Site Environment Report for

Calendar Year 2007

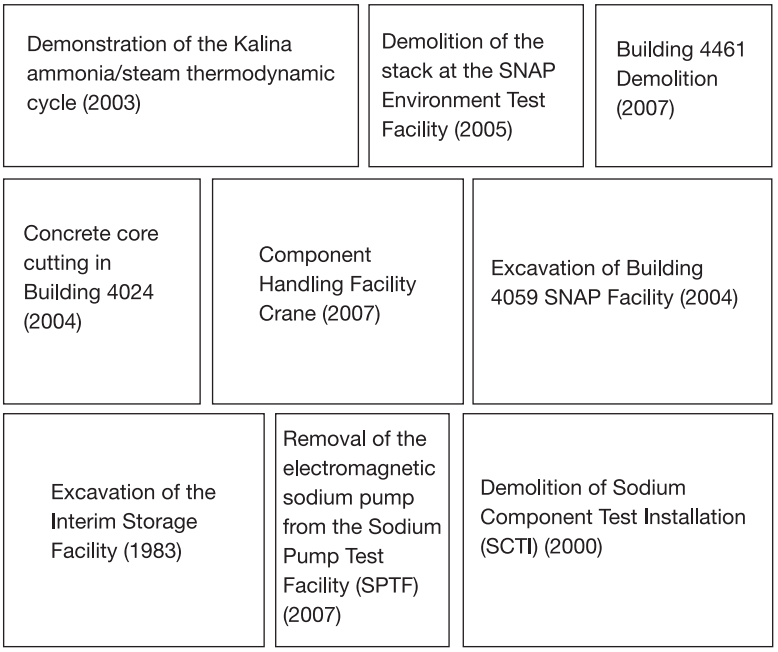
DOE Operations at

The Boeing Company

Santa Susana Field Laboratory

Area IV

Front Cover Photographs:



Site Environmental Report for Calendar Year 2007 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 2008

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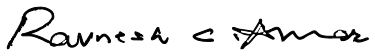
BOEING

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.



Ravnesh Amar
Program Manager
DOE Site Closure
The Boeing Company
Santa Susana Field Laboratory

September 16, 2008

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Department of Energy
Washington, DC 20585

SEP 16 2008

Subject: 2007 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 2007. Site Environmental reports are prepared annually for all DOE sites with significant environmental activities and distributed to external regulatory agencies, interested organizations, and individuals.

To the best of my knowledge, this report accurately summarizes the results of the 2007 environmental monitoring and restoration program at ETEC for DOE. This statement is based on reviews conducted by the Oakland Projects Office 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
P.O. Box 10300
Canoga Park, CA 91309

Questions may also be directed to me at (818) 466-8959.

Sincerely,

Thomas Johnson Jr.
Federal Project Director
Oakland Projects Office

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ACKNOWLEDGMENT

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

- Principal technical contributors are:

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- Editing and review were performed by Ning Liu, Phil Rutherford, and Ravnesh Amar.
- Administrative assistance was provided by Janice Edstrom.
- 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 2007 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, 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 components. All nuclear work was terminated in 1988; all subsequent radiological work has been directed toward decontamination and decommissioning (D&D) of the former nuclear facilities and their associated sites. 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 programs were continued throughout the year.

Results of the radiological monitoring program for the calendar year 2007 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.

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 2007.

Calculated radiation doses to the public due to airborne releases and direct radiation are virtually zero when compared to the applicable regulatory limits as well as the naturally existing background levels. These theoretically calculated doses are too small to measure, and they are calculated to provide upper-limit estimates of possible doses to the public. The radiation dose to a member of the public (maximally exposed individual) due to direct radiation from SSFL is indistinguishable from background, and the maximum dose due to airborne releases from SSFL is estimated to be 2.6×10^{-7} mrem. As a comparison, the annual dose from natural indoor radon activity is about 200 mrem, and the total annual dose from all natural sources is about 300 mrem.

Seventy-eight water samples from 46 groundwater wells in and around Area IV were analyzed for radiological contaminants during 2007. Only naturally occurring radioactivity was found in groundwater, except for tritium reported in ten wells. Most of these positively detected tritium levels were below the Federal and State drinking water standards of 20,000 picocuries per liter (pCi/L). Elevated tritium levels were found in several wells down gradient from the former Building 4010 site, with the highest level of 91,500 pCi/L at RD-95. However, no tritium was detected at RD-96 and RD-97, two wells located further down gradient from Building 4010. These finding indicates that tritium movement in groundwater is limited within the site boundary. The groundwater underneath the SSFL Facility is not used for drinking water purposes.

During 2007, nine 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, Radiologic Health Branch (DPH/RHB), the Ventura County Air Pollution Control District (VCAPCD), and the Cal-EPA Department of Toxic Substances Control (DTSC).

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.

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 2007. 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 technologies projects, was conducted at the site. All the nuclear R&D operations in Area IV ceased in 1988. Most recently, the efforts were directed toward decontamination and decommissioning (D&D) of two former nuclear facilities and removal of two liquid metal facilities. However, 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 programs were continued throughout the year.

As required by DOE Order 231.1 "Environmental 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 Brandeis-Bardin Institute 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.

