Site Environmental Report For Calendar Year 2012

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DOE Operations at The Boeing Company

Santa Susana Field Laboratory, Area IV

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Site Environmental Report
for Calendar Year 2012

DOE Operations at The Boeing Company
Santa Susana Field Laboratory, Area IV

Prepared by the Staff of

The Boeing Company
Santa Susana Field Laboratory

September 2013

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BOEING

CERTIFICATE OF ACCURACY

I certify that I have personally examined and am familiar with the information submitted herein and, based on inquiry of those individuals immediately responsible for preparing this report, I believe that the submitted information is true, accurate, and complete.

Phil Rutherford
Manager, Health, Safety & Radiation Services
The Boeing Company
Santa Susana Field Laboratory

September, 2013

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Energy Technology Engineering Center
4100 Guardian Street, Suite 160
Simi Valley, CA 93063

August 27, 2013

Subject: 2012 Site Environmental Report for the Energy Technology Engineering Center (ETEC)

Dear Sir or Madam:

The Boeing Company has prepared the subject report for the U.S. Department of Energy (DOE). It is a comprehensive summary of the Department's environmental protection activities at ETEC in Canoga Park, California for Calendar Year 2012. Site Environmental reports are prepared annually for all DOE sites with significant environmental activities and distributed to external regulatory agencies, interest organizations, and individuals.

To the best of my knowledge, this report accurately summarizes the results of the 2012 environmental monitoring and restoration program at ETEC for DOE. This statement is based on reviews conducted by DOE-ETEC staff and by the staff of the Boeing Company.

A reader survey form is provided with this report to provide comments. Write directly to:

U.S. Department of Energy
Energy Technology Engineering Center
4100 Guardian Street, Suite 160
Simi Valley, CA 93063

Questions may also be directed to me at (805) 416-0992

Sincerely,

John B. Jones
Federal Project Director

cc: Jack Craig, DOE EMCBC
Ralph Holland, DOE EMCBC
Stephie Jennings, DOE ETEC
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ACKNOWLEDGMENTS

Preparation of this report has been a collaborative effort of many members of Boeing's Environment, Health and Safety (EHS) Department.

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Editing and review were performed by Ning Liu, Phil Rutherford, and David Dassler.

The staff of the Boeing Creative Services group provided publication assistance. The staff of Haley & Aldrich, Inc. and MWH Global, Inc. provided technical contribution for this report.

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1. EXECUTIVE SUMMARY

This Annual Site Environmental Report (ASER) for 2012 describes the environmental conditions related to work performed for the Department of Energy (DOE) at Area IV of Boeing's Santa Susana Field Laboratory (SSFL). The Energy Technology Engineering Center (ETEC), a government-owned, company-operated test facility, was located in Area IV. The operations in Area IV included development, fabrication, operation and disassembly of nuclear reactors, reactor fuel, and other radioactive materials. Other activities in the area involved the operation of large-scale liquid metal facilities that were used for testing non-nuclear liquid metal fast breeder reactor components. All nuclear work was terminated in 1988, and all subsequent radiological work has been directed toward environmental restoration and decontamination and decommissioning (D&D) of the former nuclear facilities and their associated sites. Liquid metal research and development ended in 2002. Since May 2007, the D&D operations in Area IV have been suspended by the DOE, but the environmental monitoring and characterization programs have continued.

Results of the radiological monitoring program for the calendar year 2012 continue to indicate that there are no significant releases of radioactive material from Area IV of SSFL. All potential exposure pathways are sampled and/or monitored, including air, soil, surface water, groundwater, direct radiation, transfer of property (land, structures, waste), and recycling.

Due to the suspension of D&D activities in Area IV, no effluents were released into the atmosphere during 2012. Therefore, the potential radiation dose to the general public through airborne release was zero. Similarly, the radiation dose to an offsite member of the public (maximally exposed individual) due to direct radiation from SSFL is indistinguishable from background.

All radioactive wastes are processed for disposal at DOE disposal sites and/or other licensed sites approved by DOE for radioactive waste disposal. No liquid radioactive wastes were released into the environment in 2012.

During 2012, eight regulatory agency inspections, audits, and visits were conducted in Area IV. These inspections and visits were carried out by the California Department of Public Health (DPH), County of Ventura Environmental Health Division (EHD), and Ventura County Air Pollution Control District (VCAPCD). In addition, the California Department of Toxic Substances Control (DTSC) was frequently onsite for meetings and to observe field activities.

In summary, this Annual Site Environmental Report provides information to show that there are no indications of any potential impact on public health and safety due to the DOE-sponsored operations conducted at Area IV of SSFL. The report summarizes the environmental and effluent monitoring results for the responsible regulatory oversight agencies.

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2. INTRODUCTION

This annual report describes the environmental monitoring programs related to the Department of Energy's (DOE) activities at the Santa Susana Field Laboratory (SSFL) facility located in Ventura County, California during 2012. Part of the SSFL facility, known as Area IV, had been used for DOE's activities since the 1950s. A broad range of energy related research and development (R&D) projects, including nuclear technology projects, were conducted at the site. All the nuclear R&D operations in Area IV ceased in 1988, and the efforts were directed toward environmental restoration decontamination and decommissioning (D&D). By 2007, all the D&D that remained to be completed were two former nuclear facilities and two liquid metal facilities. In May 2007, the D&D operations in Area IV were suspended until DOE completes the SSFL Area IV Environmental Impact Statement (EIS). The environmental monitoring and characterization programs were continued throughout 2012.

As required by DOE Order 231.1B, "Environment, Safety and Health Reporting," this report is used to communicate internally to DOE, and externally to the public, the environmental monitoring results and the state of environmental conditions related to DOE activities at SSFL. The report summarizes:

- Environmental management performance for DOE activities (e.g., environmental monitoring of effluents and estimated radiological doses to the public from releases of radioactive materials)
- Environmental occurrences and responses reported during the calendar year
- Compliance with environmental standards and requirements
- Significant programs and efforts related to environmental management.

2.1 SITE LOCATION AND SETTING

The SSFL site occupies 2,850 acres located in the Simi Hills of Ventura County, California, approximately 48 km (30 miles) northwest of downtown Los Angeles. The SSFL is situated on rugged terrain with elevations at the site varying from 500 to 700 m (1,650 to 2,250 ft) above sea level (ASL). The location of the SSFL site in relation to nearby communities is shown in Figure 2-1. No significant agricultural land use exists within 30 km (19 miles) of the SSFL site. Undeveloped land surrounds most of the SSFL site.

The site consists of four administrative areas and undeveloped land. Figure 2-2 illustrates the arrangement of the site. Area IV has an area of about 290 acres. Boeing and DOE-operated facilities (Figures 2-3 and 2-4) share the Area IV portion of this site. While the land immediately surrounding Area IV is undeveloped, suburban residential areas are at greater distances. The community of Santa Susana Knolls lies 4.8 km (3.0 miles) to the northeast, the Bell Canyon area begins approximately 2.3 km (1.4 miles) to the southeast, and the American Jewish University is adjacent to the north. Except for the Pacific Ocean, which is approximately 20 km (12 miles) south, no recreational body of water of noteworthy size is located in the surrounding area. Four major reservoirs providing domestic water to the greater Los Angeles area are located within 50 km (30 miles) of SSFL; the closest one to SSFL (Bard Reservoir, near the west end of Simi Valley) is more than 10 km (6 miles) from Area IV.

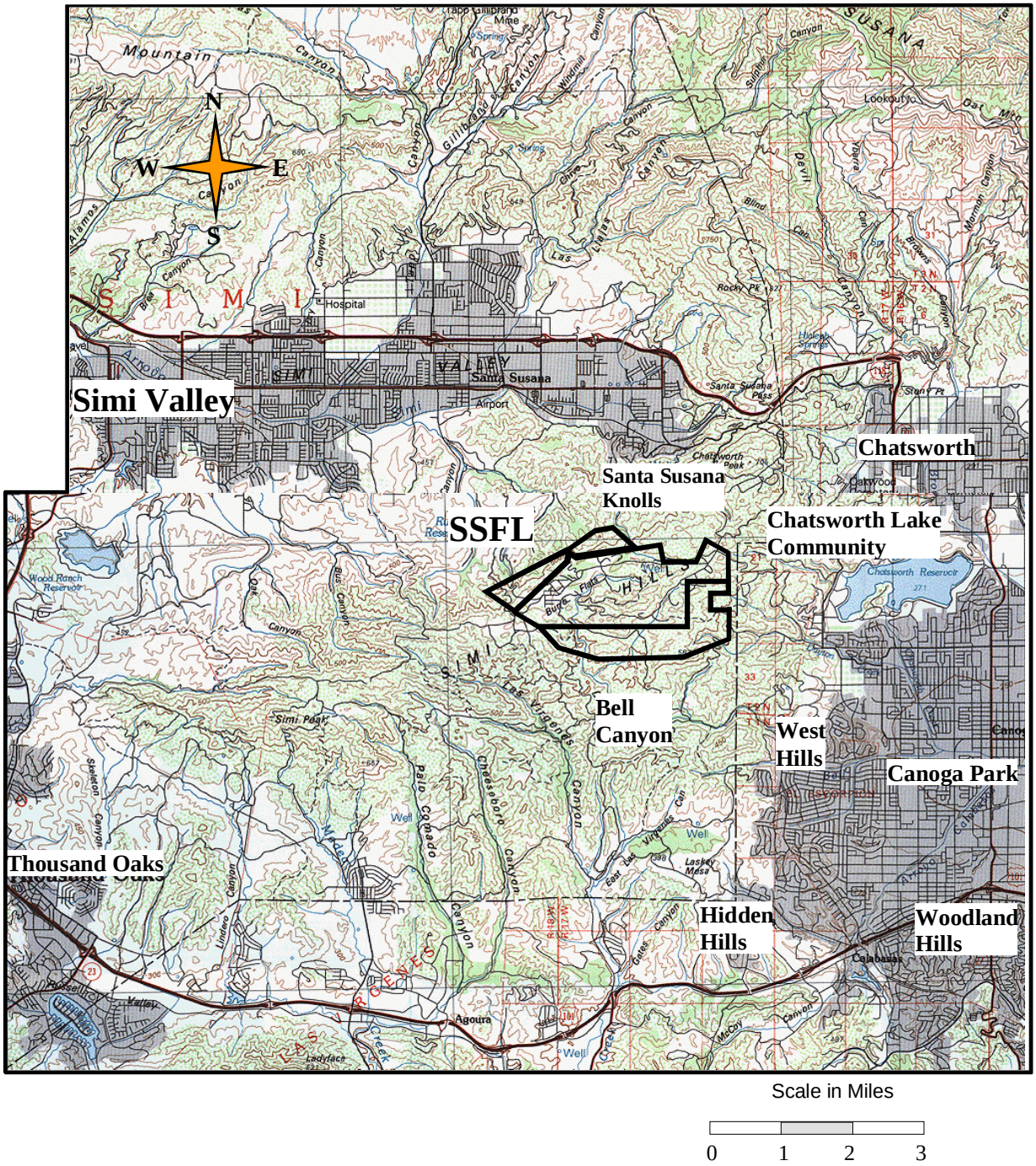

Figure 2-1. Map Showing Location of SSFL

Subdivisions			
Owner	**Jurisdiction**	**Acres**	**Subtotals**
Boeing	Boeing--Area IV Boeing—Area I and III Boeing (Undeveloped land)	289.9 784.8 1,324.6	2,399.3
Government	NASA (former AFP 57) NASA (former AFP 64)	409.5 41.7	451.2
Total Acres			2,850.5

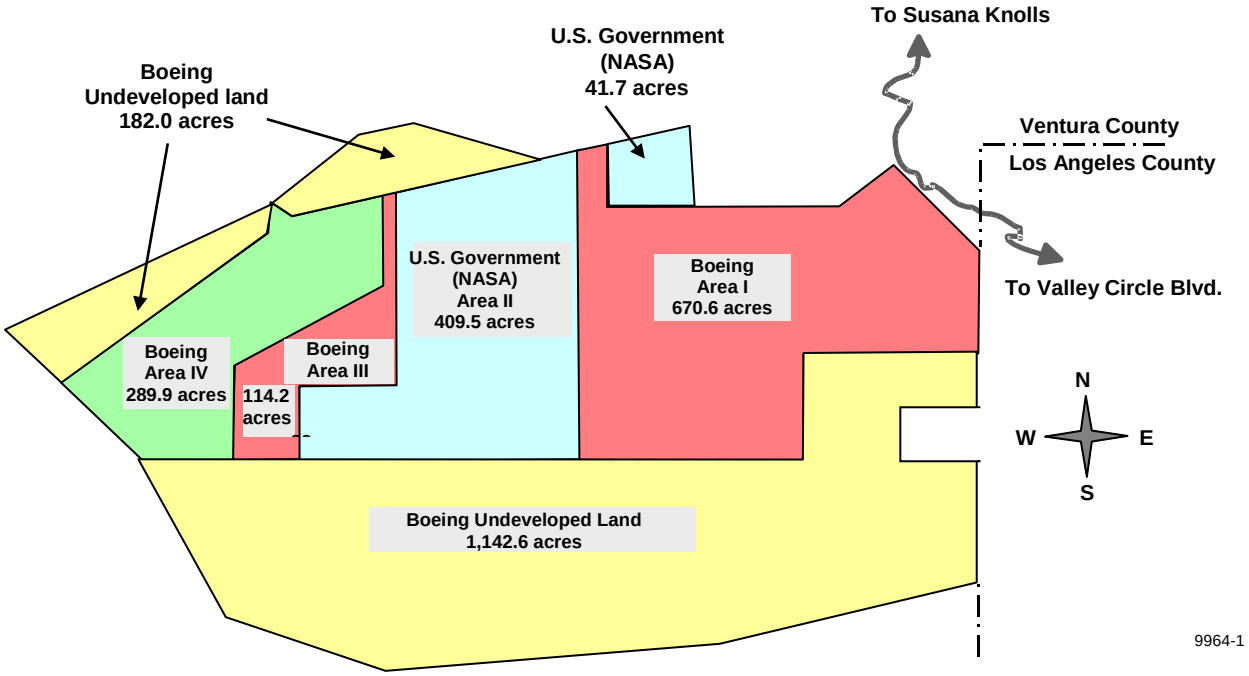

Figure 2-2. Santa Susana Field Laboratory Site Arrangement

2.2 OPERATIONAL HISTORY

The SSFL has been used for various research, development, and test projects funded by several U.S. government agencies, including DOE, Department of Defense (DOD), and National Aeronautics and Space Administration (NASA). Since 1956, various R&D projects had been conducted in Area IV, including small tests and demonstrations of reactors and critical assemblies, fabrication of reactor fuel elements, and disassembly and declading of used fuel elements. These projects were completed and terminated in the course of the next 30 years. Details about these projects can be found in the DOE website devoted to the Energy Technology Engineering Center (ETEC) closure (http://www.etec.energy.gov).

All the nuclear R&D operations in Area IV ceased in 1988. The only work related to the nuclear operations after 1988 was the cleanup and decontamination of the remaining inactive radiological facilities and the off-site disposal of radioactive waste. In 1998, DOE awarded Boeing a contract for the closure of all DOE facilities in Area IV. Boeing performs certain environmental remediation and restoration activities at SSFL as directed by DOE. In May 2007, the D&D activities in Area IV were suspended by the DOE, pending completion of an Environmental Impact Statement (EIS).

