discharge visual inspection of the site showed no issues. Program staff continues to have direct communication with maintenance and facilities staff through IDT meetings, direct phone calls and presentations to department staff.

The Environmental Monitoring Program also uses metrics to show progress in achieving goals. These metrics are updated on the Environmental Management webpage. The following four graphs present water use, sanitary sewer flow, and sewer water copper and zinc concentrations.

Figure 6-1 Water Use Metrics

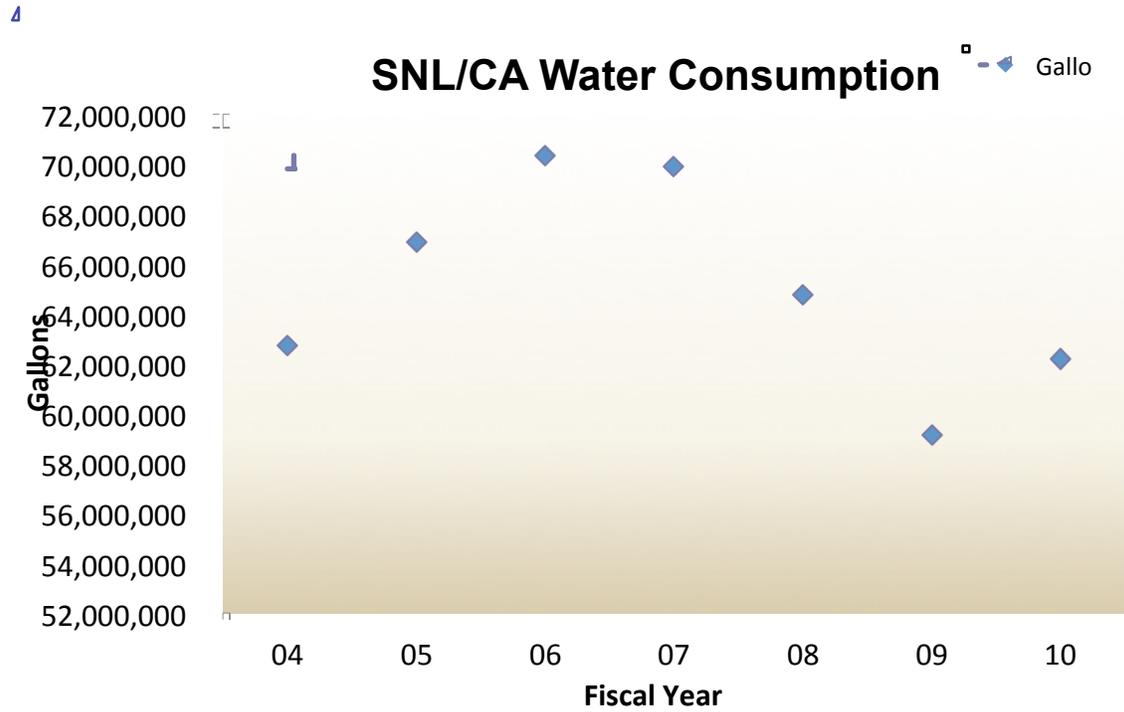


Figure 6-2 Sewer Flow Metrics

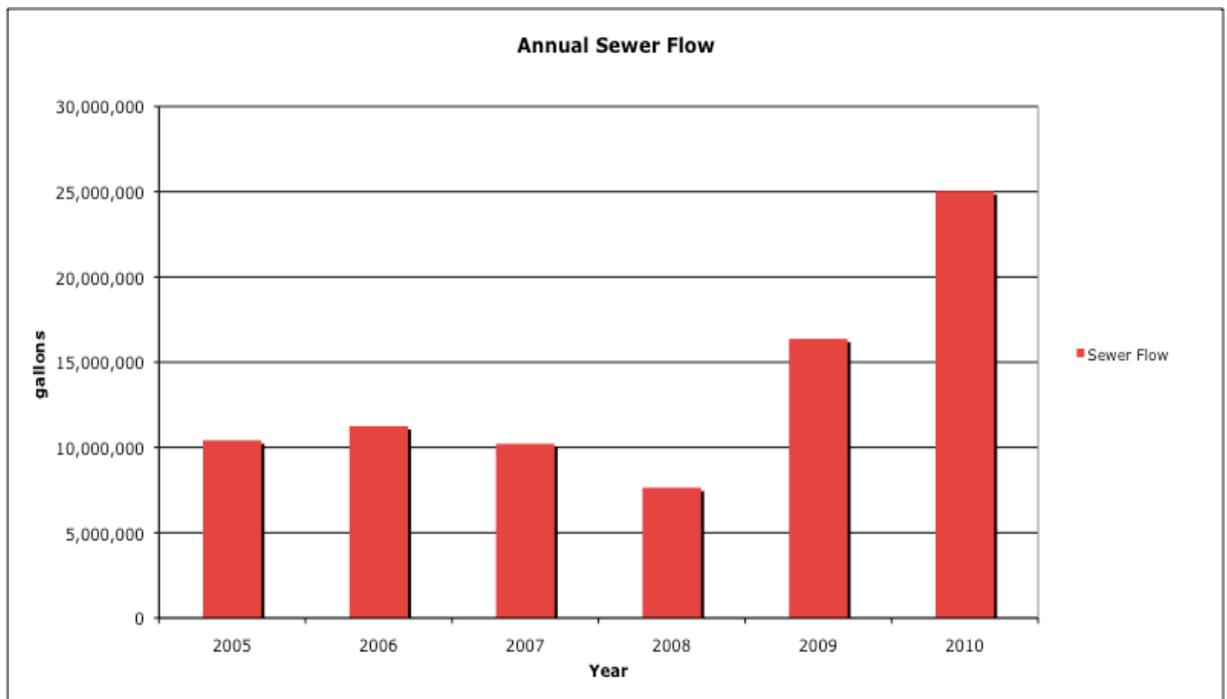