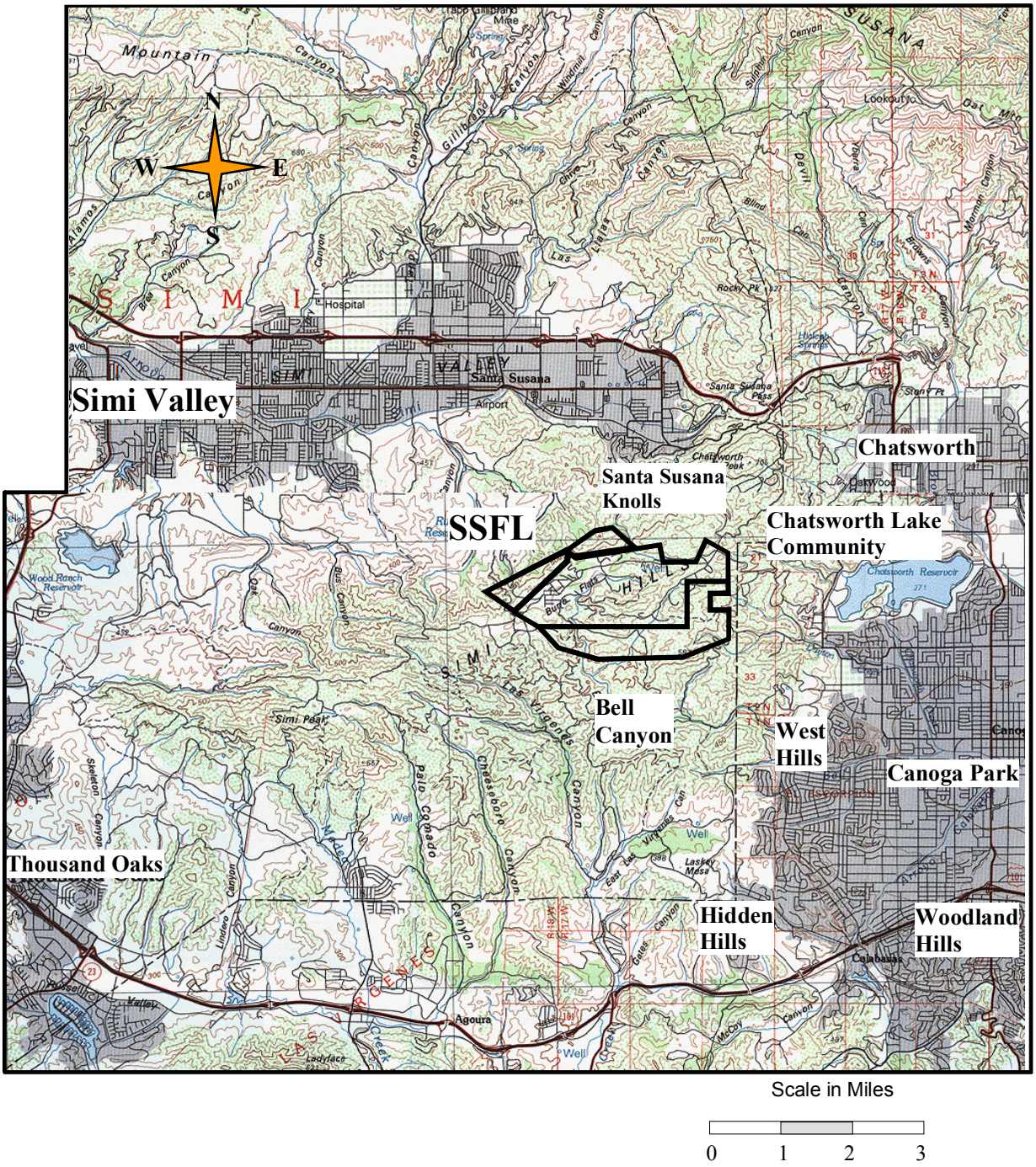

Figure 2-1. Map Showing Location of SSFL

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

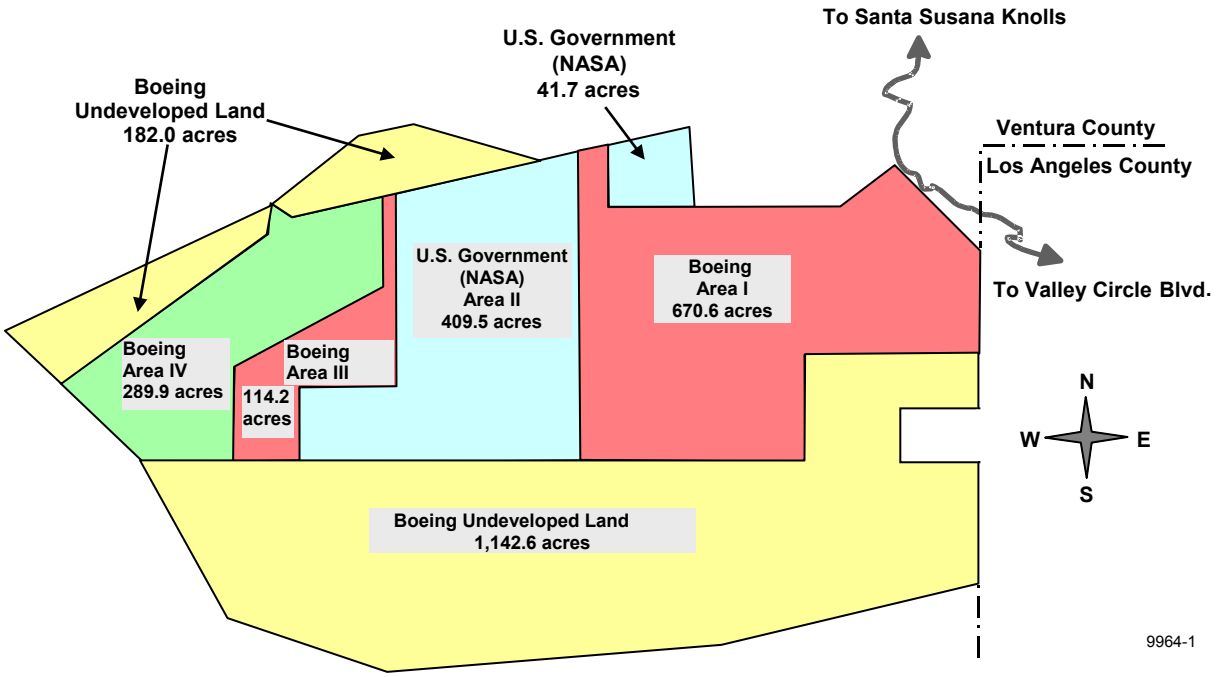

Figure 2-2. Santa Susana Field Laboratory Site Arrangement

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 disassemble and declading of used fuel elements. These projects were completed and terminated in the course of the next 30 years. This work is described 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 the environmental remediation and restoration activities at SSFL for the DOE. In May 2007, the D&D activities in Area IV were suspended until DOE completes the SSFL Area IV 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 2007, 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. Six radiological facilities have been declared free of contamination but are yet to be demolished; they are 4009, 4100, 4019, 4055, 4011 and 4029. Two facilities, Building 4024 and the RMHF are pending remediation.

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 have included processing, packaging, and temporary storage of radioactive waste materials that are shipped off-site to DOE approved disposal facilities. The radioactive waste included uranium, plutonium, mixed fission products such as Cs-137 and Sr-90, and activation products such as Co-60, Eu-152, and tritium.

Before the D&D operations were suspended in May 2007, atmospheric effluents resulting from waste handling operations were released through the stack at the RMHF. The effluents were filtered and monitored before release into the atmosphere to ensure compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAPs) requirements. No radioactive liquid effluents were released from the facility.

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

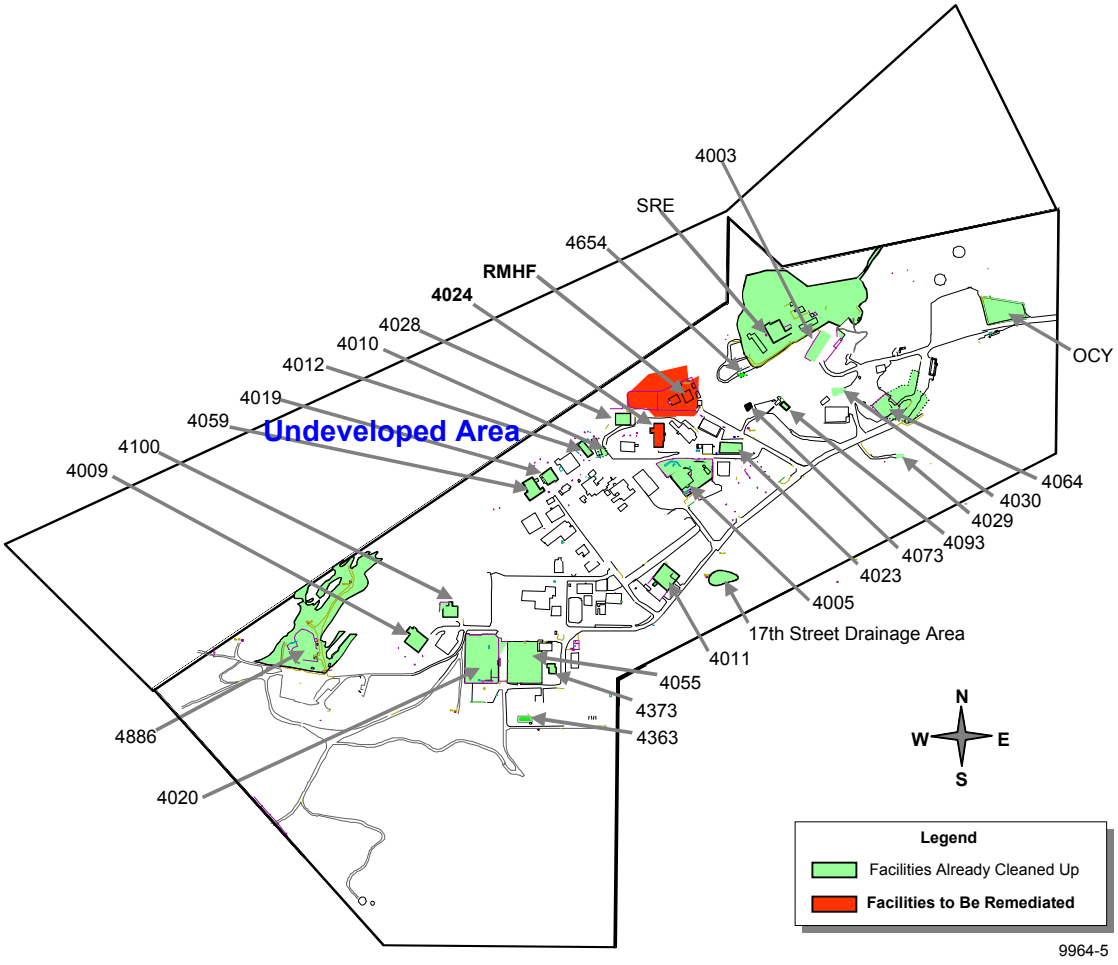

Figure 2-4. Map of Prior and Current Radiological Facilities in Area IV

Building 4024

Building 4024 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. Most of the demolished structure was sent to Kettleman Hills following certification as decommissioned material by the California Department of Public Health (DPH). In 2007, surveys and planning for demolition of the building continued until May when DOE put it on hold pending completion of the EIS.

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 building debris was shipped to either the Nevada Test Site (radioactive waste) or Kettleman Hills (decommissioned material). In 2005, site backfill was completed, and the final status MARSSIM survey was completed (Boeing, 2006). 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)

In 2007, activities at the SPTF, which consists of buildings 4461, 4462 and 4463, were confined to facility demolition. As part of these activities, a portion of the final test article was removed and returned to the test requester. All utility connections to the buildings were severed. Demolition of building 4461 was completed.