2.3 FACILITY DESCRIPTIONS

There were 27 radiological facilities that operated in Area IV (See Figure 2-4). As of the end of 2012, twenty of them have been released for unrestricted use, four have been declared suitable for unrestricted release by DOE, and one (the Building 4059 site) is pending release for unrestricted use. Demolition is pending for two facilities, Building 4024 and the RMHF. Six remaining former radiological facilities have been declared free of contamination; they are 4009, 4100, 4019, 4055, 4011 and 4029.

In addition to radiological facilities, two sodium and related liquid metal test facilities remain in Area IV. They are the Sodium Pump Test Facility (SPTF) and the Hazardous Waste Management Facility (HWMF). These were constructed at SSFL to support development testing of components for liquid metal electrical power production systems. The facilities are no longer needed, and the objective is to dismantle the structural steel, concrete and utilities, and restore the land to previous conditions.

2.3.1 Radiological Facilities

Radioactive Materials Handling Facility (RMHF)

The RMHF complex consists of Buildings 4021, 4022, 4034, 4044, 4075, 4563, 4621, 4658, 4665 and 4688. Sump 4614 was a holdup pond located at the base of the drainage channel west of the RMHF complex. The use of the pond was discontinued, and the pond was excavated in 2006. The drainage channel and pond have been replaced with an above ground storage tank, and the tank receives storm water runoff from the RMHF via a drainage pipe.

Operations at RMHF included processing, packaging, and temporary storage of radioactive waste materials for offsite disposal at DOE approved facilities. The radioactive waste included uranium, plutonium, mixed fission products such as cesium-137 (Cs-137) and strontium-90 (Sr-90), and activation products such as cobalt-60 (Co-60), europium-152 (Eu-152), and tritium (H-3).

Since May 2007, the D&D operations at the RMHF have been suspended. In 2012, no effluents were released into the atmosphere through the stack at the RMHF, and no radioactive liquid effluents were released from the facility in 2012.

Figure 2-3. Santa Susana Field Laboratory Site, Area IV (2005)

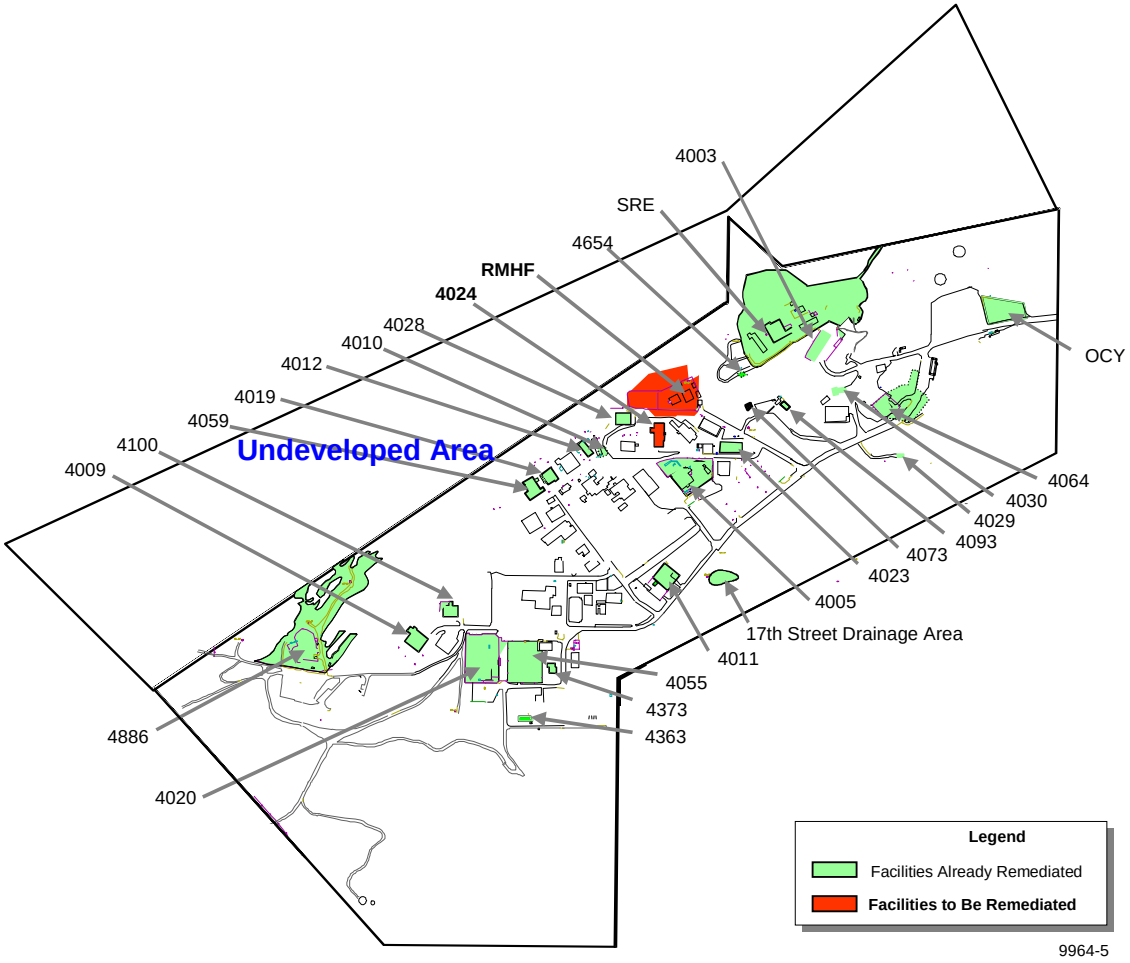

Figure 2-4. Map of Prior and Current Radiological Facilities in Area IV

Building 4024

Building 4024, the SNAP Environmental Test Facility, housed four experimental reactor systems in the 1960s. Following termination of the experimental projects, all equipment and fuel were removed from the facility. The shielding concrete in the vaults has low levels of activation products including cobalt-60 and europium-152. Remediation of the building started in 2004: the portions of the building used to support the office space and the mechanical ventilation systems were demolished, the ventilation stack was removed, and a geophysical study supporting final building demolition was completed. In 2007, demolition of the building was put on hold by the DOE.

Building 4059

Building 4059 is the former Systems for Nuclear Auxiliary Power (SNAP) reactor ground test facility. The demolition of the entire building was completed in 2004, and radioactively

contaminated building debris was shipped to the Nevada Test Site. In 2005, site backfill was completed, and the final status MARSSIM survey was completed. Both DPH and ORISE have completed their verification surveys at the Building 4059 site. Currently, the site is pending release for unrestricted use.

2.3.2 Former Sodium Facilities

Sodium Pump Test Facility (SPTF)

All utility connections to the facility buildings were severed in 2007. Demolition of building 4461 was completed in early 2007. In May 2007, DOE halted demolition of the SPTF, and the remaining buildings (4462 and 4463) were placed into a safe shutdown condition.

Hazardous Waste Management Facility (HWMF)

The Hazardous Waste Management Facility, a permitted facility consisting of buildings 4133 and 4029, was approved for closure and demolition by the DTSC in 2006. In May 2007, DOE halted plans for demolition. This facility is maintained in a safe shutdown mode.

2.4 ASER CONTENTS

This ASER provides the following information related to ensuring protection of human health and the environment for DOE's operations at Area IV:

- Section 3 "Compliance Summary", identifies and provides status for applicable permits and other regulatory requirements for DOE's closure mission.
- Section 4 "Environmental Program Information" summarizes the DOE and Boeing programs that are in place to institutionalize the identification, monitoring and response to known or potential releases to the environment that may pose a threat to human health and the environment.
- Section 5 "Environmental Radiological Monitoring" summarizes the data collection activities and associated results for radiological contaminants.
- Section 6 "Environmental Non-Radiological Monitoring" summarizes the data collection activities and associated result for non-radiological contaminants.
- Section 7 "Environmental Monitoring Program Quality Control" summarizes the quality assurance/quality control elements incorporated into the Boeing data analysis program.

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3. COMPLIANCE SUMMARY

This section summarizes DOE's compliance with federal, state, and local environmental regulations. Two main categories are presented: Section 3.1 discusses compliance status, and Section 3.2 discusses current issues and actions.

3.1 COMPLIANCE STATUS

During 2012, eight regulatory agency inspections, audits, and visits were conducted in Area IV. These inspections and visits were carried out by the California Department of Public Health (DPH), County of Ventura Environmental Health Division (EHD), and Ventura County Air Pollution Control District (VCAPCD). In addition, the California Department of Toxic Substances Control (DTSC) was frequently onsite for meetings and to observe field activities.

A list of inspections, audits, and site visits by the various agencies overseeing the SSFL sites is given in Table 3-1.

Table 3-1. 2012 Agency Inspections/Visits Related to DOE Operations

Date (2012)	Agency	Subject Area	Results
January	State of CA, DPH	1st Quarterly Environmental TLD Exchange	Compliant
February	Ventura County VCAPCD	Inspect permit to Operate #00232 (for DOE operations in Area IV)	Compliant
February	Ventura County EHD	CUPA Program Inspection (Annual Business Plan and Hazardous Waste Inspection	Compliant
April	State of CA, DPH	2nd Quarterly Environmental TLD Exchange	Compliant
June	DTSC	Routine Inspection of permitted Hazardous Waste Treatment Facility	Compliant
June	State of CA, DPH	3rd Quarterly Environmental TLD Exchange	Compliant
July	DTSC	Routine Inspection of permitted Hazardous Waste Treatment Facility	Compliant
October	State of CA, DPH	4th Quarterly Environmental TLD Exchange	Compliant

3.1.1 Radiological

The radiological monitoring programs at the SSFL comply with the applicable federal, state, and local environmental regulations. The monitoring results indicate that the SSFL does not pose any significant radiological impact on the health and safety of the general public. All potential pathways, as illustrated in Figure 3-1, are monitored. These include air, soil, surface water, groundwater, direct radiation, transfer of property (land, structures, waste), and recycling.

3.1.1.1 Airborne Activity

Due to the suspension of all DOE's Decontamination and Decommissioning (D&D) operations at SSFL, no effluents from the RMHF stack were released into the atmosphere in 2012. As a result, the potential radiation exposure dose from the airborne release was zero.

For the airborne releases from the RMHF exhaust stack, the maximum radiation exposure dose to an offsite individual is limited to 10 mrem/yr or less, as specified in 40 CFR 61, the National Emission Standards for Hazardous Pollutants (NESHAPs), Subpart H (DOE facilities).

3.1.1.2 Groundwater

There are 11 DOE-sponsored near-surface groundwater wells and 50 DOE-sponsored Chatsworth Formation wells in and around Area IV. Groundwater is sampled and analyzed periodically for radiological constituents, which include gross alpha, gross beta, tritium (H-3), potassium-40 (K-40), strontium-90 (Sr-90), isotopic uranium, and man-made beta/gamma emitters. Annual Groundwater Reports are presented online when they become available.
http://www.etec.energy.gov/Char_Cleanup/Groundwater.html

3.1.1.3 Surface Water

Surface water is regulated under the Los Angeles Regional Water Quality Control Board (LA RWQCB) National Pollutant Discharge Elimination System (NPDES). The existing NPDES Permit (CA0001309) for SSFL allows the discharge of storm water runoff, treated groundwater and fire suppression water into Bell Creek, a tributary to the Los Angeles River. The permit also regulates the discharge of storm water runoff from the northwest slope (Area IV) locations into the Arroyo Simi, a tributary of Calleguas Creek. Discharge along the northwest slope (RMHF: Outfall 003, SRE: Outfall 004, FSDF #1: Outfall 005, FSDF #2: Outfall 006, and Building 4100: Outfall 007) generally occurs only during and immediately after periods of heavy rainfall. The permit applies the numerical limits for radioactivity established for drinking water supplies to discharges through these outfalls. The permit requires radiological measurements of gross alpha, gross beta, tritium, strontium-90, total combined radium-226 and radium-228, potasium-40, cesium-137 and uranium isotopes. Detailed monitoring results are provided in the 2012 Annual NPDES Discharge Monitoring Report (Boeing, 2013). The report may also be viewed at:
http://www.boeing.com/aboutus/environment/santa_susana/ents/monitoring_reports.html

3.1.1.4 Direct Radiation

The external exposure rate at Boeing SSFL's northern property boundary, the closest property boundary to the RMHF, was indistinguishable from natural background. This property line is approximately 300 meters from the RMHF and separated by a sandstone ridge, effectively shielding the boundary from any direct radiation from the RMHF. Dosimeters placed on the RMHF side of this sandstone ridge, approximately 150 meters from the RMHF, read an average of 15 mrem/year above local background. This is considerably below DOE's 100 mrem/year limit.

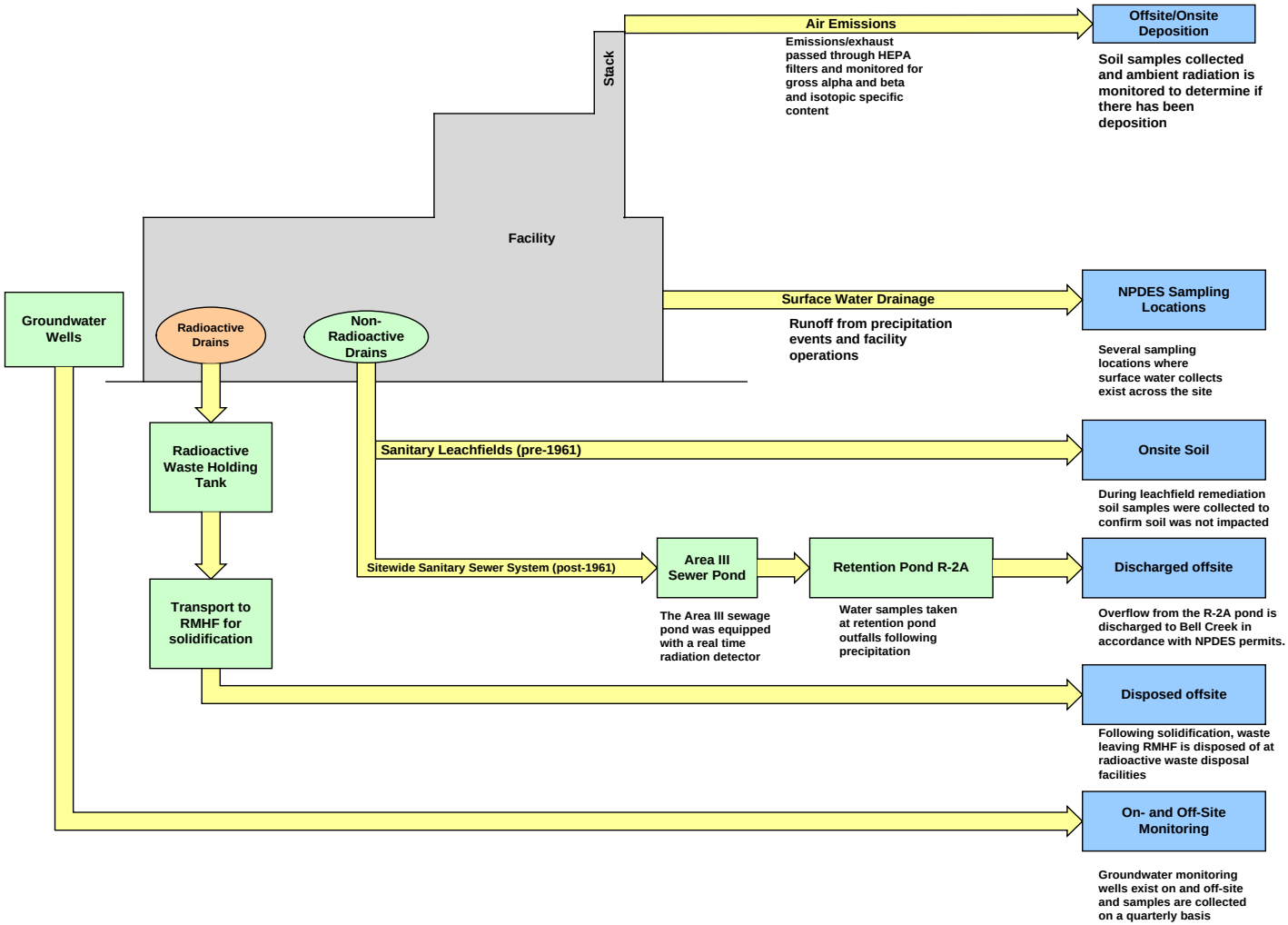

Figure 3-1. Conceptual Model of Potential Pathways

3.1.1.5 Protection of Biota

There is no aquatic system in the Area IV of SSFL. Storm water discharge from the site is monitored in accordance with the NPDES permit (see Section 3.1.1.3 above).