Figure 6-3 Environmental Monitoring Metrics: Copper in the Sanitary Sewer

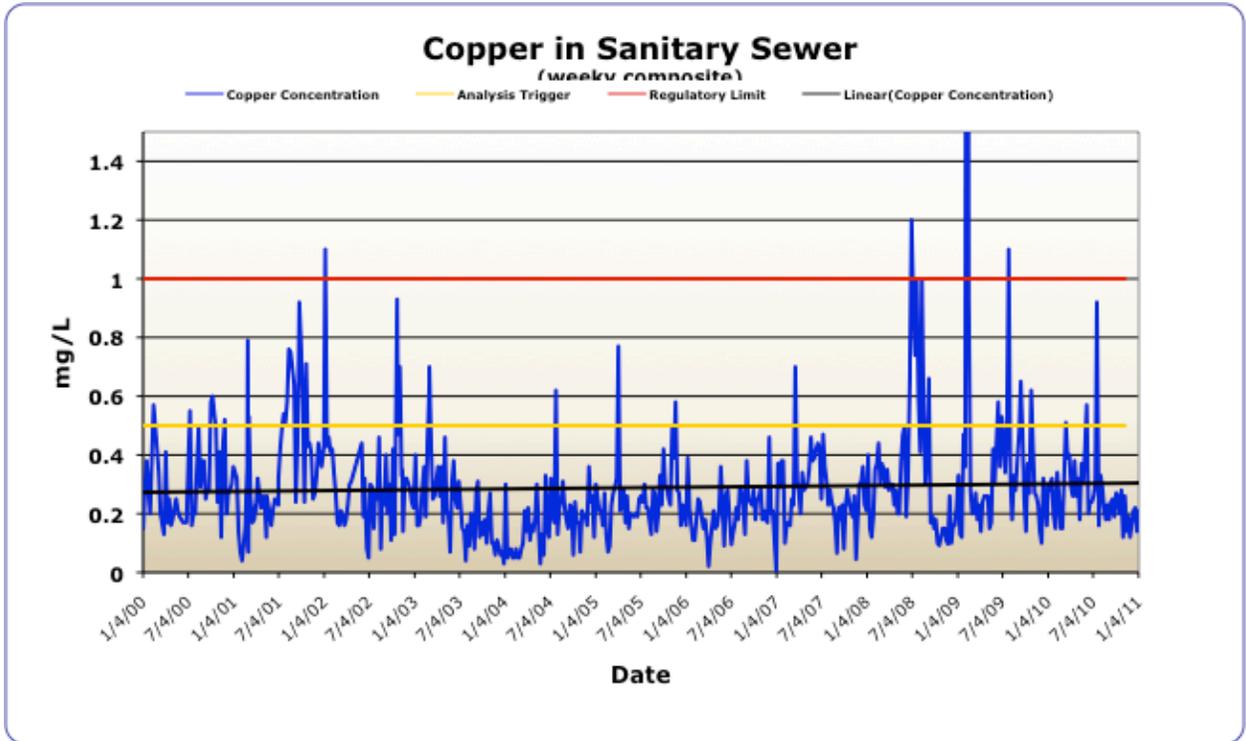
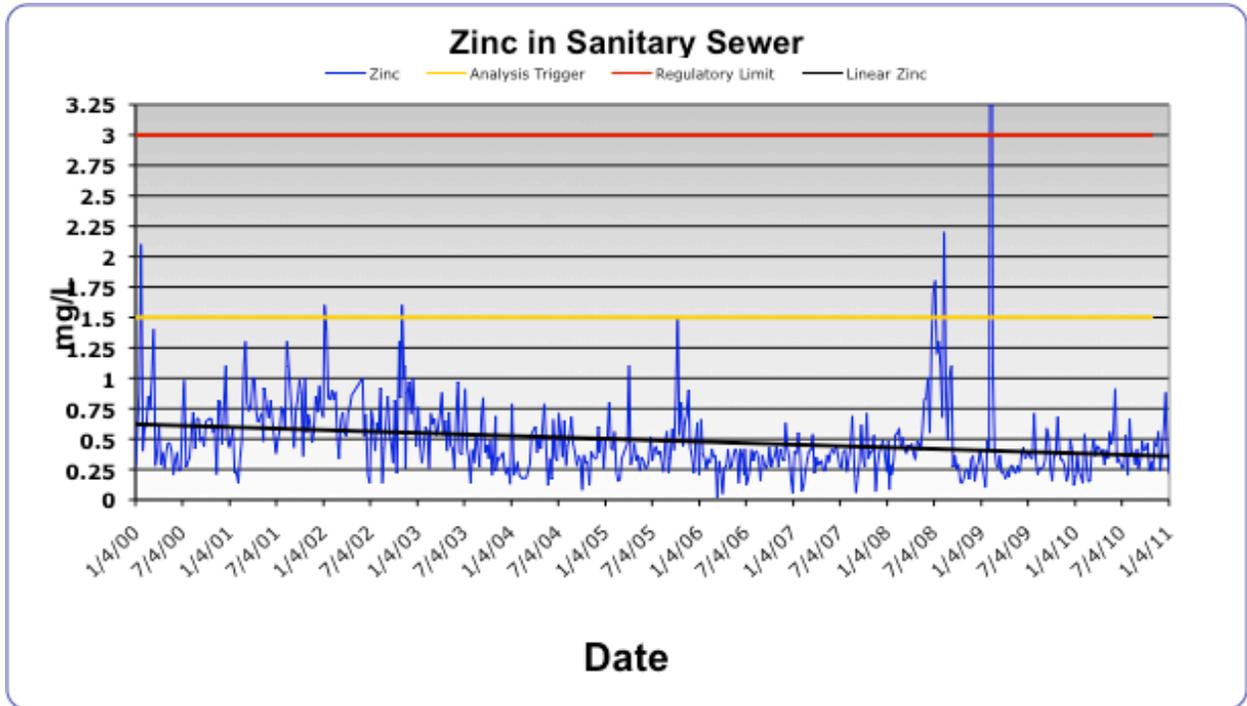


Figure 6-4 Environmental Monitoring Metrics: Zinc in the Sanitary Sewer



7. Quality Assurance

7.1. Program Risk Assessment

Annually, the Environmental Monitoring Program performs a risk assessment as part of the decision making process to determine the appropriate level of formality required for Program activities. It was determined that a risk associated with the Environmental Monitoring Program was the risk of a hazardous material spill getting into the sanitary sewer, storm drain, or groundwater. The source of the hazardous material could be from an accidental spill, an intentional discharge, or through discovery of a site contaminated by previous site operations. The overall risk from intentional discharges and discovery of past contamination was determined to be low. The risk from an accidental spill was determined to be medium. Measures taken by the Environmental Monitoring Program to mitigate this risk are 1) the provision of secondary containment pallets for chemicals stored outdoors, 2) the requirement that all chemical containers greater than one liter be stored in secondary containment in laboratories, and 3) annual site storm water inspections.