On May 24, 2007, DOE issued a stop work order to allow for the completion of an Environmental Impact Statement for Area IV. This order terminated the demolition of the SPTF, and the facility was 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 scheduled to be demolished in 2007. Demolition of this facility was about to begin when the stop work order was issued. This facility was placed into a safe shutdown pending the completion of the EIS.

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 Boeing'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

Several agencies performed routine inspections on DOE operations in Area IV during 2007. Eight of the 9 inspected activities were found to be in compliance with the applicable rules and regulations. A Notice of Violation (NOV) for storage of lead material for longer than 90 days was received following the August inspection. A written response was submitted to DTSC on September 25, 2007, and a supplemental response was submitted on January 10, 2008. In addition, a meeting among DTSC, Boeing, and DOE was held at DTSC's Glendale offices on January 17, 2008, and a response to DTSC's request for more information was submitted on February 12, 2008. At the time of this publication, a draft consent order has been issued and is pending resolution.

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. 2007 Agency Inspections/Visits Related to DOE Operations

Date (2007)	Agency	Subject Area	Results
January	State of CA, DPH/RHB	Environmental TLD exchange	Compliant
February	State of CA, DPH/RHB	Groundwater Split Sampling	Compliant
April	State of CA, DPH/RHB	Environmental TLD exchange	Compliant
June	VCAPCD	Annual inspection of Permit to Operate No. 00271	Compliant
June	State of CA, DPH/RHB	Environmental TLD exchange	Compliant
July	State of CA, DPH/RHB	Annual Inspection for Radioactive Material License 0015-19	Compliant
July	Cal-EPA, DTSC	Inspection, DOE Hazardous Waste Storage	Compliant
August	Cal-EPA, DTSC	Inspection, DOE Hazardous Waste Storage	Non-Compliant
October	State of CA, DPH/RHB	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 airborne, direct exposure, groundwater, surface water, waste disposal, and recycling.

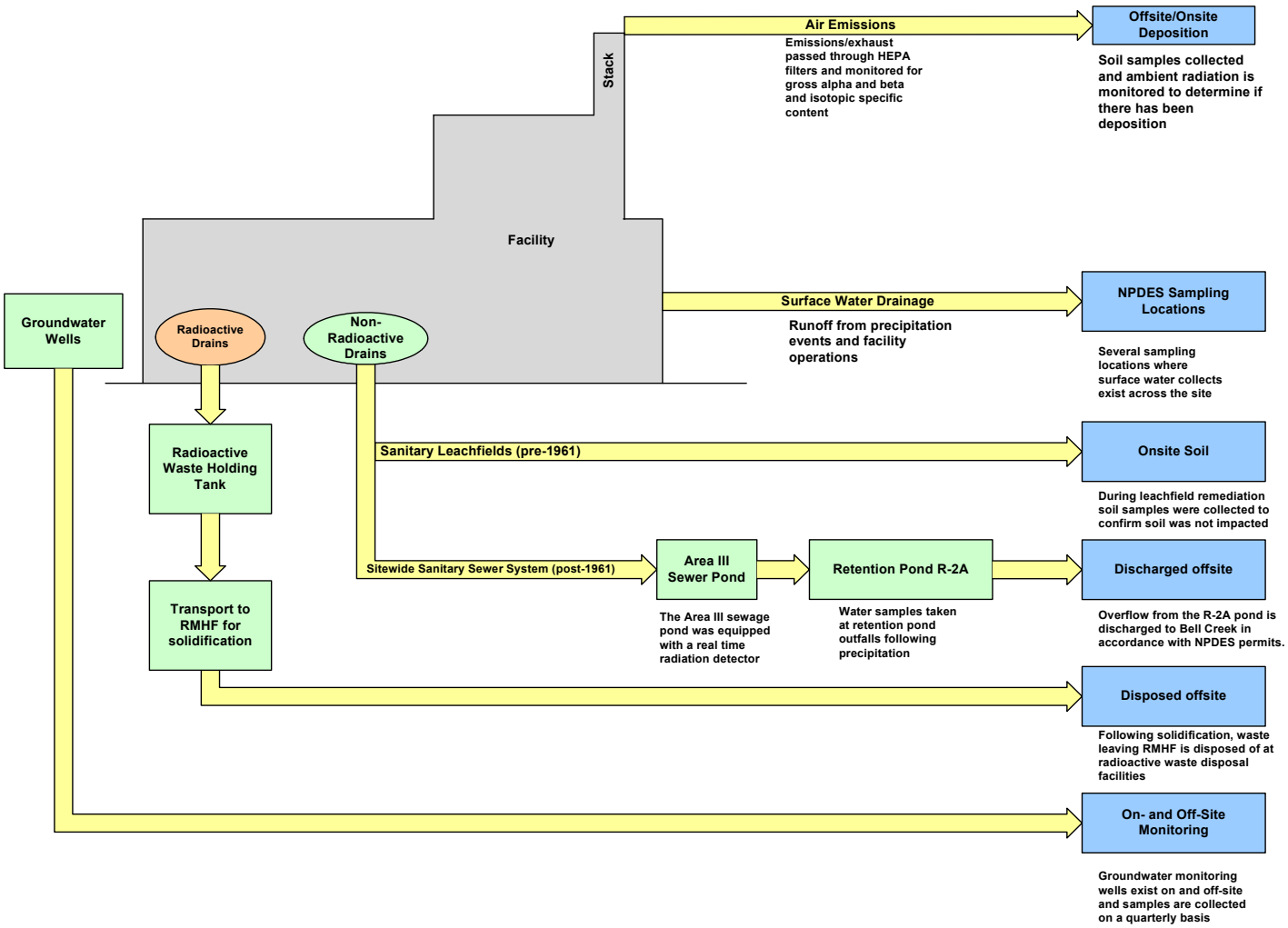

Figure 3-1. Conceptual Model of Potential Pathways

3.1.1.1 Airborne Activity

Ventilation exhaust effluent from the RMHF is minimized by using high efficiency particulate air (HEPA) filters. These effluents are monitored by sampling the exhaust; their radioactive compositions are determined by radionuclide-specific analyses. The maximum off-site doses at the nearest residence from the effluent source are estimated by using the EPA computer program, CAP88-PC (EPA, 1992).

For the airborne releases from the RMHF exhaust stack, the maximum individual annual exposure was estimated to be 2.6×10^{-7} mrem/yr. This dose is significantly below the limit of 10 mrem/yr and the action level of 1% of the limit (0.1 mrem/yr) as specified in 40 CFR 61, the National Emission Standards for Hazardous Pollutants (NESHAPs), Subpart H (DOE facilities).

3.1.1.2 Groundwater

Two core holes were installed in 2007 to help delineate the vertical profile of the tritium impacted groundwater near the former Building 4010. Tritium analysis was carried out on pore water extracted from these rock cores. The first of these core holes (SB-Trit-01) was installed at the location of the former Building 4010 just to the west of well RD-93. A maximum pore water concentration of tritium at this location was 931,258 pCi/L at a depth of about 57 feet below ground surface. The second core hole (SB-Trit-02) was installed several hundred feet west of SB-Trit-01 near RD-95. Maximum pore water concentration of tritium at this location was 90,367 pCi/L at a depth of about 82 feet below ground surface.

There are 10 DOE-sponsored near-surface groundwater wells and 48 DOE-sponsored Chatsworth Formation wells in and around Area IV. Groundwater is sampled and analyzed periodically for non-naturally occurring radionuclides. In previous years, elevated tritium levels were found in several wells down gradient from the former Building 4010 site. Some of these wells were sampled again for tritium in 2007, and the finds were similar to previous' results. The highest tritium level, 91,500 pCi/L, was detected at RD-95. However, no tritium was detected at RD-96 and RD-97, two wells located further down gradient from Building 4010. These findings indicate that tritium movement in groundwater is limited within the site boundary. The groundwater underneath the SSFL Facility is not used for drinking water purposes.

Tritium was also detected in a few routine groundwater monitoring wells in 2007. The positive detections of tritium had maximum concentrations of 1,230 pCi/L at RD-34A, 188 pCi/L at RD-34B, 244 pCi/L at RD-54A, and 118 pCi/L at RD-64. All these values were in line with historical observations and substantially below the EPA and California drinking water limit of 20,000 pCi/L. No other man-made radionuclides were detected in groundwater. The groundwater underneath the SSFL Facility is not used for drinking water purposes.

3.1.1.3 Surface Water

Surface water is regulated under the Los Angeles Regional Water Quality Control Board National Pollutant Discharge Elimination System (NPDES) Permit CA0001309 amended November 1, 2007. The NPDES permit 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 T100: 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 2007 Annual NPDES Discharge Monitoring Report (Boeing, 2008a). 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 6.8 mrem/year above local background. This is considerably below DOE's 100 mrem/year limit.