The terrestrial biota, i.e., vegetation and small wild animals, are abundant at SSFL. They are subject to potential exposure to the radioactivity in soil. Screening analysis indicates that the potential radiation exposure is less than the dose limit recommended by the DOE. Section 5.4 provides detailed information on biota protection.

3.1.2 Chemical

3.1.2.1 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) gives the Environmental Protection Agency (EPA) broad authority to regulate the handling, treatment, storage, and disposal of hazardous wastes. This authority has been delegated to the California EPA and DTSC. DOE owns and co-operates two RCRA-permitted Treatment, Storage, and Disposal Facilities within ETEC. Permit numbers are listed in Section 3.1.3.

Radioactive Materials Handling Facility (RMHF)

In 2012, the RMHF continued to be permitted as an Interim Status (Part A) facility. This facility was used primarily for the handling and packaging of low-level radioactive and mixed wastes. Interim status is required for the storage and treatment of the small quantities of mixed waste (waste containing both hazardous and radioactive constituents) resulting from D&D activities at ETEC. The final disposition of mixed waste is addressed under the DOE and DTSC-approved Site Treatment Plan, which is authorized by the Federal Facilities Compliance Act (FFCAct). Currently there is no mixed waste at RMHF. The RMHF has been in a safe shutdown mode since May 2007 and is inactive pending closure plan approval.

Hazardous Waste Management Facility (HWMF)

The Hazardous Waste Management Facility (HWMF) includes an inactive storage facility (Bldg 4029) and an inactive treatment facility (Bldg 4133) that was utilized for reactive metal waste such as sodium. The facility is no longer in operation and is awaiting final closure.

RCRA Facility Investigation

Under the Hazardous and Solid Waste Amendments of 1984, CRA facilities can be brought into the corrective action process when an agency is considering any RCRA permit action for the facility. The SSFL was initially made subject to the corrective action process in 1989 by EPA, Region IX. The EPA has completed the Preliminary Assessment Report and the Visual Site Inspection portions of the RCRA Facility Assessment (RFA) process. ETEC is now within the RCRA Facility Investigation (RFI) stage of the RCRA corrective action process under DTSC oversight for investigation of soil and groundwater.

During 2012, 3 near-surface groundwater, 29 Chatsworth Formation groundwater, and no spring/seep samples were collected within or near Area IV. Data review and validation were completed in 2012.

Administrative Order on Consent (AOC)

In December 2010, DOE and DTSC signed an Administrative Order on Consent (AOC), which outlines a specific soil investigation and remediation program for all of Area IV. Groundwater investigation and remediation is still being conducted under RCRA Corrective Action requirements specified in the 2007 Consent Order between DTSC, Boeing and DOE.

During 2012, 1,983 soil matrix samples were collected within Area IV, the Northern Buffer Zone (NBZ), and portions of Area III as a part of Phase 2 co-located sampling and Phase 3 data gap sampling. Samples collected and analyses performed to date at DOE locations are summarized in Section 6 (Table 6-3). Review and validation of Phase I co-located sampling data collected in 2011 was completed in 2012, with results published in Technical Memoranda and Phase 2 field activities were completed. Phase 3 data gap sampling activities in Area IV and Area III drainages commenced in 2012. These sampling results, along with previous sampling results, are undergoing a data gap evaluation and additional soil samples are being proposed to complete characterization during 2013.

Groundwater

Characterization of the groundwater at the site continues. Five distinct areas of TCE-impacted groundwater have been delineated inside the northwestern property boundary of Area IV, as shown in the shaded areas in Figure 6-3. In 2012, high concentrations of TCE continued to be detected in or near four of these areas. TCE was not analyzed for the fifth area. Detailed TCE results are provided in Section 6.3.

3.1.2.2 Federal Facilities Compliance Act

Boeing manages DOE's RCRA mixed wastes in accordance with FFCAct-mandated Site Treatment Plan (STP) approved in October 1995. All mixed wastes that require extended on-site storage are managed within the framework of the STP. Characterization, treatment, and disposal plans for each of several different waste streams are defined in the STP with enforceable milestones. Management of the mixed wastes has been in full compliance with the STP. In 2012 there were no mixed wastes in the inventory, and there were no additions or removals.

3.1.2.3 National Environmental Policy Act

The National Environmental Policy Act (NEPA) establishes a national policy to ensure that consideration is given to environmental factors in federal planning and decision-making. For those projects or actions expected to either affect the quality of the human environment or create controversy on environmental grounds, DOE requires that appropriate NEPA actions (Categorical Exclusion [CX], Environmental Assessment [EA], Finding of No Significant Impact

[FONSI], or Notice of Intent [NOI], draft Environmental Impact Statement [EIS], final EIS, Record of Decision [ROD]) have been incorporated into project planning documents.

The DOE issued a Finding of No Significant Impact and the final EA report on March 31, 2003. Subsequently, the Natural Resources Defense Council, City of Los Angeles, and the Committee to Bridge the Gap filed a lawsuit in federal court, claiming DOE had violated NEPA, CERCLA and the ESA. Pursuant to a court order, an EIS is being prepared to comply with NEPA.

3.1.2.4 Clean Air Act

The original 1970 Clean Air Act (CAA) authorized the Federal EPA to establish National Ambient Air Quality Standards (NAAQS) to limit the levels of pollutants in the air. EPA has promulgated NAAQS for six criteria pollutants: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. All areas of the United States must maintain ambient levels of these pollutants below the ceilings established by the NAAQS; any area that does not meet these standards is considered a “non-attainment” area (NAA). Under this law, states are required to develop state implementation plans (SIPs) that explain how each state will carry out its responsibilities under the CAA. However, the EPA must approve each SIP, and it may enforce the CAA itself if it deems a state’s SIP unacceptable. Other requirements include National Emissions Standards for Hazardous Air Pollutants (NESHAPs), New Source Performance Standards (NSPSs), and monitoring programs established to achieve air quality levels beneficial to the public health and environment.

Area IV of the SSFL is regulated by the Ventura County Air Pollution Control District (VCAPCD) and must comply with all applicable rules, regulations, and permit conditions. DOE previously operated under Permit to Operate No.00271. In 2008, this Permit was consolidated with the existing permit No. 00232. As a result, DOE currently operates under Permit to Operate No. 00232. The VCAPCD performed its annual inspection of Area IV on February 29, 2012. No violations or compliance issues were identified.

3.1.2.5 Clean Water Act

The Clean Water Act (CWA) is the primary authority for water pollution control programs, including the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program regulates point source discharges of surface water and the discharge of storm water runoff associated with industrial activities.

Surface water discharges from SSFL are regulated under the California Water Code (Division 7) as administered by the Los Angeles Regional Water Quality Control Board (LARWQCB). The existing NPDES Permit (CA0001309) for SSFL includes the requirements for a site-wide Storm Water Pollution Prevention Plan (SWPPP). The SWPPP is revised as needed and includes by reference many existing pollution prevention plans, policies, and procedures implemented at the SSFL site. Several key elements of the plan, including maps, are continually updated. Another key element is the Boeing procedure "SSFL Storm Water Pollution Prevention Requirements." The Spill Prevention Control and Countermeasure (SPCC) plan

serves to identify specific procedures for handling oil and hazardous substances to prevent uncontrolled discharge into or upon the navigable waters of the State of California or the United States. The U.S. EPA requires the preparation of an SPCC plan by those facilities that, because of their locations, could reasonably be expected to discharge oil in harmful quantities into or upon navigable waters. A revised SPCC plan was submitted as a part of the revised Hazardous Materials Release Response Business Plan to the County of Ventura Environmental Health Division in March 2012.

3.1.3 Permits and Licenses (Area IV)

Listed below are the permits and licenses applicable to activities in Area IV.

Table 3-2. SSFL Permits

Permit/License	Facility	Valid
Air (VCAPCD)		
Permit 00232	Combined permit renewed	Current
Ventura County		
Grading Permit 9225/CUP 02488	Soil Borrow Area	Current
Treatment Storage (EPA)		
CAD000629972 (93-3-TS-002)	Hazardous Waste Management Facility (Bldg/133 and Bldg/029)	Inactive. The closure plan was approved on 12/22/06, but demolition has been suspended based on the DOE stop work order and DTSC direction.
CA3890090001	Radioactive Materials Handling Facility (RMHF)	Draft closure plan submitted in 2007.
NPDES (LARWQCB)		
CA0001309	Santa Susana Field Laboratory	Current
State of California		
Radioactive Materials License(0015-19)	All Boeing SSFL facilities	Current. Renewal application submitted 7/17/2012
Storm Water Pollution Prevention Plan 56C312650	Area IV	Current

3.2 CURRENT ISSUES AND ACTIONS

3.2.1 Area IV Environmental Impact Statement

Pursuant to a federal court order issued in May 2007, the DOE is preparing an Environmental Impact Statement (EIS) for Area IV. Activities conducted in support of this EIS during 2012 are described below.

In October 2010, DOE initiated a "chemical co-located sampling" program. This program leveraged the ongoing EPA radiological soil sampling. DOE initiated the co- located sampling program in October 2010 and completed it in November 2011, including northern drainages co-located sediment sampling. The program involved co-located sampling and analysis for chemical constituents at a majority of the same locations at which EPA collected soil samples for radiological analysis. Thus, the co-located sampling program benefitted from the extensive "Historical Site Assessment" document review, geophysical surveys and aerial photograph interpretation, conducted by EPA to target sampling locations in areas of suspected contamination.

DOE conducted monthly community site visits and bi-monthly community meetings in conjunction with the US EPA and California DTSC. The tours included inspection of ongoing field activities and areas of interest to stakeholders involved in the site investigation. Stakeholders also provided input to planning for co-located soil sampling described above.

3.2.2 Radiological Decommissioning and Decontamination

Since May 24, 2007, the decommissioning and decontamination of the remaining DOE facilities in Area IV is on hold following the federal court order to conduct an EIS.

3.2.2.1 Radioactive Materials Handling Facility

During 2012, the RMHF remained in a safe shutdown mode with operations limited to routine inspections and surveys.

The status of the D&D at the Radioactive Materials Handling Facility (RMHF) may be found at:

http://www.etec.energy.gov/Operations/Support_Ops/RMHF.html

http://www.etec.energy.gov/Library/RMHFDocRecord.html

3.2.2.2 SNAP Environmental Test Facility

During 2012, the SNAP Environmental Test Facility (Building 4024) remained in a safe shutdown mode with operations limited to routine inspections and surveys.

The status of the D&D of the Building 4024 may be found at:

http://www.etec.energy.gov/Operations/Major_Operations/SNAP.html

http://www.etec.energy.gov/Library/Building24DocRecord.html

Groundwater that infiltrates into the cells and French drain of Building 4024 is routinely pumped out into Baker tanks. This water is sampled for radionuclides, and periodically for chemicals, prior to being shipped off-site as non-hazardous waste water. No nuclear by-product materials have been detected in this groundwater.

3.2.3 Disposal of Non-radiological Waste

In 2012, miscellaneous groundwater well equipment, debris, purge water and rinse water was surveyed and released for disposal.

In 2012, no metal from DOE radiological facilities was recycled.

3.2.4 Administrative Order of Consent (AOC)

In December 2010, the DTSC and DOE signed an Administrative Order of Consent for Remedial Action (AOC) that defines the process for characterization and the cleanup end-state for Area IV of the Santa Susana Field Laboratory (SSFL). As defined in the AOC, the end state of the site (Area IV and the Northern Buffer Zone) after cleanup will be background (i.e., at the completion of the cleanup, no contaminants will remain in the soil above local background levels).

In November 2012, EPA made recommendations to the DTSC how AOC look-up table (LUT) values for radionuclides should be calculated based on background soil data (EPA, 2012b). Subsequently in January 2013 DTSC issued draft provisional LUTs for sixteen radionuclides.

Likewise, the DTSC Chemical Background Study will provide background data sufficient for DTSC to determine chemical LUTs to be used in making remedial decisions for chemical contaminants.

3.2.5 EPA Background Study and Characterization Survey of Area IV

In July 2008, the DOE and EPA signed an inter-agency agreement, making available $1.5M for the EPA to conduct a radionuclide background study. Subsequently, the EPA published a "statement of work" describing the scope of this work and hosted a public meeting on December 11, 2008.

In April 2009, DOE and EPA signed a second interagency agreement, making available $38.3M for the EPA to conduct "Radiological Characterization of Area IV at SSFL." EPA conducted numerous planning and status meetings with DOE, Boeing, community members and other stakeholders to plan these studies.

EPA completed the Area IV Radiological Characterization Study in December 2012. EPA has completed surface gamma scanning of 100% of accessible portions of Area IV, has taken over 3,735 surface and subsurface soil and sediment samples and 215 groundwater and surface water samples, and completed the Historical Site Assessment. Numerous meetings were conducted, presenting status and results to the public and other stakeholders in a timely fashion.

All environmental sample results were published and are available on the DOE and DTSC web sites at,

http://www.etec.energy.gov/Char_Cleanup/EPA_Soil_Char.html

http://www.dtsc.ca.gov/SiteCleanup/Santa_Susana_Field_Lab/ssfl_document_library.cfm

EPA released two factsheets to the public summarizing the results of its survey, one in May 2012 (EPA, 2012a) and one in November 2012 (EPA, 2012c).

In the May 2012 Factsheet, EPA stated,

"Less than one percent of radioactive contaminants analyzed exceeded screening tools, called the Radioactive Trigger Levels (RTLs), used to indicate areas of contamination. So far, EPA has not found any unexpected radioactive contamination. Radiological contamination has primarily been limited to locations in the vicinity of the Sodium Reactor Experiment (SRE), the Radioactive Material Handling Facility (RMHF), and a few other locations, all onsite."

"In general, EPA found elevated radiation levels in the areas where we expected to find them, isolated to a number of former process or disposal areas."

"Based on these soil studies, we have not found any significant surprises in the soil data."

In the November 2012 Factsheet, EPA stated,

"EPA conducted one of the most comprehensive technical investigations ever undertaken for low level radioactive contamination."