The risks associated with continued copper exceedances were also assessed. The risk of imposition of fines by a regulatory agency was considered to be low. The risk of an adverse impact to Sandia's PEP score was considered to be high. The risk due to management reaction was considered to be medium. The risk of damaging SNL/CA's corporate reputation was considered to be medium. Measures taken by the Environmental Monitoring Program to mitigate this risk are ongoing investigations into the sources of the copper (and other metals), and implementation of strategies to manage the metals. A redesign of the sewer sampling system was completed in 2010

7.2. Sample Analyses

SNL/California has established criteria for the acceptability of environmental monitoring data in the *Operating Procedure for Data Validation and Verification for the Environmental Monitoring Program*. This procedure contains methods for determining the accuracy, precision, completeness, comparability, and representativeness of the data. In general, the following methods apply to Environmental Monitoring Program sampling activities:

- **Accuracy** is assessed through analysis of samples that have been spiked with the analyte of interest (spiked samples), standard reference materials, or interlaboratory comparison samples. The analytical results are compared to the known value of the spiked sample or standard reference material.
- **Precision** of the combined sampling and analysis effort is assessed through collection and analysis of duplicate samples. Data sets of routine samples are compared to data sets of duplicate samples. Recognizing that the uncertainty of

analytical results increases as the detection limit is approached, we base the acceptance criteria, in part, on the pollutant concentration. Precision of the analytical effort only is assessed in the laboratory by the use of split samples.

- **Completeness** of the data is assured by careful planning of the sampling locations and frequency. Close attention is also paid to the reliability of the sampling equipment used. Completeness is evaluated by comparison of the number of samples collected to the number planned to be collected.
- **Comparability** is assured by using proceduralized sample collection methods and using standardized analytical methods.
- **Representativeness** is secured by careful selection of the sample collection methods and analytical methods to assure you are measuring what you want to measure.

To assure that the data generated by the monitoring program may be compared to data of other monitoring systems, EPA methods are used, when available, for collecting and analyzing samples. When EPA methods or guidance are not available, Sandia develops its own methods. These methods are documented and provided, as requested, to the agencies receiving reports to aid in interpretation of the data. For further discussion see Laboratory Procedures, Section 3.6 above.

7.3. Environmental Sampling

Sample collection methods assure that the samples represent, as much as possible, the environmental medium being monitored. Considerations include the spatial and temporal variability of the medium or the pollutant of concern within the medium. If EPA- or DOE- approved criteria for sample locations exist, they are used.

Protocols for environmental sampling at SNL/California 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. 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.

All analytical data reports are reviewed by the Program Lead and documented on the Chemical Analysis Report Verification Record Form. All storm water inspection reports are reviewed by the Program Lead and documented on the Storm water Inspection Report Tracking Form. The internal requirements for filling out this documentation are described in the applicable operating procedures.

Non-conformances, such as the failure to collect a scheduled sample, are documented in the Environmental Program Non-conformance Report Log.

7.4. Quality Control Samples

Types of quality control samples prepared for the Environmental Monitoring Program include field duplicates, spiked, trip blanks and field 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.

SNL/California's goal for number of quality control samples is 20% of the total sample load, where feasible. This includes quality control samples initiated at the laboratory.

7.5. 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%.

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

8. Program Assessments

For the Environmental Management Department the following two program assessments are performed annually for each environmental program:

8.1 Program Self Assessment

The Program Self Assessment is an annual effort to determine the completeness, quality and efficiency of the program structure and management. It is also used to determine the alignment of the program with ISO14001 EMS requirements and principles.

The objective of this assessment is to assure that the program provides all of the required elements and continually strives for areas of improvement. This assessment includes a review of all procedures, processes, technical work documents, web pages, publications, communications, etc. of the program to assure that they are streamlined, accurate and current. The *Programmatic Document Review Form* is used to document this part of the self assessment, as referenced in the *Quality Assurance of Data, Documents and Select Activities of the Environmental, Safety and Health Departments, 8516 and 8517*.

In 2010 the Environmental Monitoring Program focused on the Sewer System Management Plan (SSMP) for the Self Assessment Program Area. The SSMP requires that an annual audit of the program be conducted. The results were reported in the LESA database and a final report printed December 2010. There were no findings identified in the self-assessment. There was one observation/recommendation identified. Table 8-1 documents the resolution status of these items.