3.1.1.5 Protection of Biota

There is no aquatic system in the Area IV of SSFL. Therefore, the protection of aquatic organisms on-site is not an issue. 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 2007, the RMHF continued to operate as an Interim Status (Part A) permitted facility. This facility is used primarily for the handling and packaging of radioactive waste. 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 (FFCA). The RMHF is a in a non-operational, safe shutdown mode since May 2007, pending completion of the Area IV EIS.

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 pending completion of EIS.

RCRA Facility Investigation

Under the Hazardous and Solid Waste Amendments of 1984, RCRA 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.

The DTSC has RCRA authorization and has become the lead agency in implementing the RCRA corrective action process for the SSFL, including ETEC. ETEC has performed soil sampling at various solid waste management units (SWMUs) and areas of concern (AOCs) that were identified in the RFI Work Plan.

The current conditions report and a draft of the RFI Work Plan for the Area IV SWMUs were submitted to the DTSC in October 1993. In November 1996, DTSC approved a revised work plan addendum. During 2000, an amendment to the 1996 RFI Work Plan was submitted to and approved by DTSC. This amendment added two DOE sites to the RCRA RFI program. Fieldwork in areas of unrestricted use began in November 1996.

During 2007, approximately 159 soil matrix, 17 soil vapor, 1 surface water, 6 near-surface groundwater, and 5 spring/seep samples were collected. Samples collected and analyses performed to date at DOE locations are summarized in Section 6 (Table 6-3). Data review and validation were completed in 2007.

Groundwater

Characterization of the groundwater at the site continues. Six 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 2007, high concentrations of TCE continued to be detected in three of these areas. TCE was not detected in the fourth area, and the other two areas were not monitored in 2007. 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. The current inventory consists only of mixed low-level wastes (MLLW). Management of the mixed wastes has been in full compliance with the STP. Regular updates to reflect changes in inventory or status of mixed wastes and certifications of milestone completion are submitted to DTSC in accordance with the STP.

In 2007, the total quantity of mixed wastes generated was about 3.5 m^3 and four STP waste streams had volumes in storage. By the end of the year, most of the mixed waste inventory had been shipped to EnergySolutions, LLC facility in Clive, UT for treatment and disposal. At the end of the year, of all active STP waste streams, only one had a small volume in storage. The total container volume of wastes shipped was 7.3 m^3 (waste volume 6 m^3).

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. DOE has implemented NEPA as defined in Federal Register Volume 57, Number 80, pages 15122 through 15199 and in accordance with the DOE Order 451.1A.

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. Details about the lawsuit are provided in Section 3.2, Current Issues and Actions. 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 as set forth in Permit to Operate No.00271. In 2007, the VCAPCD performed its annual inspection of Area IV on June 25, 2007. 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 was revised on November 1, 2007 and became effective December 21, 2007. The 2007 NPDES Permit incorporated the General Permit (No. CAS000001) for storm water, which includes the requirement 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 location, 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 Spill Prevention and Response Plan to the local Administering Agency on February 28, 2007.

3.1.3 Permits and Licenses (Area IV)

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

Permit/License	Facility	Valid
Air (VCAPCD)		
Permit 0271 and 00232	Combined permit renewal	Current
Ventura County		
Grading Permit 9225/CUP 02488	Soil Borrow Area	Current
Treatment Storage (EPA)		
CAD000629972 (93-3-TS-002)	Hazardous Waste Management Facility (T133 and T029)	Inactive. The closure plan was approved on 12/22/06, but facility demolition has been suspended based on the DOE stop work order.
CA3890090001	Radioactive Materials Handling Facility (RMHF)	Part A interim status Application for Part B submitted May 1999.
NPDES (LARWQCB)		
CA0001309	Santa Susana Field Laboratory	Effective on 12/21/2007
State of California		
Radioactive Materials License (0015-19*)	All Boeing SSFL facilities	Amendment Issued 110 1/4/07
Storm Water Pollution Prevention Plan 56C312650	Area IV	Current

* DPH changed numbering system; the license stays the same as before.
* Underground Storage Tanks in Area IV are exempt from permitting.

3.2 CURRENT ISSUES AND ACTIONS

3.2.1 Area IV Environmental Impact Statement

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, by performing an Environmental Assessment instead of an Environmental Impact Statement. On May 2, 2007, the judge ruled on the lawsuit saying:

> *"... the Court grants Plaintiffs' Motion for Summary Judgment as it relates to Plaintiffs' NEPA claim, and hereby declares that the DOE has violated and continues to violate NEPA. The Court further permanently enjoins the Department of Energy from transferring ownership or possession, or otherwise relinquishing control over, any portion of Area IV until the Department of Energy has completed an EIS and issued a Record of Decision pursuant to NEPA."*

As a result, the DOE issued a stop work order on May 24, 2007 suspending D&D activities at ETEC. Boeing suspended all D&D operations at the DOE's former ETEC site, except for those activities necessary to maintain the site in a safe, stable, and regulatory compliant configuration. The RFI activities in Area IV continued in 2007.

DOE contracted with CDM to perform the EIS. The EIS will comprise a data gap analysis based on an investigation of all historical radiological and chemical media sample analyses in Area IV followed by field sampling followed by a appraisal of the environmental impacts of remedial action alternatives. D&D will only commence following completion of the EIS, currently estimated to be November 2010. More information about the EIS and data gap analysis can be found at:

http://www.etec.energy.gov/eis/eis.html

The following is a summary of the operations that occurred in calendar year 2007.

3.2.2 Progress in Radiological Decommissioning Operations

3.2.2.1 Building 4059

Demolition of 4059 was completed in 2004, and the final status survey report was published in 2006 (Boeing, 2006). The survey results indicate that the site is suitable for release for unrestricted use. In September 2006, the DHS completed a verification survey. The Oak Ridge Institute of Science and Education (ORISE) conducted a verification survey of the 4059 footprint on February 2008. The ORISE survey confirmed that the area classification, final radiological status, and release limits had been satisfied. The complete ORISE survey report can be found at: http://www.etec.energy.gov/library/D&D_page/0453-SR-01-0_Final.pdf

3.2.2.2 Building 4024

In January 2007, AREVA initiated a characterization survey of the SNAP Environmental Test Facility (Building 4024) and began preparations for the demolition of the building and foundations. A public meeting was held describing the Engineering Evaluation/Cost Analysis (EE/CA). The D&D work was halted in May 2007 (before it began) following the DOE stop work order (see section 3.2.1). The characterization survey was documented in January 2008.

Detailed information about the EE/CA and the characterization survey can be found at:

- http://www.etec.energy.gov/Reading-Room/Project-Updates/Building24EECA.html
- http://www.etec.energy.gov/History/Major-Operations/SNAP-Environmental-Test-Facility.html.

3.2.2.3 RMHF

In April 2007, a public meeting was held describing the Engineering Evaluation/Cost Analysis (EE/CA) of the RMHF. Immediately thereafter, plans for the D&D of the RMHF were put on hold pending completion of the EIS (see section 3.2.1). In March 2007, the current radiological status of the RMHF was documented including the below grade vaults and other remaining contaminated building interiors. In October 2007, a survey of the above ground structures of RMHF was completed by Cabrera Services. Several shipments of LLW were made from the RMHF during 2007, however the facility is essentially in a safe shutdown mode with no active operations continuing except for regular inspections and routine surveys.

Detailed information about the EE/CA, the current status, and the characterization survey can be found at:

- http://www.etec.energy.gov/Reading-Room/Project-Updates/RHMFEECA.html
- http://www.etec.energy.gov/library/D&D_page/RMHF_Radiological_Status_3-17-2007.pdf
- http://www.etec.energy.gov/library/D&D_page/07-1016-00_Boeing_SSFL_RMHF_FINAL_Report.pdf

3.2.3 Disposal and Recycling of Non-radiological Waste

In 2007, soil from various Area IV NPDES outfalls was classified as "decommissioned material" as best management practice and sent to the Kettleman Hills Class I hazardous waste disposal facility, in compliance with the Governor's Moratorium of 2002. In 2007, no metal from DOE radiological facilities was recycled, pending completion of the metals recycling Programmatic Environmental Impact Statement (PEIS).

3.2.4 Consent Order

In August 2007, a Consent Order was signed by DTSC, Boeing, DOE, and NASA that specified goals for the RCRA cleanup at SSFL.