"EPA utilized the latest technology in analytical tools and techniques."

"Of the total samples collected [3.735], a total of 500 samples contained concentrations of radioactive materials exceeding background levels … Both man-made and naturally occurring radionuclides were detected. Man-made radionuclides were detected in 423 of the500 samples, with naturally occurring radionuclides detected in 105 of the 500 samples;

…. Most of the detected radioactive contaminants were cesium-137 and strontium-90, both man-made radionuclides."

"The majority of the samples containing concentrations exceeding background were found in

the surface soil at locations previously suspected of having contamination, such as the Radioactive Materials Handling Facility (RMHF) and the former Sodium Reactor Experiment (SRE).

3.2.6 DOE CleanUpdate

DOE continued its periodic newsletters called "CleanUpdate" to provide stakeholders with an update on its activities on the ETEC Closure Project. In 2012, one CleanUpdate was published in March. In 2013, two CleanUpdates have so far been published in February and June.

These CleanUpdates may be found at:

http://www.etec.energy.gov/Community_Involvement/Newsletters.html

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4. ENVIRONMENTAL PROGRAM INFORMATION

At SSFL, the DOE Site Closure Program Office has programmatic responsibility in accordance with Boeing contract for the former radiological facilities, former sodium test facilities, and related cleanup operations. DOE Site Closure is responsible for environmental restoration and waste management operations in Area IV, where DOE funded programs conducted energy related research and development. Environmental restoration activities include decontamination and decommissioning (D&D) of radioactively contaminated facilities, building demolition, treatment of sodium, assessment and remediation of soil and groundwater, surveillance and maintenance of work areas, and environmental monitoring. Waste management activities include waste characterization and certification, storage, treatment, and off-site disposal. Waste management activities are performed at the Radioactive Materials Handling Facility (RMHF) for radioactive and mixed waste. The Hazardous Waste Management Facility (HWMF) has been used to handle alkali metal waste, but it is now inactive and awaiting closure pending completion of the EIS.

4.1 ENVIRONMENTAL PROTECTION AND REMEDIATION

Oversight of environmental protection at SSFL is the responsibility of Boeing's Environment, Health and Safety (EHS) department. This department provides support for environmental management and restoration. The stated policy of EHS is "To support the company's commitment to the well-being of its employees, community, and environment. It is Boeing's policy to maintain facilities and conduct operations in accordance with all federal, state, and local requirements and contractual agreements." Responsibilities for environmental protection at Boeing SSFL fall under four sub-departments: Environmental Protection (EP), Environmental Remediation (ER), Radiation Safety (RS), and the ETEC Closure Program Office. The responsibilities for each are listed below.

Environmental Operations (EO) is responsible for developing and implementing cost-effective and efficient programs designed to ensure achievement of the policy objectives related to environmental protection. The EP responsibilities include:

- Ensuring compliance with applicable federal, state, and local rules and regulations, including maintaining a working knowledge of applicable environmental laws, performing compliance audits, reviewing new and modified facility projects, coordinating solid and hazardous waste disposal, maintaining required records, preparing and submitting required regulatory reports, applying for and maintaining permits, assuring compliance with permit conditions, and performing sampling and analysis.
- Responding to uncontrolled releases and reporting releases as required by law and contractual requirements.
- Suspending operations determined to be in violation of environmental regulations.
- Providing a program, in conjunction with Technical Skills and Development, for motivating, informing, and training employees about their duties to comply with environmental regulations and protect the environment.

- Recognizing and responding to the community's concerns regarding the environmental impact of operations, including escorting and cooperating with regulatory officials interested in environmental matters and responding to requests for information referred to Communications.
- Working with customers and suppliers to minimize the use of materials and processes that impact the environment while maintaining product quality and competitive pricing.
- Making environmental concerns, including energy and raw material conservation, a priority when evaluating new and existing operations and products or when making decisions regarding land use, process changes, materials purchases, and business acquisitions.

The Radiation Safety (RS) function of Health, Safety & Radiation Services is responsible for providing radiological support for the D&D of radiological contamination at all Boeing SSFL facilities. The RS responsibilities include:

- Compliance with all federal, state, and local regulations pertaining to occupational and environmental radiation protection.
- Provision of health physics oversight of D&D and radioactive waste management activities.
- Performance of final surveys of D&D'd buildings and facilities to demonstrate acceptability for release for unrestricted use.
- Response to employee and public concerns regarding radiological activities and the impact of these activities on the health and safety of the community.

Environmental Remediation (ER) is responsible for remedial actions to clean up historical chemical contamination at all SSFL facilities. The ER responsibilities include:

- Compliance with all federal, state, and local regulations pertaining to environmental remediation.
- Implementation of groundwater monitoring and treatment.
- Implementation of RCRA soil sampling and cleanup activities.

ETEC Closure is responsible for managing the D&D of former DOE nuclear, liquid metal test, and other (e.g., office and warehouse) facilities in support of the ETEC Closure program. ETEC Closure responsibilities also include:

- Responsibility for the management and shipment to DOE-approved disposal sites of radioactive waste generated during the D&D operations.
- Operation of the Radioactive Materials Handling Facility (RMHF) under an interim status Part A permitted facility for the management of mixed (radioactive and hazardous) wastes.
- Performance of the routine Surveillance and Maintenance (S&M) activities for DOE-owned facilities to ensure that the buildings are properly maintained such that the buildings do not create personnel or environmental safety hazards.

- Responsibility for identifying, removing, staging, and initiating documentation for DOE equipment being divested.

4.2 ENVIRONMENTAL MONITORING PROGRAM

The purpose of the environmental monitoring program is to detect and measure the presence of hazardous and radioactive materials, maintain compliance with federal, state, and local laws and regulations, and identify other undesirable impacts on the environment. It includes remediation efforts to correct or improve contaminated conditions at the site and prevent off-site impact. For this purpose, the environment is sampled and monitored, and effluents are analyzed. A goal of this program is to demonstrate compliance with applicable regulations and protection of human health and the environment. Environmental restoration activities at the SSFL include a thorough review of past programs and historical practices to identify, characterize, and correct all areas of potential concern. The key requirements governing the monitoring program are DOE Order 458.1 (DOE, 2011b), and DOE Order 231.1B (DOE, 2011a). Additional guidance is drawn from California regulations and licenses, and appropriate standards.

The basic policy for control of radiological and chemical materials requires that adequate containment of such materials be provided through engineering controls, that facility effluent releases be controlled to federal and state standards, and that external radiation levels be reduced to as low as reasonably achievable (ALARA) through rigid operational controls. The environmental monitoring program provides a measure of the effectiveness of these operational procedures and of the engineering safeguards incorporated into facility designs.

4.2.1 Historical Radiological Monitoring

Monitoring the environment for potential impact from our past nuclear operations has been a primary focus of Boeing and its predecessors.

In the mid 1950s, Atomics International (AI), then a Division of North American Aviation (NAA), began initial plans for nuclear research at its facilities in the west San Fernando Valley. In 1955, prior to initial operations, it started a comprehensive monitoring program to sample and monitor environmental levels of radioactivity in and around its facilities.

During the half century history of nuclear research and later environmental restoration, on-site and off-site environmental monitoring and media sampling have been extensive. In the early years, soil/vegetation sampling was conducted monthly. Sampling locations extended to the Moorpark freeway to the west, to the Ronald Reagan freeway to the north, to Reseda Avenue to the east, and to the Ventura freeway to the south. Samples were also taken around the Canoga and De Soto facilities as well as around the Chatsworth Reservoir. This extensive off-site sampling program was terminated in 1989 when all nuclear research and operations (except remediation) came to an end.

During the 1990s, extensive media sampling programs were conducted in the surrounding areas, including the Brandeis-Bardin Institute and the Santa Monica Mountains Conservancy to the north, Bell Canyon to the south, the Rocketdyne Recreation Center in West Hills to the east,

and various private homes in the Chatsworth and West Hills areas. Samples were also taken from such distant areas as Wildwood Park and Tapia Park. In addition, monitoring of off-site radiation, groundwater, and storm water runoff from the site were routinely performed during this time.

Boeing's ongoing radiological environmental monitoring ensures that activities at the SSFL, including cleanup, do not adversely affect either its employees or its neighbors.

Additional details about onsite and offsite monitoring are available at:

http://www.etec.energy.gov/Environmental_and_Health/Enviro_Monitoring.html

From 2009 through 2012, EPA conducted extensive radiological sampling in off-site locations (Background Study) and on-site locations (Area IV Radiological Study). See Section 3.2.5.

4.2.2 Non-radiological Monitoring

Extensive monitoring programs for chemical contaminants in air, soil, surface water, and groundwater are in effect to assure that the existing environmental conditions do not pose a threat to the public welfare or the environment. Extensive soil sampling is being performed under the Resource Conservation and Recovery Act Facility Investigation and other site-specific remedial programs. Groundwater beneath Area IV was extensively monitored for chemical groundwater conditions in Area IV. Groundwater analyses were conducted by MWH using a DTSC-approved sampling and analysis plan and EPA-approved analytical methods and laboratories.

All surface water discharges were monitored as specified in the National Pollutant Discharge Elimination System (NPDES) permit, which was most recently revised on June 16, 2010. All sources of air emissions were monitored as required by the Ventura County Air Pollution Control District (VCAPCD).

In addition to the environmental monitoring and restoration programs, current operational procedures reflect Boeing's commitment to a clean and safe environment. For example, solvents and oils are collected and recycled rather than being discarded. A comprehensive training and employee awareness program is in place. All employees working with hazardous materials are required to attend a course on hazardous materials waste management. Environmental bulletins are available on the Boeing website to promote environmental awareness among all employees.

4.3 INTEGRATED SAFETY MANAGEMENT SYSTEMS (ISMS)

The "ETEC Closure Contract, Integrated Safety Management System Description" details how the ISMS guiding principles and the core functions are met by utilizing Boeing Policies (POL), Procedures (PRO), Business Process Instructions (BPI), Guides and Santa Susana site procedures contained in specific ETEC Closure Program documents. General ISMS guidelines are tailored specifically for ETEC Closure work. The tailored ISMS integrates safety, health, and

environmental protection into management and work practices at all levels so the ETEC Closure Contract work is accomplished while protecting the worker, the public, and the environment. The ISMS Annual Report reviews performance, accomplishments and improvements to the site Integrated Safety Management System. The CY 2012 Annual ISMS Report submittal was submitted in May 2013.

The site ISMS self-assessment plan incorporates quarterly program assessments, site audits, and the review and distribution of DOE Lessons Learned, Occurrence Reports, and Operating Experience Reports.

A Safety-Conscious Work Environment Self-Assessment conducted for 2012 highlighted the following comments in the Executive Summary:

The EM ETEC project is currently a focused project on remedial site characterization and maintenance of facilities for future decontamination and demolition work. The two contractors, Boeing and CDM Smith, have a relatively small staff (less than 20 full time personnel total) to support these activities. With this information as a basis, there is good communication of safety issues within this project. Both contractors maintain safety systems to assess work activities and monitor for improvements and changing conditions. Contract incentives and performance measures are currently adequate for the scope of work. Based on this limited review, the safety culture at the ETEC project appears to be a positive attribute.

In addition, the Overall Conclusions of the FY 2012 ISMS Declaration for ETEC stated:

Overall, assessments indicate that both the CDM and Boeing ISMS and QA programs effectively meet DOE and program requirements. All potential safety issues identified through Effectiveness Reviews and internal assessment mechanisms were found to be addressed in an appropriate and timely manner. In FY2013, both CDM and Boeing will continue its vigilance with regards to these evaluations and the implementation of continual improvement policies.

To ensure that the ISMS continues to reflect current policies, procedures, processes and business organization within the context of the ISMS principles, related program documents continue to be regularly reviewed and updated. Updates for the following documents were completed in 2012:

- ETEC Closure Contract Integrated Safety Management System Description (EID-04694, 9/21/2012)
- Health & Safety Plan for DE-AC03-99SF21530 (EPA-00060, 6/8/2012)
- 10 CFR 851 Compliance Plan (EPA-00062, 6/8/2012)
- ETEC Closure Training Plan (EID-04450, 10/11/2012)
- Occurrence Reporting (QA-00003, 4/24/2012)
- Demolition Subcontractor General Requirements (PB 08-009, 5/4/2012)
- RMHF Contingency Plan (EPA-00046, 12/21/2012)

4.4 ENVIRONMENTAL TRAINING

Boeing conducts training and development programs as an investment in human resources to meet both organizational and individual goals. These programs are designed to improve employee performance, ensure employee proficiency, prevent obsolescence in employee capability, and prepare employees for changing technology requirements and possible advancement.

The Human Resources organization is responsible for the development and administration of formal training and development programs. Process managers are responsible for individual employee development through formal training, work assignments, coaching, counseling, and performance evaluation. Process managers and employees are jointly responsible for defining and implementing individual training development goals and plans, including on-the-job training.

The Boeing Santa Susana Environment, Health and Safety (EHS) organization currently maintains a list of 55 EHS courses for Boeing Santa Susana personnel. Classes are available as both computer-based training and instructor-lead training. Training is available to employees through Boeing's "My Learning" website. Specialized training programs on new technological developments and changes in regulations are provided, as needed, to ensure effective environmental protection and worker health and safety. Additional off-site courses are also encouraged.

4.5 WASTE MINIMIZATION AND POLLUTION PREVENTION

4.5.1 Program Planning and Development

A Waste Minimization and Pollution Prevention Awareness Plan is in place and serves as a guidance document for all waste generators at ETEC. The plan emphasizes management's proactive policy of waste minimization and pollution prevention, and outlines goals, processes, and waste minimization techniques to be considered for all waste streams generated at the former ETEC. The plan requires that waste minimization opportunities for all major restoration projects be identified and that all cost-effective waste reduction options be implemented.

The majority of waste currently generated at the former ETEC results from environmental restoration of surplus facilities (now on hold pending completion of EIS) and characterization of contaminated sites from previous programs. The typical wastes generated at ETEC in 2012 were:

- Investigation-Derived Waste (IDW)
- Disposal of obsolete groundwater monitoring equipment
- Infiltrated groundwater from Building 4024

Waste minimization is accomplished by evaluating the waste generating processes, identifying waste minimization options, and finally conducting technical and economic evaluations to determine the best approach.

4.5.2 Waste Minimization and Pollution Prevention Activities

The following are some significant activities related to waste minimization and pollution prevention:

- Oils used in motor vehicles and compressors are shipped to vendors who recycle them.
- Hazardous waste containers in acceptable condition are reused to the maximum extent possible.
- Empty product drums returned to the vendor for reuse when practical.

4.5.3 Tracking and Reporting System

Various categories of materials from procurement to waste disposal are tracked. Radioactive and mixed wastes are transferred to the RMHF, logged, characterized, and stored at the RMHF. Documents that accompany the wastes are verified for accuracy and completeness, and filed at the RMHF. Hazardous waste tracking and verification procedures (from generator to final off-site disposal) are followed by the EHS department.

4.6 PUBLIC PARTICIPATION

Throughout 2012, DOE interacted frequently with community members at public meetings and on tours, to inform them of plans and progress, to involve them in ongoing planning, and to educate interested people about highly technical topics. At an average of three meetings per month, DOE participated in or attended meetings of the SSFL Public Participation Group, US EPA's Technical Work Group, DTSC/DOE stakeholder meetings on characterization and sampling, DTSC's chemical background study updates, community-sponsored meetings, and other topical meetings.