Table 8-1 LECS Equipment Self Assessment Observations/Recommendations Status

Observations/Recommendations	Status (at time of publication)
2010 Assessment SSMP	Completed
Dates of training completed in training matrix were out of date. Change table to remove training dates as these change as training is completed.	Training matrix will be changed during the next update to the SSMP.
2009 Assessment Storm water	
Assessment of Storm water sampling. Need replacement or new PPE for members of the storm water sampling team.	Completed
Storm water sampler storage container for sampling location G needs to be relocated from current location to storm grate near credit union	In process.
2008 Assessment Wastewater	
Assessment of Wastewater sampling. Replace sample bottles in the outfall daily composite sampler.	Completed
As Operating Procedures are due to be updated the location of records and the	On-going during two-year review cycle for operating procedures.

Observations/Recommendations	Status (at time of publication)
Environmental Technologist's office will need to be changed to Building 960 Room 132F.	
Redesign chain-of-custody template to have a specific place to indicate grab or composite sample. Currently this is being written in the comments section.	Under development.
Need to develop routine procedure for verifying laboratory data uploaded to the Environmental Database.	Completed.
More laboratory equipment is needed at the outfall for collecting different types of samples.	Under review.
2007 Assessment SPCC	
The SPCC Plan is in draft form and needs to be updated before Sandia is out of compliance with tasks identified in the August 2004 Plan or the regulatory deadline, July 1, 2009, for implementation of the new regulations. The internal deadline for updating the plan was October 2007. A draft plan is currently under review.	Plan still in Draft. Review by SSO needs to be completed.
2006 Assessment Wastewater	
There is no operating procedure for the Batch Treatment System at Building 916 operated by the Maintenance Department.	Environmental Monitoring Program Lead contacted the Maintenance Department staff by email to offer assistance with developing an OP. Maintenance responded the OPs had already been assigned to staff but have not yet been finalized.
There is no operating procedure for the Wash Pad operated by the Maintenance Department.	Environmental Monitoring Program Lead contacted the Maintenance Department staff by email to offer assistance with developing an OP. Maintenance responded the OPs had already been assigned to staff but have not yet been finalized.

8.2 Line Performance Assessment

The Program Line Implementation Assessment is an annual effort to determine how well the line or site is implementing the requirements of the program or supporting

specific program-related objectives/targets. The success or failure of the line or site to implement program requirements can be attributed to many things: culture, line management support, communications, program management, etc. (Note: Poor program implementation by the line may not necessarily indicate poor program management or execution, but the Program Lead will consider whether these are contributing factors and take appropriate action.)

Significant line violations to program requirements that are discovered during this assessment are entered into the ES&H Self Assessment database for communications and tracking. The assessment is for the “big picture” and not just conducted to find violations. The completed finding form is submitted to the Division 8000 ES&H coordinator for entry into the self-assessment tracking system.

Storm water and wastewater assessments were performed during 2010. The results of these assessments are as follows:

- An annual assessment of material storage on-site. No issues concerning hazardous material storage were found.

8.3 Environmental Programs Representative Assessment

The Environmental Programs Representative performs and records informal assessments of line implementation of critical program elements. During 2010, the Environmental Programs Representative reported on the results of these informal assessments. No issues requiring action by the Environmental Monitoring Program were identified.

8.4 Corporate Line Self Assessment

No issues were forwarded to the Environmental Monitoring Program from the Corporate Line Self Assessment Program during 2010.

9. Accomplishments

In the past year accomplishments for the Environmental Monitoring Program include:

- Redesigned and installed new sewer sampling system. Testing began in March 2011.
- Utilized new Construction General Permit process for storm water for the first time (CRCV project).
- Program Lead attended class and took State sponsored test in first step towards becoming a Qualified SWPPP Developer.
- Sewer sumps were cleaned on January 15, 2011.

10. Issues

The newly implemented Construction General Permit for storm water will require considerably more oversight of construction projects requiring a permit by Environmental Monitoring personnel. Close coordination with the Projects Engineering and Operations and Strategic Planning Departments will be required.

11. Trends

11.1. Storm water

The storm water program started in the early 1990s as part of the National Pollutant Discharge Elimination System (NPDES) program, which had previously addressed point sources of pollutants. Phase I of the program began by addressing storm water discharges from medium and large municipal separate storm sewer systems (MS4s), industrial activities and construction activities disturbing 5 acres or more. Most recently Phase II of the program began. Phase II addresses storm water discharges from small MS4s, construction activities disturbing 1 acre or more and additional industrial activities. As the storm water program has developed and matured the requirements and regulations have become stricter and encompass more areas.