One requirement of the Consent Order was to prepare an Offsite Evaluation Report compiling all radiological and chemical sampling results taken by Boeing and its contractors within the neighboring communities surrounding SSFL. This was published in December 2007.

A second requirement of the Consent Order was to prepare a GIS based database of both on-site and off-site environmental media. This was published in February 2008.

Detailed information about the Consent Order and the off-site report can be found at:

- http://www.etec.energy.gov/Reading-Room/consent-order.html
- http://www.etec.energy.gov/Health-and-Safety/Offsite-Report.html

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4. ENVIRONMENTAL PROGRAM INFORMATION

At SSFL, the DOE Site Closure Program Office has programmatic responsibility 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 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. Boeing employees are responsible for implementing and complying with this policy." 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 Protection (EP) 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.

- Participating in rule and regulation development, including evaluating impacts on Boeing programs; coordinating with other Boeing functions, as appropriate; and informing management and staff of new or revised requirements.

- 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 Boeing operations, including escorting and cooperating with regulatory officials interested in environmental matters and responding to requests for information referred to Communications.

- Working with Boeing 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 Boeing SSFL facilities. The ER responsibilities include:

- Compliance with all federal, state, and local regulations pertaining to environmental remediation.

- Remediation of historical chemically contaminated Boeing SSFL sites to achieve closure.

- 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 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 effects. 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 Orders 5400.1 (DOE, 1990) and 5400.5 (DOE, 1993). 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 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 54-year 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. Figure 4-1 shows sampling and monitoring locations for these two time periods, and Table 4-1 shows a matrix of sampled media, organizations, and time periods for all historical off-site radiological monitoring.

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/Health-and-Safety/Environmental-Monitoring.html
- http://www.etec.energy.gov/Health-and-Safety/Community.html

In December 2007, Boeing issued a comprehensive Offsite Data Evaluation Report compiling all chemical and radiological offsite sample data taken during the last two decades.

- http://www.etec.energy.gov/Health-and-Safety/Offsite-Report.html

In February 2008, Boeing issued a comprehensive GIS map based database of all chemical and radiological offsite and onsite sample data.

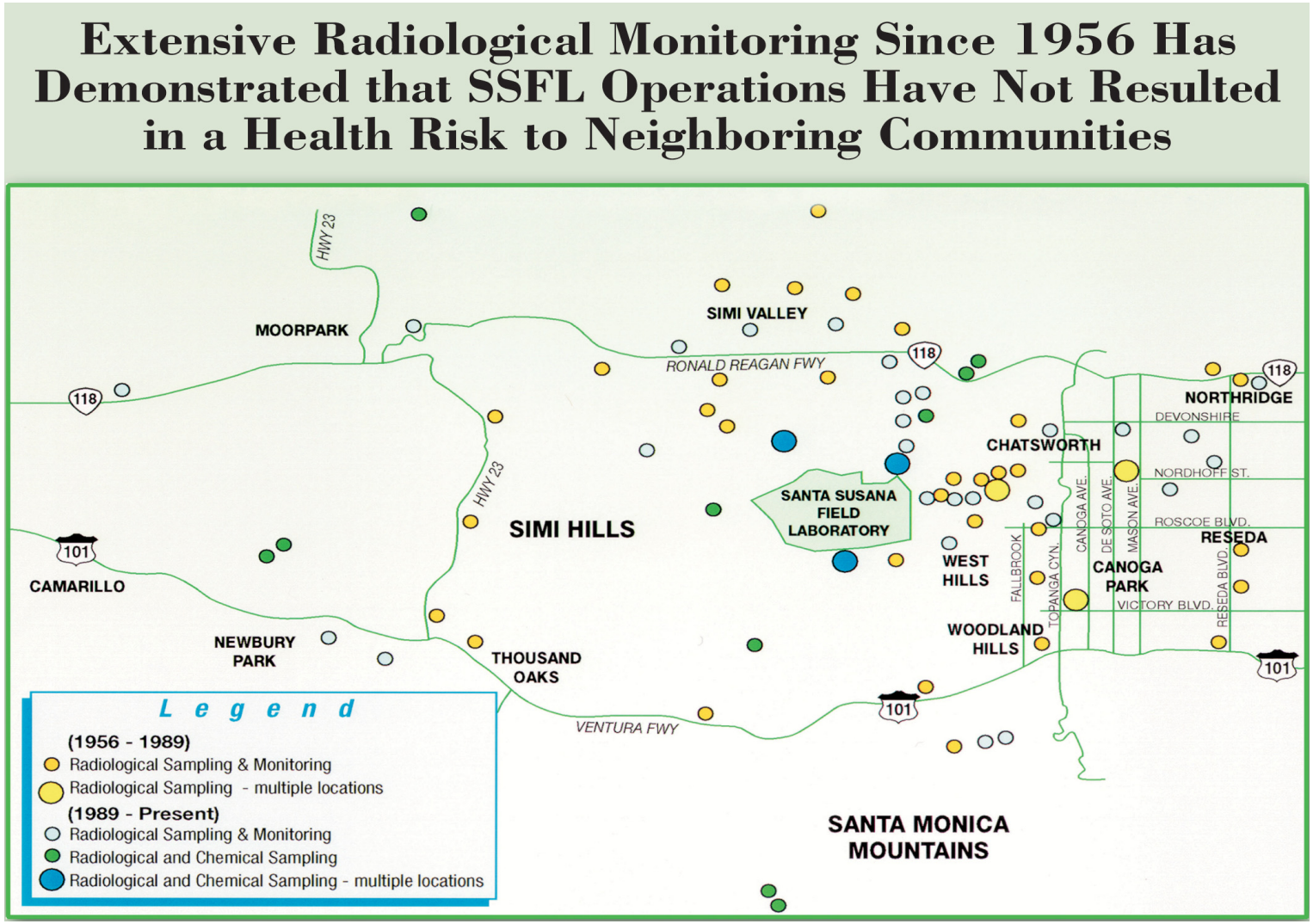

Figure 4-1. Radiological Sampling and Monitoring Locations

Table 4-1. Organizations Conducting Radiological Environmental Sampling

Environmental Sampling for Radiation/Radioactivity Surrounding Santa Susana					
Location	**Media Sampled (Date Range and Organization)**				
	Soil	**Groundwater**	**Surface water**	**Airborne Particulates**	**Radiation Exposure**
On-site	1956-Present (Boeing[a]) 1975,81,84 (ANL) 1986-87 (ORAU) 1992-Present (ORISE) 1993 (RWQCB) 1992-Present (DPH-RHB) 1994-95 (DPH-EMB)	1960-86 (Boeing) 1984-Present (GRC) 1998 (EPA-ORIA)	1970-Present (Boeing) 1993-98 (RWQCB)	1956-Present (Boeing)	1971-Present (Boeing) 1975,81,84 (ANL) 1981-Present (DPH-RHB) 1986-87 (ORAU) 1992-Present (ORISE)
North Off-site	1956-89 (Boeing) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DPH-EMB) 1991-97 (Cehn) 1995 (Boeing) 1995 (ORISE)	1984-Present (GRC) 1991-96 (Cehn) 1998 (EPA-ORIA)	1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DPH-EMB) 1992-94 (Cehn)	1989 (DPH-RHB & LLNL)	1974-Present (Boeing) 1992-94 (EPA-ORIA) 1995 (ORISE)
East Off-site	1956-89 (Boeing) 1986 (ORAU) 1994 (Boeing) 1995 (ORISE) 1997 (LLNL)	1984-Present (GRC)	1961-71 (Boeing)	1959-Present (Boeing)	1974-Present (Boeing) 1986 (ORAU) 1995 (ORISE)
South Off-site	1956-89 (Boeing) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DPH-EMB) 1992-94 (Cehn) 1995 (Boeing) 1998 (Ogden)	1984-Present (GRC)	1966-89 (Boeing)	1989 (DPH-RHB & LLNL)	1974-Present (Boeing)
West Off-site	1956-64 (Boeing) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DPH-EMB) 1992-94 (Cehn) 1995 (Boeing)	1984-Present (GRC)	None	None	1974-Present (Boeing)

a) Including Boeing and previous site operators, Rocketdyne Propulsion & Power and Atomics International.

4.2.2 Nonradiological 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 contaminants. Both Chatsworth Formation wells and shallow wells were utilized to monitor groundwater conditions in Area IV. Groundwater analyses were conducted by Haley & Aldrich 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 November 1, 2007. 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 printed on the Boeing website to promote environmental awareness among all employees.