In June 2012, in appreciation of the former workers that participated in the Former Worker Interview Project, DOE hosted a tour of the Santa Susana Field Laboratory. The former workers who chose to participate in the tour had a chance to reconnect with their co-workers, see first-hand what the site looks like today, and learn more about on-going efforts to remove facilities, characterize the site, and clean up any remaining contamination.

In addition to hosting monthly public visitation days, DOE participated in 11 Boeing sponsored SSFL community bus tours over several Saturdays in 2012 for approximately 500 individuals.

DOE continued its participation in bi-weekly meetings with NASA, Boeing, US EPA, DTSC, and the Los Angeles Regional Water Quality Board staff to coordinate public outreach efforts.

During 2012, DOE issued email announcements including “DOE News from SSFL,” to inform stakeholders of key activities, meeting notifications, draft and final documents, and contract awards. One issue of the CleanUpdate Newsletter (March 2012) was sent to DOE's 500-

plus electronic mailing list and also in hard copy via regular mail to an additional 4,300 interested parties.

DOE held an Environmental Impact Statement (EIS) Alternatives Development Workshop. This three-session workshop series was held May-June 2012. The series was a pre-scoping effort for the EIS. The first session was informational and included an overview of environmental laws that must be complied with during preparation of an EIS. The second session included a presentation on DOE's purpose and need for action and outlined the objectives that must be addressed for each alternative analyzed in the EIS. The second session also allowed stakeholders to participate in small group discussions regarding how DOE might address various objectives. The final session provided an opportunity for interested stakeholders to develop alternatives for DOE to consider for evaluation in the EIS.

DOE kicked-off the Soil Treatability Study and established the Soil Treatability Investigation Group (STIG) in 2011. The STIG is comprised of over 30 members of the community. The STIG met four times in 2012, along with representatives from Sandia National Laboratories ("Sandia"), DOE, NASA, and DTSC. At the meetings, Sandia presented its proposed approach for identifying treatability study requirements for SSFL, the results of its research in evaluating potential technologies, its results of the screening process for technologies meeting SSFL contaminate needs, and Sandia's recommendations to DOE for studies to be implemented. The STIG will continue its involvement throughout the conduct of the studies.

5. ENVIRONMENTAL RADIOLOGICAL MONITORING

The environmental radiological monitoring program at SSFL started before the first radiological facility was established in 1956. The program has continued with modifications to suit the changing operations. The selection of monitoring locations was based on several site-specific criteria such as topography, meteorology, hydrology, and the locations of the nuclear facilities. The prevailing wind direction for the SSFL site is generally from the northwest, with some seasonal diurnal shifting to the southeast quadrant.

Stormwater at Area IV flows through several natural watercourses and drainage channels and is contained and pumped to in a large-capacity retention pond (Silvernale Pond) for filtration and sampling. This water may then be discharged off-site into Bell Creek to the south.

Ambient air samples are measured for gross alpha and gross beta for screening purposes. These screening measurements can quickly identify any unusual release and provide long-term historical records of radioactivity in the environment. At the end of each year, the air samples for the entire year are combined and analyzed for specific radionuclides. The isotopic analysis results may be used for estimating the potential off-site dose from air pathways.

Groundwater and surface water samples are analyzed for radioactivity, and the results are compared with the limits established by the EPA for suppliers of drinking water. The analyses include gross alpha and gross beta, tritium, Sr-90, radium-226, radium-228, isotopic thorium, isotopic uranium, and gamma emitters.

Direct radiation is monitored by the thermoluminescent dosimeters (TLDs) located on the site boundary and throughout the site. To accurately measure low-level ambient radiation, “sapphire” TLDs, which are very sensitive to low-level radiation, are used. These TLDs are complemented by TLDs installed by the State of California Department of Public Health Radiologic Health Branch for independent surveillance.

5.1 AIR EFFLUENT MONITORING

The only potential emission source at the DOE facility at SSFL is the exhaust stack at the Radioactive Materials Handling Facility (RMHF). In May 2007, DOE suspended all Decontamination and Decommissioning (D&D) operations at SSFL. As a result, the entire facility was placed into a safe shutdown mode, and no effluents were released to the atmosphere through the stack in 2012.

The EPA limit for a DOE site is 10 mrem/yr, as specified in 40 CFR 61, Subpart H. The regulation also specifies that radiation exposure dose to the Maximally Exposed Individual (MEI) be calculated using the EPA’s CAP88PC computer model. Due to the fact that no effluents were released to the atmosphere from the DOE facility at SSFL in 2012, the potential radiation exposure dose to the MEI was zero.

5.2 ENVIRONMENTAL SAMPLING

5.2.1 Ambient Air

Due to the temporary suspension of D&D operations at SSFL, the number of environmental stations was reduced in 2009. The sampling locations are shown in Figure 5-1 and listed in Table 5-1.

During 2012, ambient air sampling was performed continuously at SSFL with air samplers operating on 7-day sampling cycles. Airborne particulate radioactivity was collected on glass fiber (Type A/E) filters that were changed weekly. The samples were counted for gross alpha and beta radiation following a minimum 120-hour decay period to allow the decay of short-lived radon and thoron daughters. The volume of a typical weekly ambient air sample was approximately 50.4 m^3.

Weekly ambient air samples were counted for gross alpha and beta radiation with a low-background, thin-window, gas-flow proportional-counting system. The system is capable of simultaneously counting both alpha and beta radiation. The sample-detector configuration provides a nearly hemispherical (2π) geometry. The thin-window detector is continually purged with argon/methane counting gas. A preset time mode of operation is used for counting all samples.

Counting system efficiencies were determined routinely with Technetium-99 (Tc-99) and Thorium-230 (Th-230) standard sources. The activities of the standard sources are traceable to the National Institute of Standards and Technology (NIST).

Filter samples for each ambient air sampling location were combined annually and analyzed for isotopic-specific activity. The ambient air sampling results, as shown in Table 5-2, had radionuclide concentrations far below the Derived Concentration Guide (DCG) values. The variability in the measurements was primarily due to weather effects, as well as analytical and background variations.

It should be noted that these measurements determine only the long-lived particulate radioactivity in the air and, therefore, do not show radon (Rn-222) and most of its progeny. Polonium-210 is a long-lived progeny and is detected by these analyses.

The gross radioactivity guidelines for SSFL site ambient air are based on the reference values specified in DOE Order 458.1 Chg 2 (DOE, 2011b) and DOE Order 5400.5 (DOE, 1993). The conservative guide value for alpha activity is 2×10^{-14} μCi/mL, and the value for beta activity is 9×10^{-12} μCi/mL. These values are the most restrictive airborne limits for plutonium-239 and strontium-90 respectively. A complete list of the results from the gross alpha and gross beta counting of the ambient air samples is given in Table 5-3.

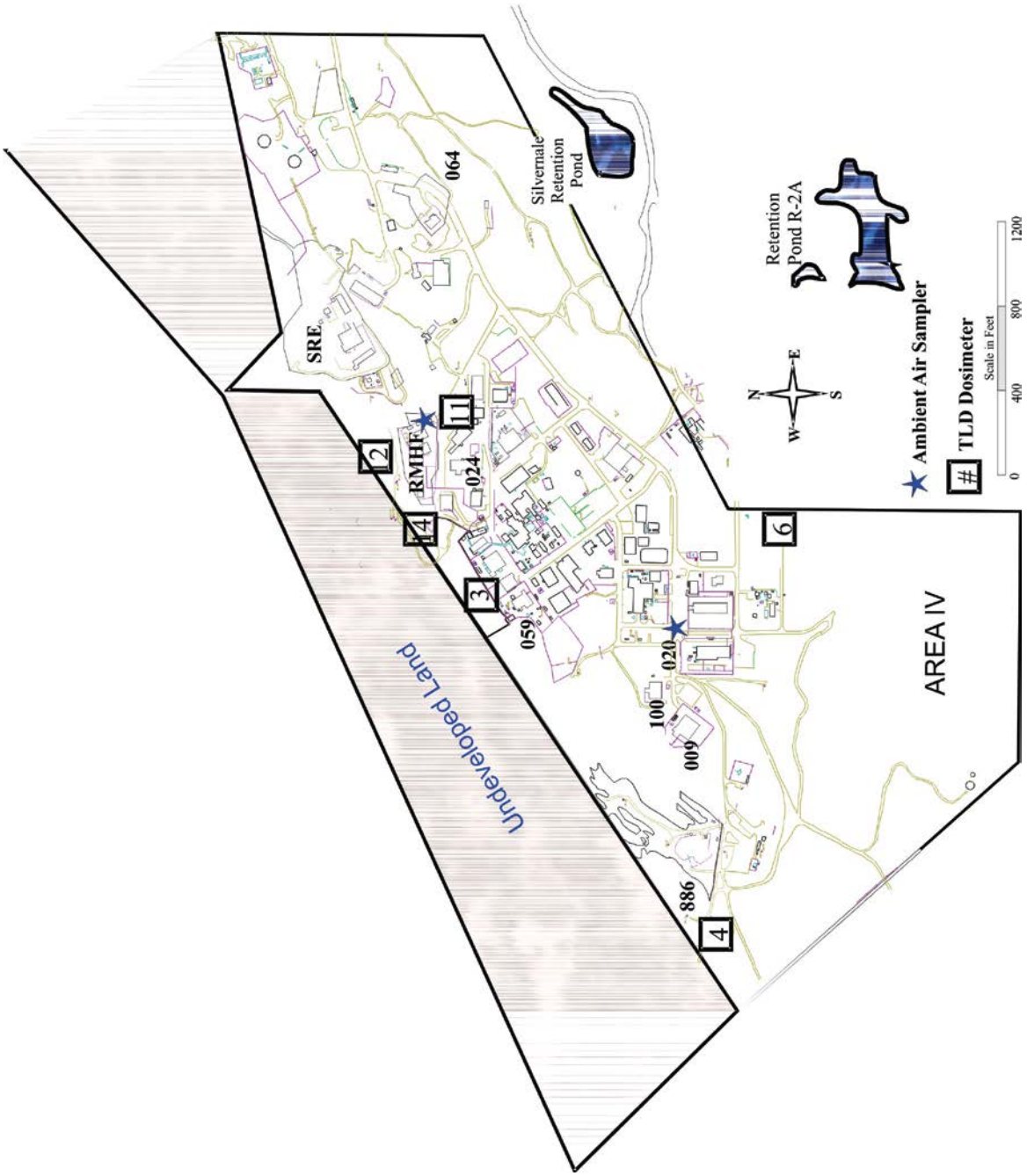

Figure 5-1. Map of Santa Susana Field Laboratory Area IV Sampling Stations

Table 5-1. Sampling Location Description

Station	Location	Sampling Frequency
Ambient Air Sampler Locations		
A-2	SSFL Site, 4020, northeast of former 4020 site	(W)
A-3	SSFL Site, RMHF Facility, next to 4034	(W)
A-4	SSFL Site, 4886, Former Sodium Disposal Facility	Discontinued
A-5	SSFL Site, RMHF Pond, north side	Discontinued
A-6	SSFL Site, 4100, east side	Discontinued
On-site - SSFL - Ambient Radiation Dosimeter Locations		
SS-3 (CA)	SSFL Site, Electric Substation 719 on boundary fence	(Q)
SS-4 (CA)	SSFL Site, west boundary on H Street	(Q)
SS-6 (CA)	SSFL Site, northeast corner of 4353	(Q)
SS-7 (CA)	SSFL Site, 4363, north side	Discontinued
SS-8 (CA)	SSFL Site, Former Sodium Disposal Facility north boundary	Discontinued
SS-9 (CA)	SSFL Site, RMHF northeast boundary at 4133	Discontinued
SS-11 (CA)	SSFL Site, 4036, east side	(Q)
SS-12 (CA)	SSFL Site, RMHF northwest property line boundary	(Q)
SS-13 (CA)	SSFL Site, RMHF northwest property line boundary	Discontinued
SS-14 (CA)	SSFL Site, RMHF west of 4614	(Q)
SS-15 (CA)	SSFL Site, RMHF northwest property line boundary	Discontinued
EMB-1 (CA)	SSFL Site, SRE area north of 4003	Discontinued
EMB-2 (CA)	SSFL Site, south of Silvernale retention pond, off Test Area Road	Discontinued
Off-site Ambient Radiation Dosimeter Locations		
OS-1 (CA)	SSFL Front Gate	(Q)
BKG-11	Background Location, West Hills	(Q)
BKG-12	Background Location, Somis	Discontinued
BKG-13	Background Location, Hollywood	Discontinued
BKG-15	Background Location, Calabasas	Discontinued
BKG-18	Background Location, Agoura	Discontinued
BKG-19	Background Location, Westlake Village	(Q)
BKG-22	Background Location, Saugus	Discontinued

Codes		**Locations**	
A	Air Sampler Station	SS	SSFL
W	Weekly Sample	OS	Off-site
Q	Quarterly Sample	BKG	Background
CA	State Confirmatory Location	EMB	Environmental Management Branch

Table 5-2. Ambient Air Specific Isotopes – 2012

Radionuclide	Derived Conc. Guide (DCGs)	RMHF	4020	Average (% of DCGs)
	(μCi/mL)			
H-3	1E-07	NA	NA	NA
Be-7	natural	6.43E-15	8.87E-15	7.65E-15(NA)
K-40	natural	ND	ND	NA
Mn-54	2E-9	ND	ND	NA
Co-60	8E-11	ND	ND	NA
Sr-90	9E-12	ND	ND	NA
Cs-137	4E-10	ND	ND	NA
Po-210	natural	8.68E-15	9.44E-15	9.06E-15 (NA)
Th-228	4E-14	ND	ND	NA
Th-230	4E-14	1.41E-16	3.81E-18	7.23E-17(0.2%)
Th-232	7E-15	ND	ND	NA
U-234	9E-14	ND	ND	NA
U-235	1E-13	ND	ND	NA
U-238	1E-13	ND	ND	NA
Pu-238	3E-14	ND	ND	NA
Pu-239/240	2E-14	ND	ND	NA
Pu-241	1E-12	ND	ND	NA
Am-241	2E-14	ND	ND	NA

NA = Not applicable
ND = Not detected

Table 5-3. Ambient Air Gross Alpha and Gross Beta—2012

Area	Activity	Number of Weeks	Gross Radioactivity	
			Average Concentrations[a] (μCi/mL)	Average Percent of Guide[b]
SSFL Area IV 4020	Alpha	52	3.35E-15	16.75%
	Beta		1.58E-14	0.18%
SSFL Area IV RMHF	Alpha	52	4.90E-15	24.51%
	Beta		1.96E-14	0.22%

[a]Values include natural background.
[b]Guidelines for SSFL site: 2E-14 μCi/mL alpha, 9E-12 μCi/mL beta, DOE Order 5400.5 (01/07/93).