SNL/California is identified as a non-traditional small MS4 and may be notified in the near future to meet the requirements of the Small MS4 General Permit. The Small MS4 General Permit covers areas such as public participation, public education, construction activities, post-construction, illicit connection and discharge program and municipal maintenance activities. Previously the site was only required to address the areas of industrial activities and construction. This new permit will require the site's storm water program to expand into other areas.

Storm water post construction requirements are becoming an integral part of storm water requirements and regulations. Phase I municipal permits (including Alameda County) now include very prescriptive requirements for storm water controls on new and redevelopment projects. Storm water controls may include both storm water treatment requirements and storm water flow control requirements. Some post construction requirements are contained in Phase II small MS4s general permit. As the Phase II program matures requirements may become as prescriptive and strict as the current Phase I requirements. The Phase II regulations will require more support from the site maintenance program in terms of a formal storm drain maintenance and cleaning program. This program was implemented during 2005. The new regulations will also require the Environmental Monitoring Program to work closely with the Facilities Engineering Department to assure that new or significantly remodeled buildings meet the requirements for post-construction runoff control.

The Storm water Construction Activities General Permit was reissued in 2009 with post-construction requirements for flow control and a new requirement for public notice of SWPPPs during an approval process. The new permit also calls for more extensive submittals during the permitting process, and more extensive inspections during the construction phase.

The State Board is working on the reissuance of the Storm water Industrial Activities General Permit. The last available draft of the industrial activities storm water general permit had stricter requirements including comparing storm water sampling results to numeric EPA benchmarks. Exceedance of the numeric benchmarks will trigger activities, evaluation and regulatory notification. There are also more requirements for inspections and sampling. Increased monitoring and sampling requirements will impact program manpower and resources. The State Board has indicated the reissued industrial permit will also have requirements for public notice and availability of all SWPPPs.

There is an administrative draft Phase I MS4 permit by the Los Angeles Region RWQCB that includes municipal Action Levels for selected pollutants that are applied to storm water discharges at the end of pipe. This draft permit shows a potential trend moving from regulating storm water discharges by BMPs to regulating through numeric limitations.

Provisions in the Energy Independence and Security Act of 2007 (section 438) require that new or remodeled federal facilities with a footprint of 5000 square feet or more have a post-construction runoff coefficient no greater than that that existed pre-development. U.S. EPA issued guidance on meeting this requirement in December 2009.

The storm water program in California has been under increased regulatory oversight. SNL/California may reasonably anticipate being audited in the near future.

11.2. Wastewater

Section 303(d) of the federal Clean Water Act requires that states identify water bodies that do not meet water quality standards. The San Francisco Bay RWQCB has identified the following water bodies and pollutants for which the Arroyo Seco is a tributary and the site's treated wastewater is discharged to:

- Several of the Arroyos that Arroyo Seco is tributary to are listed for diazinon
- Alameda Creek is listed for diazinon
- San Francisco Bay is listed for chlordane, DDT, diazinon, dieldrin, dioxin compounds, exotic species, furan compounds, mercury, PCBs, PCBs (dioxin like), and selenium.

This list was approved by the SWRCB and partially approved by EPA in 2006. The RWQCB is required to address these issues through Total Maximum Daily Loads (TMDLs). TMDLs examine these water quality problems, identify sources of pollutants, and specify actions that create solutions. The RWQCB are currently working on TMDL reports and implementation plans for the pollutants of concern listed above. The final

TMDL reports and implementation plans may directly affect Bay Area wastewater treatment plants' Pretreatment and Pollution Prevention programs. New requirements or regulations for LWRP's Pretreatment and Pollution Prevention Program may lead to stricter requirements or scrutiny for SNL/California through their wastewater discharge permit. TMDL reports and implementation plans may also require additional requirements for area storm water programs, for example, if TMDL limits are imposed, SNL/California may need to develop the capability of measuring storm water loads which would include flow quantities and concentrations. Stream Flow meters have been purchased and installed in the Arroyo Seco where it enters the developed portion of the site, and where it exits the site.

In 2008 LWRP received site specific objectives for cyanide in their NPDES permit. The site specific objectives require pollution prevention activities related to cyanide. As part of this program the LWRP required Sandia to document all processes with a potential for cyanide discharge.