4.3 INTEGRATED SAFETY MANAGEMENT SYSTEMS (ISMS)

The ETEC *Integrated Safety Management System (ISMS)* description document is a compilation of safety policies and procedures. This document prescribes a formal, organized process that ensures worker health and safety, and includes a built-in mechanism for self-assessment and continuous improvement. In addition to noting accomplishments and improvements, the Annual ISMS Report for CY 2007, to be submitted in 2008, reemphasizes the policies and procedures that help the organization comply with ISMS principles. The Annual ISMS Report also contains metrics monitored by Environment, Health and Safety (EHS) to assess improvement in safety practices.

During 2007, Boeing SSFL continued refining the implementation of ISMS principles. The self-assessment plan incorporates tools such as DOE Lessons Learned Reports, DOE ORPS (Occurrence Reporting and Processing System) Reports, and DOE Operating Experience Reports. Safety issues were emphasized with Boeing subcontractors by having an EHS representative present safety requirements and information prior to the start of each job. Periodic ISMS subcontractor audits were performed to ensure that safety requirements were being met while work was in progress.

Training in ISMS principles was provided to new employees working on DOE closure programs. Updates on ISMS subjects and various safety issues and lessons are presented to the ETEC Closure Program Office personnel.

In early 2007, DOE approved ETEC's 10CFR851 Worker Health and Safety Compliance Plan (Boeing, 2007).

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 SSFL Training and Development department currently maintains a list of 53 environment, health, and safety courses for Boeing SSFL personnel. Six of them are related to environmental protection, 9 to radiation safety and remediation, and 38 to health and safety. Over 50 environment, health, and safety courses are available as computer-based training. Training is also available to the employees through Boeing's enterprise-wide Library and Learning Center. 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 cleanup of contaminated sites from previous programs. The key components of waste generated at ETEC are:

- Low-level radioactive waste (LLW), mixed, hazardous, and non-hazardous wastes from D&D operations.

- Oils from ongoing remediation and O&M activities.

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 Training and Awareness Programs

The ETEC Waste Minimization and Pollution Prevention Awareness Program includes (1) orientation programs and refreshers, (2) specialized training, and (3) incentive awards and recognition. Employees are reminded about pollution prevention and waste minimization awareness. Posters are placed in work areas to notify employees about environmental issues or practices. Presentations using visual aids are provided, as needed, to review major changes in environmental issues.

4.5.3 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.

- Use of comprehensive segregation and screening procedures to minimize generation of mixed waste.

- Hazardous waste containers in acceptable condition are reused to the maximum extent possible.

- Empty product drums returned to the vendor for reuse when practical.

- Approximately 80% of the office paper and aluminum cans are recycled as a result of increased environmental awareness. During 2007, 0.61 metric tons of white paper and 0.34 metric tons of aluminum cans were recycled.

- Size-reduction and compaction of low-level radioactive waste to reduce waste volume from approximately 2,500 cubic feet to 500 cubic feet during 2007.

4.5.4 Tracking and Reporting System

Various categories of materials from procurement to waste disposal are tracked. Radioactive and mixed wastes are characterized sufficiently (for safe storage) by the generator, transferred to the RMHF, and logged and temporarily 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. Boeing is responsible for all non-hazardous and sanitary waste operations at the SSFL.

The relevant reports include:

- EPA's Biennial Hazardous Waste Report.
- DOE's Annual Waste Generation and Pollution Prevention Progress Report.
- DOE's Affirmative Procurement Report.

4.6 PUBLIC PARTICIPATION

In 2007, the DOE, supported by Boeing and its contractors, held two meetings to inform the community of the alternatives to implement the decommissioning and decontamination of the two remaining radiological facilities.

February 2007: Proposed Building 4024 Decommissioning.
http://www.etec.energy.gov/Reading-Room/Project-Updates/Building24EECA.html

April 2007: Proposed Radioactive Materials Handling Facility (RMHF) Decommissioning.
http://www.etec.energy.gov/Reading-Room/Project-Updates/RHMFEECA.html

DOE added and updated content on the web site devoted to the environmental cleanup associated with the ETEC Closure. The web site is part of an effort to expand DOE's communication with the public. This site describes the history of operations and remediation at ETEC, provides posters, presentations and handouts from public meetings and serves as a focal point for information on DOE activities. It is used as an on-line source of key documents, including annual environmental monitoring reports, off-site sampling reports, the Environmental Assessment, the Historical Site Assessment, cleanup standards, the EPA Hazard Assessment, and the ongoing EIS. Material will be added on an ongoing basis.

The web site address, which was revised to be shorter and easier to read, is:
http://www.etec.energy.gov/.

During 2007, DOE participated the SSFL Workgroup Meeting, which is regularly attended by US EPA, DTSC, DOE, and interested stakeholders to discuss ongoing and proposed investigations and cleanup at SSFL.

DOE and Boeing also participated in local Homeowner Association meetings, Chambers of Commerce and civic groups that brought DOE and Boeing environmental remediation staff and technical experts together with local residents. The meetings featured fact sheets and presentation materials that enhanced public understanding of the environmental programs and future use of the property. Public feedback indicated a very positive response to these meetings and the sharing of information. In addition, Boeing continued to support regulatory agency-sponsored meetings.

DOE and Boeing conducted tours for the community and elected officials and their staffs; this activity is part of an outreach program and includes updating local elected officials on DOE and Boeing remediation efforts to aid elected officials efforts to be responsive to their constituents in the local community.

DOE and Boeing responded to queries from the local media; including the Los Angeles Times, Los Angeles Daily News and Ventura County Star. Media outreach included holding timely briefings for reporters on environmental topics. DOE and Boeing also continued to regularly respond to phone calls from community members on the nature and status of environmental activities at the facility.

DOE and Boeing continued to supply three local repositories with information on environmental remediation projects at the site. They are: Los Angeles Public Library, Platt Branch; Simi Valley Library; and Oviatt Library at Urban Archives Center, California State University, Northridge.

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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. Most rainfall runoff at the SSFL site flows through several natural watercourses and drainage channels and is collected in two large-capacity retention ponds. This water may be discharged off-site into Bell Creek to the south, or it may be reused for industrial purposes. The runoff water from Area IV also flows to the northwest, which is monitored through five NPDES sampling locations.

Ambient and ventilation exhaust 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 are used for estimating the potential off-site dose from air pathway.

Groundwater and surface water samples are screened for gross alpha and gross beta, and the results are compared with the screening limits established by the EPA for suppliers of drinking water. Groundwater samples are also analyzed for tritium, gamma emitters, radium-226, radium-228, isotopic uranium and thorium. Surface water samples are also analyzed for strontium-90, tritium, gamma emitters such as cesium-137 and potassium-40, radium-226, radium-228, and isotopic uranium.

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 Health Services Radiologic Health Branch for independent surveillance.

5.1 AIR EFFLUENT MONITORING

During 2007, the only applicable emission source at the DOE facility at SSFL was the operating exhaust stack at the RMHF. The D&D operations at the RMHF were suspended in May 2007 until DOE completes the SSFL Area IV Environmental Impact Statement (EIS). As a result, no effluents were released to the atmosphere through the stack since May 2007.

At RMHF, workplace ventilation was provided in the decontamination and packaging rooms of Building 4021, where equipment was decontaminated and radioactive waste was repackaged. The ventilation assured protection of the workers from inhalation of airborne radioactive materials and prevented the spread of radioactive contamination into adjacent clean areas. The ventilation exhaust was passed through the HEPA filters before being sampled and discharged to the atmosphere. Airborne releases from the RMHF are shown in Table 5-1. No contaminated liquids were discharged to uncontrolled areas.