5.2.2 Groundwater

Both Chatsworth Formation wells and shallow wells are utilized to monitor groundwater conditions in Area IV. The locations of these wells are shown in Figure 6-2. The purpose of these wells is to monitor concentrations of chemicals and/or radioactivity released by DOE operations. Water samples from these wells are periodically analyzed for gross alpha, gross beta, H-3, K-40, Sr-90, Ra-226, Ra-228, isotopic thorium, isotopic uranium, and man-made

beta/gamma emitters. Complete sampling schedule and analytical results are presented in the 2012 Annual Groundwater Report, which can be found at:

http://www.etec.energy.gov/Char_Cleanup/Groundwater.html

In addition, EPA issued a Final Groundwater Report in July 2012 with results of sampling conducted in the third quarter of 2010 and first quarter of 2011.

http://www.etec.energy.gov/Library/Cleanup_and_Characterization/Soil/Co-Located/1-Final%20Groundwater%20Report%20072412.pdf

5.2.3 Surface Water

Most of Area IV slopes toward the southeast, and rainfall runoff is collected by a series of drainage channels and accumulates in the R2A or Silvernale Ponds. Water is contained and pumped into Silvernale Pond for treatment/filtration and sampling prior to discharge to Bell Creek under the NPDES permit. Some of Area IV slopes to the northwest, and a small amount of rainfall drains toward five catch basins (two at the FSDF, one at building 4100, one at the RMHF and one at the SRE). This water is also contained and pumped to Silvernale Pond for treatment/filtration and sampling prior to discharge to Bell Creek.

The NPDES Permit No. CA0001309 requires that a discharge monitoring report (DMR) for the Santa Susana Field Laboratory (SSFL) be published quarterly and annually. The DMR provides information and data, including summary tables of surface water sample analytical results, rainfall summaries, liquid waste shipment summaries, and analytical laboratory QA/QC procedures and certifications. The annual DMR provides a summary of all the data for the period of January 1, 2012 through December 31, 2012. (Boeing, 2013).

The 2012 Quarterly and Annual NPDES Discharge Monitoring Reports are also available at:

http://www.boeing.com/aboutus/environment/santa_susana/ents/monitoring_reports.html

In addition, EPA issued a Final Surface Water and Sediment Report in December 2012.

http://www.etec.energy.gov/Library/Cleanup_and_Characterization/Soil/Co-Located/Final%20Surface%20Water%20&%20Sediment%20Report%20122112.pdf

5.2.4 Soil

All of the radiological environmental soil sampling was conducted by USEPA in Area IV during 2012. See Section 3.2.5 for a discussion of the soil sampling conducted by EPA as part of the Area IV Characterization Survey.

5.2.5 Vegetation

No vegetation samples were collected in 2012.

5.2.6 Wildlife

No animal samples were collected in 2012.

5.2.7 Ambient Radiation

Boeing deploys environmental TLDs that use an aluminum oxide ("sapphire") chip. These TLDs are capable of determining doses in increments of 0.1 mrem. Proper use of the control badges supplied with these dosimeters allows elimination of the natural and transportation exposure that occurs before, during, and after the deployment of the environmental dosimeters to measure the ambient radiation. This usage permits accurate determination of the net exposure received while the environmental TLDs are in the field, exposed to the ambient radiation.

The State DPH/RHB deploys calcium sulfate ($CaSO_4$) dosimeters for independent monitoring of radiation levels at SSFL and in the surrounding area. These dosimeters are placed at specific locations by DPH/RHB along with the Boeing TLDs. The State dosimeters are collected by the Radiologic Health Branch for evaluation each quarter. Data obtained in 2012 on these Boeing and State TLDs, are shown in Table 5-4. The differences between the Boeing and State results are mainly due to the fact that two different types of TLDs were used in the measurement.

The natural background radiation level as measured by the off-site TLDs ranges from 27 to 54 mrem/yr. At SSFL, the local background ranges from 47 to 67 mrem/yr, based on the data from dosimeters SS-3, -4, -6, and -11 as shown in Table 5-4. The variability observed in these values can be attributed to differences in elevation and geologic conditions at the various sites. The altitude range for the dosimeter locations is from approximately 260 m (850 ft) ASL at two off-site locations (BKG-11 and BKG-19) to a maximum of approximately 580 m (1,900 ft) ASL at SSFL. Many of the SSFL TLD locations are also affected by proximity to sandstone rock outcroppings, a condition that results in elevated exposure levels. Radiation doses measured at locations SS-12 and -14, north of the RMHF are similar to those measured at other locations on-site.

Table 5-4. 2012 SSFL Ambient Radiation Dosimetry Data

TLD-Locations		Annual Exposure (mrem) By Boeing	Average Exposure Rate (μR/h)	
			Boeing	State DPH
SSFL	SS-3	47.4	5.4	8.2
	SS-4	67.1	7.7	9.7
	SS-6	60.5	6.9	10.1
	SS-11	57.0	6.5	9.9
	SS-12	76.3	8.7	10.7
	SS-14	69.5	7.9	9.0
Mean Values		**63.0**	**7.2**	**9.7**
Off-site	OS-1	54.4	6.2	8.9
	BKG-11	34.9	4.0	
	BKG-19	27.2	3.1	
Mean Values		**38.8**	**4.4**	**8.9**

The external exposure rate at Boeing SSFL's northern property boundary, the closest property boundary to the RMHF, is indistinguishable from natural background. This property line is approximately 300 meters from the RMHF and separated by a sandstone ridge that effectively shields the boundary from direct radiation from the RMHF. Dosimeters placed on the RMHF side of this sandstone ridge (SS-12 and –14), approximately 150 meters from the RMHF, read an average of 15 mrem/year above the local background. This amount is considerably below the 100 mrem/year limit specified in DOE Order 458.1, *Radiation Protection of the Public and the Environment*. The TLD results demonstrate that the potential external exposure at the site boundary is below the DOE's dose limit.

The SSFL local background, calculated as the average of all onsite TLDs (excluding SS-12 and SS-14), is 58 mrem/year. This value is 19 mrem/year higher than the average of offsite background of 39 mrem/year. This result can be attributed to the contribution of higher elevation and different geology. Offsite TLDs are located in Boeing staff members' backyards, surrounded by natural soil. In contrast, SSFL lies atop the Chatsworth Formation. The Chatsworth Formation is composed of arkosic sandstone, rich in feldspar. Arkosic rocks are often high in naturally occurring radioactive material (NORM). As a result, the Chatsworth Formation rocks produce higher radiation exposure than the soil of the surrounding valleys.

5.3 ESTIMATION OF RADIATION DOSE

5.3.1 Individual Dose

In accordance with regulations, the total effective dose equivalent (TEDE) to any member of the public from all pathways (combining internal and external dose) shall not exceed 100 mrem/yr (above background) for DOE facilities. Although the two TLD monitoring stations to the north of the RMHF, namely SS-12 and –14, recorded an external dose level at 15 mrem above the local background, the actual dose at the property boundary is likely to be indistinguishable from the natural background. This is because the high rocky terrain between the actual property line and the TLD monitoring stations acts as an effective shield and makes the exposure from direct radiation at the property line indistinguishable from background. Exposure from direct radiation at the nearest residence would also be indistinguishable from background for the same reason.

Due to the fact that no effluents were released to the atmosphere through the RMHF stack in 2012, the potential internal dose from airborne releases is zero mrem. For DOE operations, the air pathway standard is 10 mrem/yr (CEDE), as established by EPA.

Public exposure to radiation and radioactivity is shown in Table 5-5. The table presents the estimated exposures in comparison to the regulatory standards. Dose values in the tables represent both internal and external exposures.

5.3.2 Population Dose

Since no effluents were released to the atmosphere during 2012, the potential collective dose to the general population was zero person-rem.

Table 5-5. Public Exposure to Radiation from DOE Operations at SSFL

1.	**All pathways**	
	1. Maximum estimated external dose to an individual from direct radiation	0 mrem/yr
	2. Maximum estimated internal dose to an individual	0 mrem/yr
	Limit ("Radiation Protection of the Public and the Environment" DOE Order 458.1)	100 mrem/yr
2.	**Air pathway (reported in NESHAPs report)**	0 mrem/yr
	Limit (40 CFR 61, Subpart H)	10 mrem/yr

5.4 PROTECTION OF BIOTA

DOE Order 458.1, "Radiation Protection of the Public and the Environment", requires that populations of aquatic organisms be protected using a dose limit of 1 rad/day. While there is no formal DOE dose limit for terrestrial biota, DOE strongly recommends that its site activities meet the internationally recommended dose limits for terrestrial biota, which are:

- the absorbed dose to aquatic animals will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material,
- the absorbed dose to terrestrial plants will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material, and
- the absorbed dose to terrestrial animals will not exceed 0.1 rad/day (1 mGy/day) from exposure to radiation or radioactive material.
- There is no aquatic system in the Area IV of SSFL. Therefore, the protection of aquatic organisms on-site is not an issue.

The terrestrial biota, i.e., vegetation and small wild animals, are abundant at SSFL. They are subject to exposure to the radioactivity in soil. The DOE Technical Standard, A Graded Approach for Evaluating Doses to Aquatic and Terrestrial Biota (DOE, 2002), provides a methodology for demonstrating compliance with the requirement for protection of biota. RESRAD-BIOTA, a computer program developed by DOE, implements the graded approach for biota dose evaluation. There are three levels of dose evaluations in RESRAD-BIOTA. The first level is a conservative screening tool for compliance demonstration. Once the screening test in Level 1 is passed, no further action is necessary.

In the Level 1 dose evaluation, measured radionuclide concentrations in environmental media are compared with the biota concentration guides (BCGs). Each radionuclide-specific BCG represents the limiting concentration in environmental media that would not cause the biota dose limits to be exceeded.

EPA soil concentrations in Area IV are used for the Level 1 dose evaluation. Table 5-6, summarizes the comparison results. The total BCG fraction in Area IV, as shown in Table 5-6, is less than 1, indicating that the potential exposure is less than the dose limit recommended by the DOE.

Table 5-6. Terrestrial Biota Radiation Exposure as a Fraction of Dose Limit

Isotope	Soil			
	Draft LUT (pCi/g)	BCG Limit (pCi/g)	Avg. Soil Concentration above LUT (pCi/g)	Avg. Site Isotopic Partial Fraction
Am-241	3.86E-02	3.89E+03	1.50E-05	3.966E-09
Cm-243/244	3.96E-02	4.06E+03	9.00E-06	2.223E-09
Co-60	3.63E-02	6.92E+02	4.00E-06	6.080E-09
Cs-137	2.25E-01	2.08E+01	2.11E-01	1.012E-02
Eu-152	7.39E-02	1.52E+03	3.40E-05	2.252E-08
Pu-238	2.54E-02	5.27E+03	9.00E-06	1.624E-09
Pu-239/240	2.30E-02	6.11E+03	1.65E-04	2.705E-08
Sr-90	1.17E-01	2.25E+01	4.68E-02	2.082E-03
Th-230	2.38E+00	9.98E+03	9.85E-04	9.872E-08
Th-232	3.44E+00	1.51E+03	0.00E+00	0.00E+00
Th-234	3.54E+00	2.16E+03	1.30E-03	6.026E-07
U-233/234	2.18E+00	5.13E+03	2.56E-03	4.991E-07
U-235/236	1.52E-01	2.77E+03	1.47E-04	5.322E-08
U-238	1.96E+00	1.58E+03	1.49E-03	9.445E-07
	Sum of Partial Fraction			**1.22E-02**

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6. ENVIRONMENTAL NON-RADIOLOGICAL MONITORING

Boeing SSFL maintains a comprehensive environmental program to ensure compliance with all applicable regulations, to prevent adverse environmental impact, and to restore the quality of the environment from past operations.

The discharge of surface water at SSFL results from storm water runoff or excess treated groundwater. The Los Angeles Regional Water Quality Control Board regulates discharges through a National Pollutant Discharge Elimination System (NPDES) permit. Most surface water runoff drains to the south and is collected in the water reclamation/pond system. Discharges from this system are subject to effluent limitations and monitoring requirements as specified in the NPDES permit. A small portion of the site within Area IV discharges storm water runoff to five northwest runoff channels where sampling locations (Figure 6-1) have been established and sampling is conducted in accordance with the northwest slope monitoring program. All discharges are regularly monitored for various constituents, including: volatile organics, heavy metals, and applicable radionuclides as well as other parameters necessary to assess water quality.

The major groundwater contaminants in Area IV are TCE and its degradation products. Three interim groundwater extraction systems were installed in Area IV between 1994 to 1998. The Building 4059 (B/059) interim system was turned off in 2005 following Building 4059 demolition. The FSDF interim system was shut off in 2003 to facilitate aquifer testing and to support the ongoing CFOU characterization program. The RMHF interim system was deactivated in September 2006. Since all interim groundwater extraction systems have been deactivated, further reporting has been suspended.

The overall annual groundwater monitoring program at SSFL addresses collection and analysis of groundwater samples and measurement of the water levels. The locations of the wells and piezometers within and around DOE areas in Area IV are shown in Figure 6-2. Groundwater quality parameters and sampling frequency have been determined on the basis of historical water quality data, location of known or potential sources of groundwater contamination, operational requirements of groundwater extraction and treatment systems, and regulatory direction. The groundwater monitoring program includes the following parameters, which are analyzed using the appropriate EPA methods: volatile organic constituents, base/neutral and acid extractable organic compounds, petroleum hydrocarbons, trace metals, and common ion constituents. Radiological analyses are performed on groundwater samples from DOE areas in Area IV and off-site (see Section 5.2.2).