SNL/California was informed by State Water Quality Resource Control Board staff that they must obtain coverage under the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (Order No. 2006-0003-DWQ) adopted May 2, 2006. This General Permit requires a proactive approach to reduce the number and frequency of sanitary sewer overflows (SSOs) within the State. The permit would require DOE to file a Notice of Intent (NOI), submit a Legally Responsible Official (LRO) Registration Form for the SSO Database and submit a Data Submitter Registration Form for the SSO Database. SNL/California has developed a Sewer System Management Plan (SSMP), reports monthly in the SSO Database and must properly manage, operate and maintain the system, taking all feasible steps to eliminate SSOs and if an SSO occurs take all feasible steps to contain and mitigate the impacts. The SSMP was completed by August 2, 2010, as required by the regulations.

11.3. Above-ground Tanks

The site's Spill Prevention Control and Countermeasure (SPCC) Plan was update in 2009 to meet new federal regulations passed in October 2007. SNL/California has implemented changes in order to meet the definition of a Qualified Facility. As a qualified facility SNL/California is able to self certify the SPCC Plan and meet tank integrity testing requirements through visual inspections. The regulations require the SPCC Plan be updated by August 2014.

11.4. Underground Tanks

During 2005, a decision was made by SNL/California Management to investigate removal of the one Underground Storage Tank on-site. Preliminary engineering was performed in preparation for issuing a Request for Proposal for the tank removal. This process was halted in 2006 due to budget constraints.

12. Goals and Objectives

EMS environmental objectives are reviewed and updated annually. The 2011 objectives that involve the Environmental Monitoring Program are:

- By FY 2020, reduce water intensity by 26 percent from a 2007 baseline. Current activities to meet this goal include installation of Dolphin™ water treatment systems on selected cooling towers.

In addition to the corporate goal above, the Environmental Monitoring Program has internal goals as discussed below.

The EMS includes implementation of a watershed approach for surface water protection. The watershed approach is meant to have a geographic focus on the natural boundaries of a watershed, which may transcend departmental, programmatic and organizational boundaries of the site, using sound science. Many of the objectives and targets of the Environmental Monitoring Program support a watershed approach. The SNL/California site lies within a single watershed. The site's storm water runoff drains to the Arroyo Seco. The Environmental Monitoring Program has broken down this watershed into subwatersheds referred to as drainage areas in the previous discussions. The Environmental Monitoring Program works with departments and personnel across the site on all levels to ensure protection of the Arroyo Seco water quality.

Environmental Monitoring Program goals and objectives for the next 1-3 years are:

- Achieve Qualified SWPPP Developer status for the EM Program lead.
- Identify potential sources and elimination or management options for metals in the sanitary sewer.
- Incorporate new requirements when the Industrial Activities Storm water General Permit is reissued. The draft revised permit currently has more visual inspection requirements, more sampling requirements, more stringent analysis of sample results and follow-up actions, and specific BMP requirements.
- Ensure that the requirements of the new Construction Storm water General Permit are implemented as necessary.
- Continue to implement Phase II Small MS4 Storm water General Permit requirements in the Industrial Activities SWPPP.
- Develop and implement the Sanitary Sewer Management Plan as required by the Sanitary Sewer System General Permit.
- Increase integration of BMPs into new facilities projects.
- Maintain the average weekly composite Zinc and Copper concentrations in sewer below the 50% regulatory trigger level. (0.5 mg/L for Cu and 1.5 mg/L for Zn)
- 100% of new construction will have post-construction runoff equal to or less than pre-construction runoff.
- 100% inspection / cleaning of on site storm drain system including drop structures by October 1 of each year.

- By Sept 1 of each year implement runoff controls for 100% of bulk erodible landscape and construction material.
- Conduct sewer line cleaning twice per year, and CCTV inspection for all sewer lines six inches and greater at least every three years.
- Conduct an annual physical survey/visual inspection of all sewer system components.

13. Appendix A Personnel Assignments

Environmental Monitoring Personnel Assignments

Job Title	Personnel	Back-Up
Environmental Monitoring Program Lead	Robert Holland	Mark Brynildson
Environmental Management Technologist	John Chavarria	None

Special Assignment Personnel

Job Title	Personnel
Underground Storage Tank Operator	Carl Smith