Table 5-1. Atmospheric Effluents to Uncontrolled Areas

SSFL/RMHF - 2007	
Effluent volume (m^3)	1.39E+07
Air volume sampled (m^3)	2.72E+03
Annual average concentration in effluent	
Gross alpha (μCi/ml)	2.71E-16
Gross beta (μCi/ml)	2.04E-15
Maximum observed concentration	
Gross alpha (μCi/ml)	1.25E-15
Gross beta (μCi/ml)	9.98E-15
Activity releases (μCi)	
Gross alpha	3.77E-03
Gross beta	2.83E-02

Radionuclide-Specific Data

Radionuclide	Half-Life (yr)	Activity Detected (pCi)	Annual Release (μCi)	Average Exhaust Concentration (μCi/ml)	Average Exhaust Concentration as Percent of DCG	DCG[d] (μCi/ml)
H-3	1.23E+01	7.99E+03[a]	2.06E+01	1.48E-12	0.001%	1E-07
Be-7	1.46E-01	ND[b]				Natural[c]
K-40	1.26E+09	ND				Natural
Co-60	5.26E+00	ND				8E-11
Sr-90	2.77E+01	ND				9E-12
Cs-137	3.00E+01	4.18E+01	2.14E-01	1.54E-14	0.004%	4E-10
Th-228	1.91E+00	ND				4E-14
Th-230	8.00E+04	1.47E+00	7.51E-03	5.40E-16	1.351%	4E-14
Th-232	1.41E+10	ND				7E-15
U-234	2.47E+05	ND				9E-14
U-235	7.10E+05	ND				1E-13
U-238	4.51E+09	ND				1E-13
Pu-238	8.64E+01	ND				3E-14
Pu-239/240	2.44E4/6.58E3	ND				2E-14
Pu-241	1.52E+01	ND				1E-12
Am-241	4.33E+02	ND				2E-14

a) H-3 activity is directly measured from water sample prior to evaporation, in pCi/L.
b) ND = Not Detected.
c) Naturally occurring radionuclides are included for information. They are not included for dose calculations.
d) Derived Concentration Guide (DCG) for exposure of the public, for the most restrictive form of radionuclide as specified in DOE Order 5400.5 (2/8/90; Change 2: 1/7/93).

The level of radioactivity released to the atmosphere was reduced to the lowest practical value by passing the effluents through certified HEPA filters. The effluents were sampled for particulate radioactive materials in the stack exhaust samplers at the point of release. In addition, the stack monitor installed at the RMHF provided automatic alarm capability in the event of elevated release of particulate activity. The HEPA filters used for filtering atmospheric effluents were at least 99.97% efficient for particles 0.3 μm in diameter.

The total radioactivity, measured as gross alpha and gross beta activity, in the atmospheric effluents flowing to uncontrolled areas from the RMHF is shown in Table 5-1. The total shows that no significant quantities of radioactivity were released in 2007. The gross alpha and gross beta counts were made shortly after the weekly stack samples were collected, a procedure that permitted identification of any unusual release.

The isotopic composition of the radioactivity deposited on the RMHF exhaust air sampling filters, combined for the entire year, is also presented in Table 5-1. Gamma-emitting radionuclides were measured by high-resolution gamma spectrometers, and all others were measured by specific chemical separations followed by alpha or beta counting. Radionuclides that were found to be less than the detection limits are identified in the table as "not detected" (ND).

Small amounts of Cs-137 and Th-230 on the filter samples were due to the materials involved in the operations at the RMHF. H-3 concentration was directly sampled from the water that was evaporated. In 2007, H-3 concentration in the water sample was detected at 7,990 pCi/L. The concentrations in the effluent are compared with appropriate reference values for nonoccupational exposure. The isotopic reference values for DOE facilities are the DCGs specified in DOE Order 5400.5. These values refer to the permissible concentrations allowed by the State of California and the DOE for continuous, nonoccupational exposure (i.e., to general public). The radionuclide concentrations released from the RMHF stack are far below the DCG, as shown in Table 5-1. The fact that dilution and dispersion occur before the material reaches an unrestricted area further reduces the concentration in the public area.

The U.S. EPA regulates airborne releases of radioactivity from DOE facilities under 40 CFR 61, Subpart H. The isotopic radionuclide concentrations in the exhaust ventilation are used to demonstrate compliance with State DPH/RHB, DOE, and EPA (NESHAPs) standards.

The potential downwind radiation exposures due to the atmospheric emissions during 2007 from the RMHF exhaust stack were calculated using the CAP88-PC computer code. Such site-specific input data as wind speed, directional frequency and stability, stack height, and exhaust air velocity were used to perform the dose assessment.

The highest potential radiation exposure doses at the site boundary and the nearest residential area were estimated using the CAP88-PC computer code; the results are presented in Table 5-2. The airborne dose calculations were performed to demonstrate compliance with the NESHAPs standard. At the location of the hypothetical Maximally Exposed Individual (MEI), the effective dose equivalent from the DOE facility (RMHF) exhaust during 2007 was 2.6×10^{-7} mrem (2.6×10^{-9} mSv) per year. The EPA limit for a DOE site is 10 mrem/yr, as specified in 40

CFR 61, Subpart H. Potential releases from the RMHF are so low that, even assuming the absence of HEPA filters, estimated doses would be below the level requiring continuous monitoring. However, monitoring is still being performed as a best management practice.

Table 5-2. Radiation Exposure Dose due to Atmospheric Effluents—2007

Facility	Distance (m) and Direction to		Downwind Exposure Dose (mrem/yr)	
	Boundary	Residence	Boundary	Residence
RMHF	300 NW	2,675 NW	3.7×10^{-7}	2.6×10^{-7}

5.2 ENVIRONMENTAL SAMPLING

5.2.1 Ambient Air

During 2007, ambient air sampling was performed continuously at SSFL with air samplers operating on 7-day sampling cycles. The sampling locations are shown in Figure 5-1 and listed in Table 5-3. 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 Tc-99 and Th-230 standard sources. The activities of the standard sources are traceable to the National Institute of Standards and Technology (NIST).