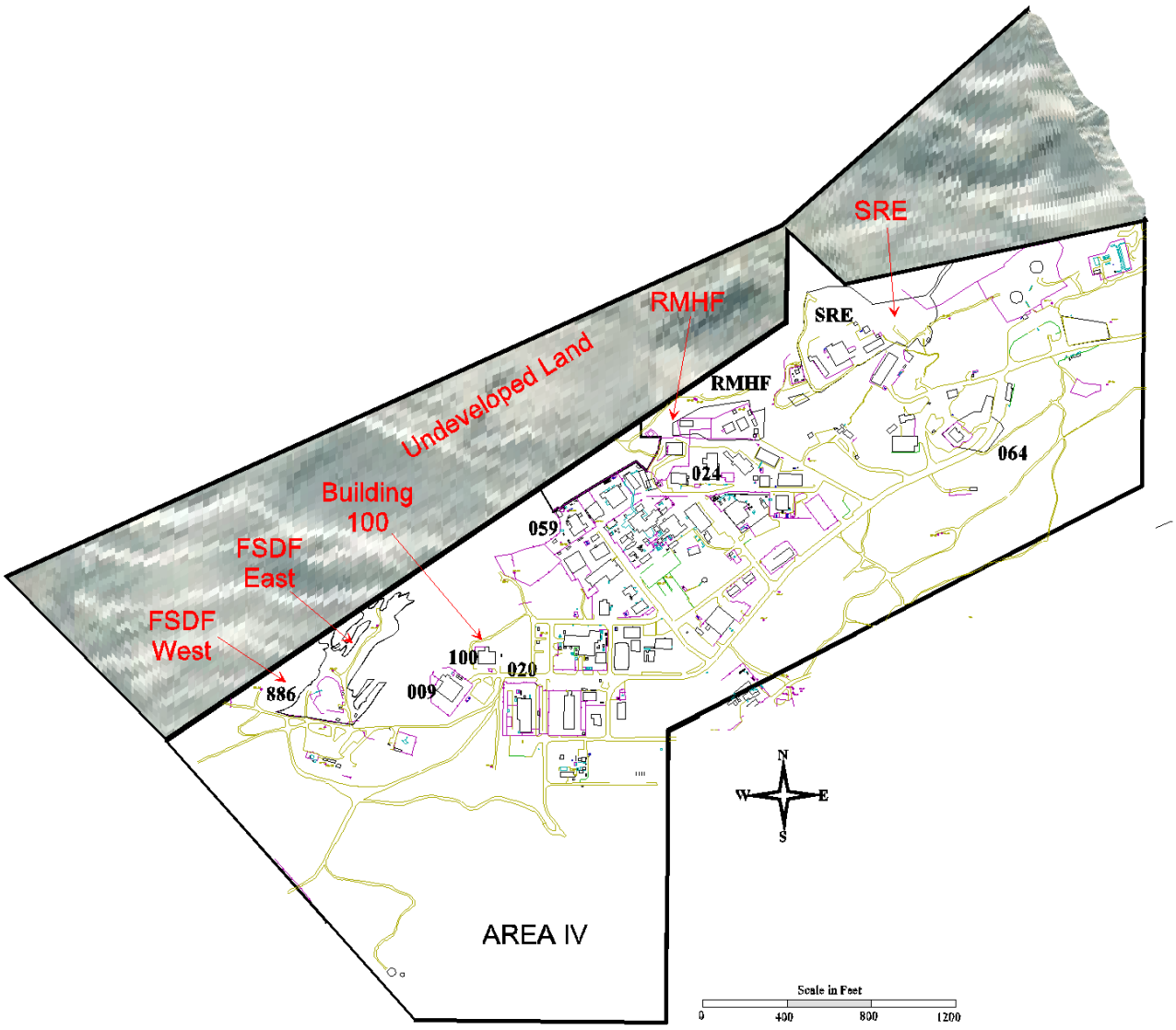

Figure 6-1. Locations of Surface Water Runoff Collectors

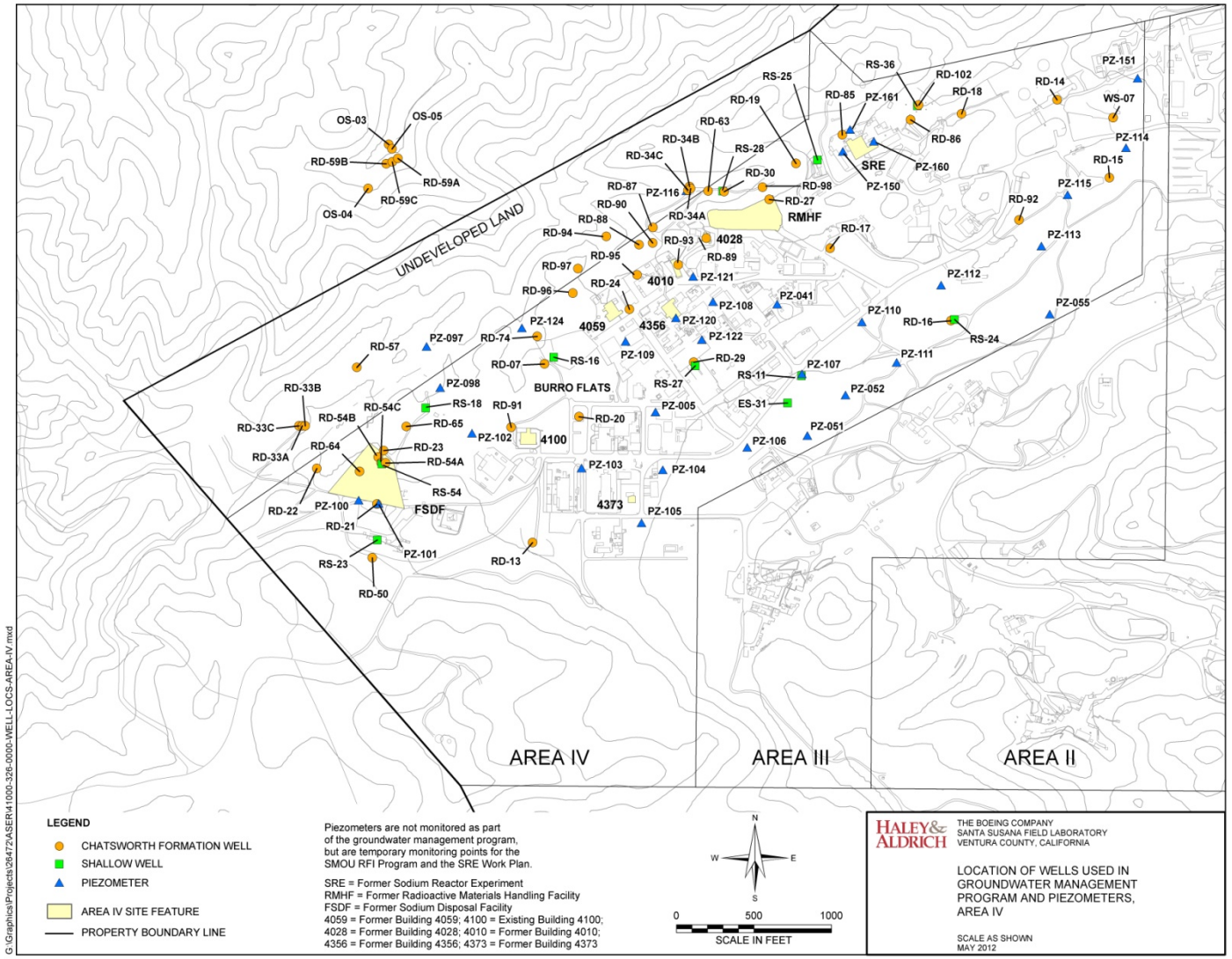

Figure 6-2. Well and Piezometer Locations

6.1 SURFACE WATER

The Los Angeles Regional Water Quality Control Board (LA RWQCB) has granted Boeing SSFL a discharge permit pursuant to the National Pollutant Discharge Elimination System and Section 402 of the federal Water Pollution Control Act. The permit to discharge, NPDES No. CA0001309, initially became effective on September 27, 1976, and was most recently renewed on June 16, 2010 and became effective on July 19, 2010.

The permit allows the discharge of storm water runoff from retention ponds into Bell Creek, a tributary of the Los Angeles River. Storm water from the southeastern portion of Area I is permitted to discharge to Dayton Creek and from the Northeastern locations of Area II into the Arroyo Simi, a tributary of Calleguas Creek. The permit also allows for the discharge of storm water runoff from the northwest slope (Area IV) locations into the Arroyo Simi, a tributary of Calleguas Creek. Discharge along the northwest slope (RMHF: Outfall 003, SRE: Outfall 004, FSDF #1: Outfall 005, FSDF #2: Outfall 006, and T100: Outfall 007) generally occurs only during and immediately after periods of heavy rainfall. As of March 8, 2006 all rocket engine testing has ceased. No waste water currently generated from site operations is discharged. Discharges consist only of treated groundwater, storm water runoff and fire suppression water.

There is no sanitary sewer connection to a publicly owned treatment works from SSFL. Domestic sewage is temporarily stored in two inactive Sewage Treatment Plants (STP) and then trucked offsite for treatment and disposal, as summarized in the monthly Discharge Monitoring Reports (DMR) reports to the RWQCB. Boeing SSFL does not anticipate future use of any of the STPs. Area IV sewage was piped directly to the Area III Sewage Treatment Plant (STP III). Area IV has gone through demolition activities and sewage has been transferred to mobile containment and is trucked off-site for disposal. The STP III was demolished in April 2012.

Of the two retention ponds at SSFL that discharge via the NPDES permit, only one, the R-2A Pond, receives influent from Area IV. Influent to the pond is from storm water runoff only. When there is discharge from either the Perimeter or R-2 ponds grab and composite samples are collected and sent to a California State certified testing laboratory for analysis. Analyses include chemical constituents such as heavy metals, volatile organics, base/neutral and acid extractables, general chemistry, E. Coli and Fecal Coliform, and specified radionuclides. Toxicity testing is also conducted in the form of acute and chronic toxicity bioassays.

Details on the NPDES discharge from the SSFL for the period of January 1, 2012 through December 31, 2012 are available in 2012 Annual NPDES Discharge Monitoring Report (Boeing, 2013). This annual report provides information and data, including summary tables of surface water sample analytical results, rainfall summaries, liquid waste shipment summaries, and analytical laboratory QA/QC procedures and certifications. The report may also be viewed at:

http://www.boeing.com/aboutus/environment/santa_susana/ents/monitoring_reports.html

6.2 AIR

The SSFL is regulated by the VCAPCD and must comply with all permit conditions set forth in the air permit and applicable VCAPCD rules and regulations. During 2008, the former Permit to Operate No.00271 for DOE was consolidated into SSFL Permit to Operate No. 00232. As a result, the current Permit is No. 00232. No changes or modifications from the previous permit were made as a result of the permit consolidation. However, as equipment is removed from the site, it is taken off the permit. Permit to Operate No.00232 covers all areas of the SSFL, which is inspected annually by VCAPCD. On February 29, 2012, the annual inspection was performed. No issues or violations were identified. Likewise, air emissions associated with this operating permit have continued to remain under the threshold limits contained the permit conditions. This area is not considered a major source and therefore is not captured under Title-V or the Aerospace NESHAP. Area IV, as well as the entire SSFL, is not expected to exceed the threshold for reporting under SARA 313 Toxic Release Inventory Reporting for the 2012 report year.

6.3 GROUNDWATER

A groundwater monitoring program has been in place at the SSFL site since 1984. Currently, the monitoring system includes 275 on-site and off-site wells and 20 private off-site wells. An additional 162 piezometers are installed on- and off-site. Routine semi-annual chemical and radiological monitoring of the wells is conducted according to the monitoring plan submitted to DTSC for the groundwater program.

Reports are submitted to the regulatory agencies following each sampling event. An annual report for 2012 was submitted to the regulatory agencies in February 2013. Summaries of groundwater monitoring activities and sampling results for Area IV during 2012 are presented in Tables 6-1 and 6-2.

Table 6-1. Groundwater Monitoring at Area IV in 2012

	Remediation	Waste Management	Environmental Surveillance	Other Drivers
Number of active wells monitored	0	0	28	0
Number of samples taken	0	0	32	0
Number of analyses performed	0	0	241	0
% of analyses that are non-detect	NA	NA	77	NA

Table 6-2. Ranges of Detected Non-Radiological Analytes in 2012 Groundwater Samples

Analytes	Ranges of Results for Positive Detections
Fluoride (mg/L)	0.24 J to 0.8
Metals (mg/L)	0.000033 J to 140
Perchlorate (ug/L)	1.2 J to 1.8 J
1,1-Dichloroethane (µg/L)	0.4 J to 0.45 J
1,1-Dichloroethene (µg/L)	0.37 J to 0.78 J
1,4-Dioxane (µg/L)	1.2 J
Acetone (µg/L)	3.7 J to 59
cis-1,2-Dichloroethene (cis-1,2-DCE) (µg/L)	0.22 J to 39
trans-1,2-Dichloroethene (µg/L)	0.3 J to 1.4
Trichloroethene (TCE) (µg/L)	0.16 J to 75
Methyl Ethyl Ketone (µg/L)	2.6 J

J = Estimated value. Analyte detected at a level less than the reporting limit and greater than or equal to the MDL.

Groundwater occurs at SSFL in the alluvium, weathered bedrock, and unweathered bedrock. First-encountered groundwater may be observed in any of these media under water table conditions. For regulatory purposes, "near-surface groundwater" is defined to occur within the site's unconsolidated deposits (e.g., alluvium) and shallow weathered bedrock, where as deep groundwater, referred to as "Chatsworth Formation groundwater," occurs in the unweathered bedrock. The near-surface groundwater may be perched or vertically continuous with deeper groundwater. The alluvium is indicated to generally consist of unconsolidated sand, silt, and clay. Some portions of the alluvium and upper weathered Chatsworth Formation are saturated only during and immediately following a wet season. Within and northwest of Area IV, there are 12 near-surface groundwater wells and 33 near-surface groundwater piezometers (Figure 6-2). The principal water bearing system at the Facility is the fractured Chatsworth Formation, predominantly composed of weak- to well- cemented sandstone with interbeds of siltstone and claystone. Several hydraulically significant features such as fault zones and shale beds are present at SSFL and may act as aquitards or otherwise influence the groundwater flow system. There are 54 Chatsworth Formation wells and 3 private off-site wells in and around Area IV (Figure 6-2).

The solvents found in Area IV groundwater include trichloroethene (TCE) and its family of degradation products. The results of the 2012 analyses of the Area IV wells were documented in the 2012 Annual Groundwater Monitoring Report (MWH, 2013). Boeing initiated a voluntary site-wide program to assess the occurrence and distribution of perchlorate in 1997. This assessment identified a limited area of groundwater in the vicinity of the FSDF that has been impacted by perchlorate. Historical perchlorate concentrations in FSDF-area groundwater ranged from an estimated 1.6 µg/L (RD-65) to 56 µg/L (RD-54A).

The Draft Site-Wide Groundwater Remedial Investigation Report (MWH, 2009) identified five distinct areas of TCE-impacted groundwater in Area IV. These areas include the drainage below RMHF, the Hazardous Materials Storage Area (HMSA), the FSDF area, an area near

former Building 4373, and in the northeastern corner of Area IV (Figure 6-3). These areas are roughly defined by the locations of monitor wells where results of laboratory analyses of water samples collected in 2012 or past years indicate concentrations of TCE equal to or above the MCL of 5 µg/L.

RMHF: The TCE occurrence associated with the RMHF canyon (the northern occurrence) has historically been detected in shallow wells and Chatsworth Formation wells. TCE was not sampled for in the groundwater samples collected from shallow wells in 2012. TCE was detected below the MCL in the groundwater samples collected from Chatsworth Formation wells RD-34A (3.6 µg/L) and RD-63 (4.3 µg/L) during 2012. Each of these concentrations was less than the historical maximum TCE concentration for its respective location. No TCE samples were collected from piezometers from this area in 2012.

HMSA: TCE was detected in groundwater collected from piezometer PZ-108 at a concentration of 75 µg/L. This concentration was within the historical range of TCE concentrations, which ranged from 57 to 160 µg/L at this location.

FSDF: TCE was detected in groundwater collected from wells located near the FSDF area during the year. TCE was detected below the MCL at Chatsworth Formation wells RD-33A (0.16 J µg/L) and RD-54A (2.1 µg/L). Each of these samples were collected from discrete interval groundwater monitoring systems installed in 2002. Historical TCE concentrations in RD-33A have ranged from 0.1 J to 14 µg/L. Historical TCE concentrations in RD-54A have ranged from 2.8 to 580 µg/L.

Former Building 4373 Area: No TCE samples were collected from this area in 2012.

Northeastern Corner of Area IV: No TCE samples were collected from this area in 2012. However, since TCE was detected at 140 µg/L in Area III well RD-60 which is located approximately 100 feet east of Area IV. This may indicate that groundwater in the northeastern corner of Area IV exceeds the 5 µg/L MCL.

Other Areas: TCE was detected in two wells outside of the five concentrated areas of TCE-impacted groundwater. TCE was detected below the MCL in groundwater collected at Chatsworth Formation well RD-07 which is located west of former Building 4059. The RD-07 TCE result of 0.71 J µg/L was within the historical detection range 1.4 to 130 µg/L for this well. TCE was detected below the MCL in groundwater collected at Chatsworth Formation well RD-14, which is located in the northeast portion of Area IV. RD-14 contained TCE at 1.2 µg/L. This result was within the historical detection range of 0.6 to 13 µg/L in RD-14.

The extraction activity at the FSDF occurred between 1995 and 2003. The groundwater extraction system at FSDF included extraction of impacted groundwater from wells RD-21 and RS-54 and treatment of the extracted groundwater in a GAC adsorption treatment unit. The FSDF system also used ion exchange resin in series to treat perchlorate-impacted groundwater prior to discharge. Groundwater has not been extracted from FSDF interim extraction wells RS-54 and RD-21 since 2003 in order to accommodate FSDF-area groundwater investigations.

In addition to groundwater monitoring activities, additional characterization efforts conducted in the FSDF area of Area IV during 2012 included the collection of continuous water level data from transducer data loggers installed in eight FSDF-area groundwater wells.

The 2012 Annual Groundwater Monitoring Report may be found at:

http://www.etec.energy.gov/Char_Cleanup/Groundwater.html

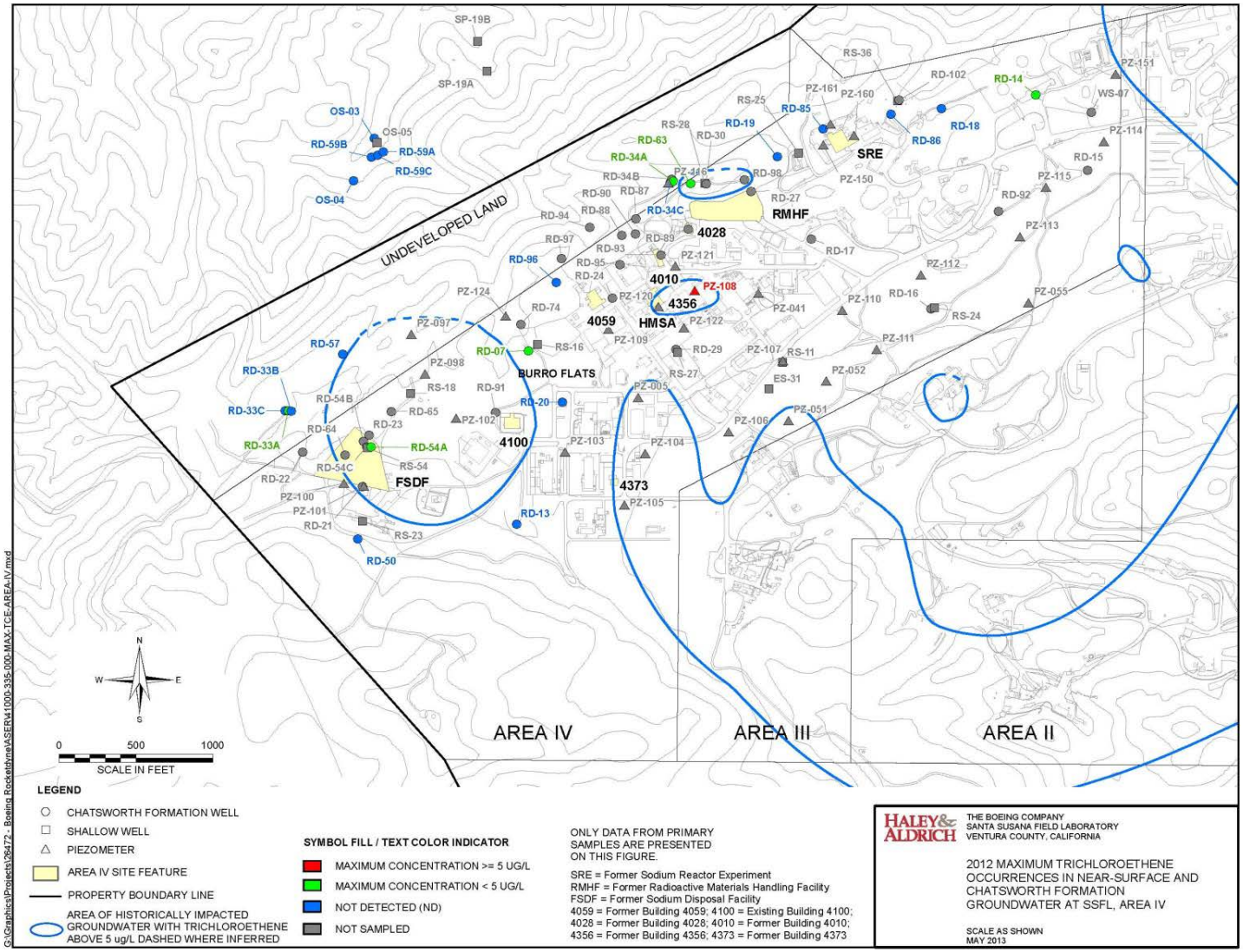

Figure 6-3. TCE Occurrences in Groundwater at SSFL, Area IV

6.4 SOIL

The soils investigation program started at the SSFL site in 1996 and is currently ongoing. In 2012, potential chemically contaminated soils in Area IV were assessed under the DTSC/DOE Administrative Order on Consent (AOC) sampling program. This agreement between the DOE and DTSC outlines an approach to investigate and clean up soil contamination in Area IV to background levels under DTSC oversight, with the objectives of determining the nature and extent of chemicals in soil and assessing the potential threat to groundwater quality in Area IV, the adjacent undeveloped land in the NBZ, and in contiguous areas where soil contamination has migrated. Prior to the signing of the AOC on December 6, 2010, investigation of chemical contamination in soil was performed as part of the RFI program under DTSC oversight. Per the AOC and as described above, investigation and cleanup of groundwater is continuing under the RCRA Corrective Action program under DTSC oversight.

The Phase 2 co-located sampling program, performed by CDM Smith in conjunction with the EPA radiological investigation within Area IV and the NBZ, was completed in 2012. Phase 3 chemical data gap soil sampling performed by CDM Smith commenced in Subareas 5C, 5B, 3 and 6 following approval of work plans by DTSC. Sediment samples were also collected in Area III drainages by CDM Smith leading from Area IV and at the Silvernale Reservoir. DTSC was onsite during much of the fieldwork to observe sampling protocols and select sampling locations and depths.

During 2012, a total of 1,983 soil matrix samples were collected in Area IV, adjacent portions of Area III, and the NBZ. Of these samples, 18 were collected from drainages in Area III and the Silvernale Reservoir. Data currently being collected as part of the Phase 3 chemical data gap program are being reviewed, validated, and will be reported in the Technical Memoranda and the Chemical Data Gap Summary Report.

Samples collected and analyses performed as part of the RFI and AOC programs through 2012 at DOE locations are included in Table 6-3.

Table 6-3. Surficial Media Sampling Summary

Date	Soil Matrix		Soil Vapor		Surface Water	
	Sample	Analyses	Sample	Analyses	Sample	Analyses
1/1/12 to 12/31/12	1,983	14,245	0	0	0	0
Total Through 2012	6,354	62,740	470	470	20	66

Key activities completed in the year 2012 included the following:

Data obtained from co-located sampling during 2011 Phase 1 field activities have been reviewed and validated, and Technical Memoranda were submitted to DTSC in early 2012.

Phase 2 co-located random sampling in the NBZ was completed in 2012, and data review and validation continued into 2013. Over 200 soil samples were collected during Phase 2 field activities.

Master Phase 3 chemical data gap investigation planning documents were finalized and approved by DTSC. These documents include the Master Phase 3 Data Gap Investigation Work Plan, the Master Field Sampling Plan (MFSP), the Quality Assurance Project Plan (QAPP), and a Worker Health and Safety Plan (HSP), and 18 supporting Field Standard Operating Procedures (SOPs). All documents can be found at:

http://www.etec.energy.gov/Char_Cleanup/Phase3.html

Phase 3 data gap analysis was performed to identify chemical sampling locations for Area IV and the NBZ. Data gap analysis was completed for Subareas 5C, 5B 5A, 3, and 6, and was initiated for Subarea 7. Phase 3 MFSP Addenda No. 1 (Subarea 5C), No. 2 (Subareas 5B), No. 3 (Sediment Sampling in Area III), No. 4 (Subarea 5A), and No. 5 (Subareas 5 and 6) were submitted and approved by DTSC. In accordance with the MFSP Addenda, over 1,700 soil samples were collected in 2012 Phase 3 data gap field activities in Subareas 5C, 5B, 3, and 6. Additional sediment sampling was also performed in drainages and Silvernale Reservoir located in Area III.

DOE continued to develop information regarding achievable analytical method reporting limits for DTSC's review that will serve as a foundation for the AOC characterization and cleanup program in Area IV. Early in 2012, DOE also revised site-wide technical memoranda for information in Area IV describing water conveyance systems, aerial photo review procedures, natural gas distribution, sewer systems, tank inventories, and surface drainage systems to address DTSC comments. This site-wide infrastructure information is being used to identify chemical data gaps for Phase 3 sampling.

With assistance from Sandia National Laboratory, DOE established a Soil Treatability Investigation Group (STIG) involving interested stakeholders to begin evaluation of soil remediation methods per AOC requirements. Screening of potential remediation technologies was completed, and work began on identification of treatability testing alternatives. Recommendations for soil treatability studies were presented during several public meetings held in 2012.

Planning for DOE's Environmental Impact Statement (EIS) began, and DOE conducted pre-scoping meetings to obtain public stakeholder input on alternatives prior to formal EIS scoping meetings.

Work planned for 2013 includes continuation of Phase 3 chemical data gap investigation planning and sampling activities. Specific tasks include meeting with DTSC and stakeholders, preparing MFSP Addenda for subarea chemical sampling requirements, and conducting field sampling, laboratory analysis, and data validation. DOE will continue preparation of Phase 3 Sampling Results Technical Memoranda for each subarea once data validation is complete. All Area IV soil sampling data will be re-evaluated to identify any final data gaps once the AOC

Look-Up Table is issued by DTSC, with MFSP Addenda prepared for DTSC approval prior to sampling. DOE will initiate soil treatability studies by university researchers, and continue to conduct STIG public meetings. Planning for DOE's EIS will also continue.

Additional details on previous RFI and AOC soil sampling may be found at:

http://www.boeing.com/aboutus/environment/santa_susana/groundwater_soil.html

Recent information regarding the 2010 AOC requirements and AOC soil sampling efforts may be found at:

http://www.etec.energy.gov/char_cleanup/AOC.html

http://www.etec.energy.gov/char_cleanup/Co-located.html

7. ENVIRONMENTAL MONITORING PROGRAM QUALITY CONTROL

This section describes the quality assurance (QA) elements incorporated into the Boeing SSFL radiological monitoring program applicable to the former ETEC. The following elements of quality control are used for the Boeing SSFL program:

- Reagent Quality—Certified grade counting gas is used.
- Laboratory Ventilation—Room air supply is controlled to minimize temperature variance and dust incursion.
- Laboratory Contamination—Periodic laboratory contamination surveys for fixed and removable surface contaminations are performed. Areas are cleaned routinely and decontaminated when necessary.
- Control Charts—Background and reference source control charts for counting equipment are maintained to evaluate stability and response characteristics.
- Calibration Standards—Counting standard radioactivity values are traceable to NIST
- primary standards.
- Co-location of State DPH thermoluminescent dosimeters.

7.1 PROCEDURES

Procedures followed include those for selection, collection, packaging, shipping, and handling of samples for off-site analysis; sample preparation and analysis; the use of radioactive reference standards; calibration methods, and instrument QA; and data evaluation and reporting.

7.2 RECORDS

Records generally cover the following processes: field sample collection and laboratory identification coding; sample preparation method; radioactivity measurement (counting) of samples, instrument backgrounds, and analytical blanks; and data reduction and verification.

Quality control records for laboratory counting systems include the results of measurements of radioactive check sources, calibration sources, backgrounds, and blanks as well as a complete record of all maintenance and service.

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APPENDIX A: ACRONYMS

AI	Atomics International
ALARA	As Low As Reasonably Achievable ASER Annual Site Environmental Report
ANL	Argonne National Laboratory
AOC	Administrative Order on Consent
ASL	Above Sea Level
BCG	Biota Concentration Guides
CAA	Clean Air Act
CAL/OSHA	California Occupational Safety and Health Administration
CDM	Camp, Dresser, McKee
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
D&D	Decontamination and Decommissioning
DCG	Derived Concentration Guideline
DCGL	Derived Concentration Guideline Level
DPH/RHB	Department of Public Health/Radiologic Health Branch
DMR	Discharge Monitoring Report
DOD	Department of Defense
DOE	Department of Energy
DTSC	Cal-EPA Department of Toxic Substances Control
EA	Environmental Assessment
EEOICPA	Energy Employees Occupational Illness Compensation Program Act
EHS	Environment, Health and Safety
EIS	Environmental Impact Statement
EO	Environmental Operations
EPA	Environmental Protection Agency
ER	Environmental Remediation
ETEC	Energy Technology Engineering Center
FFCAct	Federal Facilities Compliance Act

FONSI	Finding of No Significant Impact
FSDF	Former Sodium Disposal Facility
GRC	Groundwater Resources Consultants, Inc. (Tucson, AZ)
HEPA	High-Efficiency Particulate Air
HPGe	High-Purity Germanium (Detector)
HWMF	Hazardous Waste Management Facility
IDW	Investigation-Derived Waste
ISMS	Integrated Safety Management System
LARWQCB	Los Angeles Regional Water Quality Control Board
LLNL	Lawrence Livermore National Laboratory
LLW	Low Level Waste
LUT	Look-up Table
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCA	Multichannel Analyzer
MCL	Maximum Contamination Level
MDA	Minimum Detectable Activity
MEI	Maximally Exposed Individual
MLLW	Mixed Low-level Waste
NASA	National Aeronautics and Space Administration
ND	Not Detected
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NIST	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
ORAU	Oak Ridge Associated Universities
ORISE	Oak Ridge Institute for Science and Education
ORPS	Occurrence Reporting and Processing System
PCB	Polychlorinated Piphenyl
PCE	Perchloroethene
PEIS	Programmatic Environmental Impact Statement
QA	Quality Assurance
QAP	Quality Assessment Program

R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RESL	Radiological and Environmental Sciences Laboratory
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RFP	Request for Proposal
RMHF	Radioactive Materials Handling Facility
ROD	Record of Decision
RS	Radiation Safety
RTL	Radioactive Trigger Level
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SIPs	State Implementation Plans
S&M	Surveillance and Maintenance
SNAP	Systems for Nuclear Auxiliary Power
SPCC	Spill Prevention Control and Countermeasure
SPTF	Sodium Pump Test Facility
SRAM	Standardized Risk Assessment Methodology
SRE	Sodium Reactor Experiment
SSFL	Santa Susana Field Laboratory
SWPPP	Storm Water Pollution Prevention Plan
STP	Sewage Treatment Plant or Site Treatment Plan
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
UST	Underground Storage Tank
VCAPCD	Ventura County Air Pollution Control District
WVN	Water Vapor Nitrogen

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Site Environmental Report Reader Survey--2012

To Our Readers:

The Annual Site Environmental Report publishes the results of environmental monitoring in support of DOE-sponsored programs at Boeing's Santa Susana Field Laboratory, and documents our compliance with federal, state, and local environmental regulations. In providing this information, our goal is to give our readership—regulators, scientists, and the public—a clear understanding of our environmental activities, the methods we use, how we can be sure our results are accurate, the status of our programs, and significant issues affecting our programs.

It is important that the information we provide is easily understood, of interest, and communicates DOE's efforts to protect human health and minimize our impact on the environment. We would like to know from you whether we are successful in achieving these goals. Your comments are appreciated and will help us to improve our communications.

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