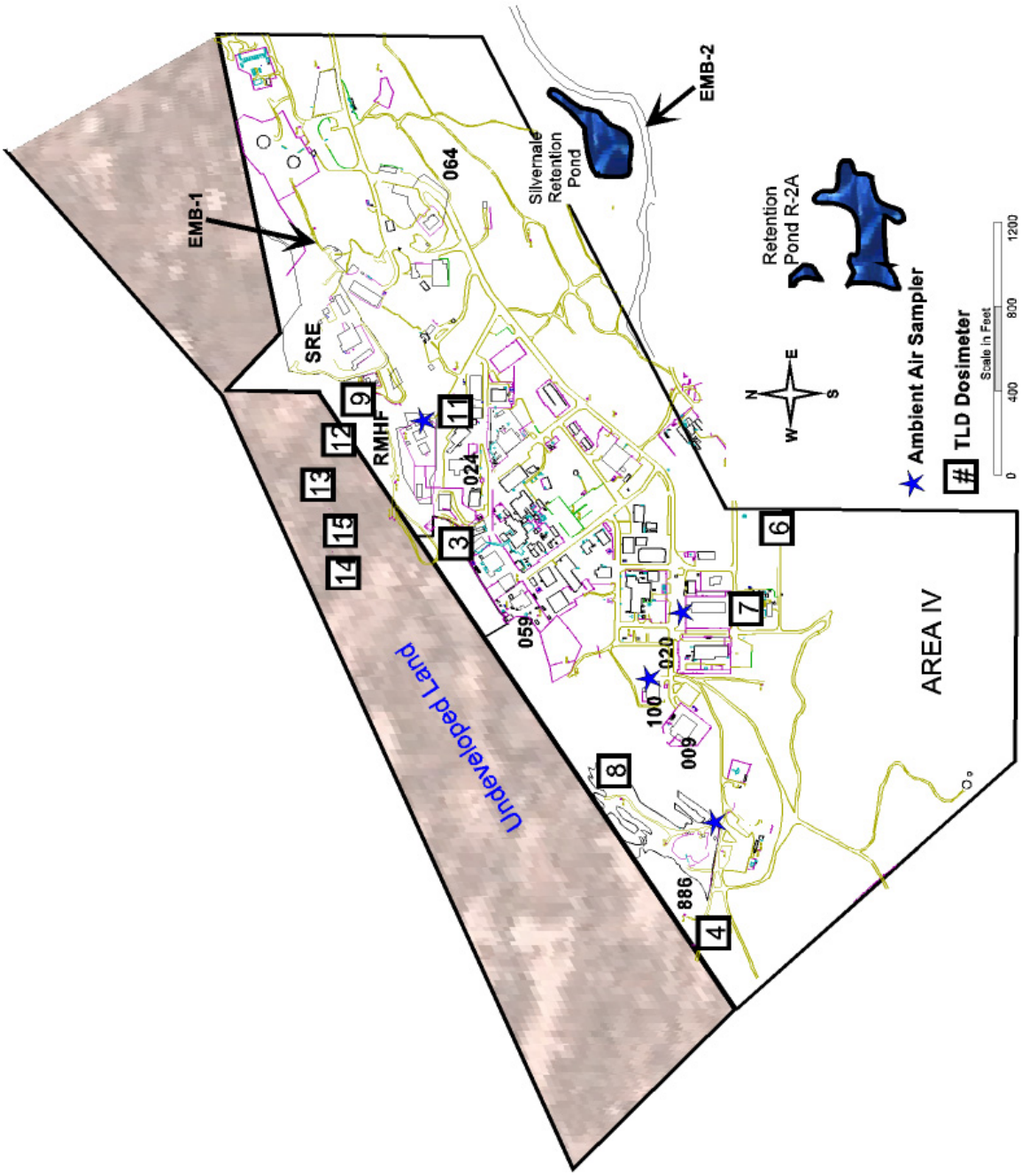

Figure 5-1. Map of Santa Susana Field Laboratory Area IV Sampling Stations

Table 5-3. 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	(W)
A-5	SSFL Site, RMHF Pond, north side	Discontinued in 2006
A-6	SSFL Site, 4100, east side	(W)
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	(Q)
SS-8 (CA)	SSFL Site, Former Sodium Disposal Facility north boundary	(Q)
SS-9 (CA)	SSFL Site, RMHF northeast boundary at 4133	(Q)
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	(Q)
SS-14 (CA)	SSFL Site, RMHF northwest property line boundary	(Q)
SS-15 (CA)	SSFL Site, RMHF northwest property line boundary	(Q)
(or RMHF_Middle)		
EMB-1 (CA)	SSFL Site, SRE area north of 4003	(Q)
EMB-2 (CA)	SSFL Site, south of Silvernale retention pond, off Test Area Road	(Q)
Off-site Ambient Radiation Dosimeter Locations		
OS-1 (CA)	Off-site, Chatsworth	(Q)
BKG-11	Background Location, West Hills	(Q)
BKG-12	Background Location, Somis	(Q)
BKG-13	Background Location, Hollywood	(Q)
BKG-15	Background Location, Calabasas	(Q)
BKG-18	Background Location, Agoura	(Q)
BKG-19	Background Location, Simi Valley	(Q)
BKG-22	Background Location, Saugus	(Q)

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

Filter samples for each ambient air sampling location were combined annually and analyzed for isotopic-specific activity. The results of the sample analyses are shown in Table 5-4 with the RMHF stack effluent results for comparison. Like effluent air samples, the ambient air samples had radionuclide concentrations far below the 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.

Table 5-4. Filtered Exhaust and Ambient Air Radioactivity Concentrations – 2007

	Activity Concentration (microcuries per milliliter, μCi/ml)						
		Exhaust	Ambient				
Radionuclide	Derived Conc. Guide	RMHF Stack (% of DCG)	RMHF	4020	4100	4886	Average (% of DCG)
H-3	1E-07	1.48E-12 (0.001%)	NA	NA	NA	NA	NA
Be-7	natural	ND	ND	ND	ND	ND	NA
K-40	natural	ND	ND	ND	ND	ND	NA
Co-60	8E-11	ND	ND	ND	ND	ND	NA
Sr-90	9E-12	ND	1.52E-15	ND	ND	ND	3.81E-16 (0.00%)
Cs-137	4E-10	1.54E-14 (0.00%)	ND	ND	ND	3.34E-15	8.34E-16(0.00%)
Po-210	natural	NA	3.39E-15	ND	ND	5.18E-15	2.14E-15 (NA)
Th-228	4E-14	ND	ND	ND	ND	ND	NA
Th-230	4E-14	5.40E-16 (1.35%)	ND	2.92E-16	ND	ND	7.31E-17 (0.18%)
Th-232	7E-15	ND	ND	ND	ND	7.23E-17	1.81E-17 (0.26%)
U-234	9E-14	ND	ND	5.10E-17	ND	ND	1.27E-17 (0.01%)
U-235	1E-13	ND	ND	1.52E-16	9.21E-17	ND	6.11E-17 (0.06%)
U-238	1E-13	ND	ND	2.10E-16	ND	2.02E-16	1.03E-16 (0.10%)
Pu-238	3E-14	ND	ND	ND	ND	ND	NA
Pu-239/240	2E-14	ND	9.09E-17	ND	ND	ND	2.27E-17 (0.11%)
Pu-241	1E-12	ND	ND	ND	ND	ND	NA
Am-241	2E-14	ND	ND	ND	ND	ND	NA

NA = Not applicable
ND = Not detected

The gross radioactivity guidelines for SSFL site ambient air are based on the reference values in DOE Order 5400.5 (DOE, 1993). The conservative guide value for alpha activity is 2 x 10^{-14} μCi/mL, and the value for beta activity is 9 x 10^{-12} μCi/mL. A complete list of the results from the gross alpha and gross beta counting of the ambient air samples is given in Table 5-5.

Table 5-5. Ambient Air Radioactivity Data—2007

Area	Activity	Number of Samples	Gross Radioactivity Concentrations (μCi/mL)		
			Annual Average Value[c]	Maximum Value[a]	Average Percent of Guide[b]
SSFL Area IV	Alpha	51	2.92E-15	1.57E-14	14.62%
4100	Beta		2.13E-14	6.87E-14	0.24%
SSFL Area IV	Alpha	51	2.19E-15	8.76E-15	10.94%
4020	Beta		1.52E-14	2.91E-14	0.17%
SSFL Area IV	Alpha	51	3.50E-15	1.30E-14	17.52%
RMHF	Beta		2.59E-14	6.38E-14	0.29%
SSFL Area IV	Alpha	51	3.95E-15	1.45E-14	19.75%
4886	Beta		2.58E-14	5.51E-14	0.29%

[a]Maximum value observed in a single sample.
[b]Guidelines for SSFL site: 2E-14 μCi/mL alpha, 9E-12 μCi/mL beta, DOE Order 5400.5 (02/08/90).
[c]Values includes natural background.

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 radioactivity. Seventy-eight (78) water samples from 46 of these wells were collected and analyzed in 2007. The summary results are shown in Table 5-6.

Table 5-6. Radioactivity in Groundwater at SSFL—2007

	Activity (pCi/L)									
	H-3	Cs-137	Th-228	Th-230	Th-232	U-234	U-235	U-238	Gross Alpha	Gross Beta
Water Suppliers MCL[a]	20,000	200	NA			20 – Total Uranium			15	50
Maximum	91,500*	ND	ND	ND	ND	30.00	1.22	24.00	40.00	22.00
Mean[b]	3,692	NA	NA	NA	NA	9.78	0.44	8.59	6.98	7.39
Minimum	ND	ND	ND	ND	ND	0.59	ND	0.51	ND	ND
Number of Analyses[c]	69 (58)	37 (37)	4 (4)	4 (4)	4 (4)	17 (0)	17 (1)	17 (0)	60 (25)	60 (4)

[a]From 40 CFR 141 and EPA limit of 4 mrem/yr (see text).
[b]The mean is calculated from all reported values.
[c]Numbers in parentheses represent the number of analyses reported as less than the detectable limit.
NA = not applicable
ND = not detected
* This figure applies to free-flowing groundwater well samples. Higher tritium levels were found in rock core pore water in 2007. See text below.

The State of California assigns drinking water standards to groundwater as a water-quality goal. Numerical limits for radionuclides not specifically listed by the State were derived from the EPA generic dose limit of 4 mrem/year, as specified in 40 CFR 141. Except for the following instances of gross alpha (16.7 pCi/L at RS-11 on 2/28/07, 20.0 pCi/L at RS-54 on 2/25/07, 39.4 and 40.0 pCi/L at RD-7 on 2/28/07 and 8/9/07, respectively, 18.8 pCi/L at RD-29 on 8/8/07, 20.1 and 23.2 pCi/L at RD-34A on 2/28/07 and 8/15/07, respectively, and 20.0 pCi/L at RD54A on 8/10/07), the monitored groundwater satisfies these goals. The high gross alpha concentrations are due to the presence of higher levels of naturally occurring uranium (as determined by uranium isotopic ratios). Gamma spectrometry analysis did not detect any man-made beta and gamma emitters.

Tritium analyses were performed in 69 water samples from 46 groundwater-monitoring wells (see Figure 6-2). Among these monitoring wells, some of them were drilled specifically for investigating tritium in the groundwater. In 2007, relatively high tritium concentrations were observed at the tritium monitoring wells, RD-87, -88, and -90, -93, -94 and -95, which are located down gradient from the former Building 4010 site, a possible source for man-made tritium production. Tritium results from these wells are consistent with the findings in previous years. The highest level of tritium in these wells was observed at RD-95 at 91,500 pCi/L. Investigation is continuing to fully understand the source of the tritium and the extent of

migration. Figure 5-2 shows the well locations and tritium concentrations in these wells, and Figure 5-3 shows the tritium concentrations in RD-95 in recent years.

Besides the tritium investigation wells, routine groundwater sampling had results similar to historical data. The positive detections of tritium had maximum concentrations of 1,230 pCi/L at RD-34A, 188 pCi/L at RD-34B, 244 pCi/L at RD-54A, and 118 pCi/L at RD-64. All these values are substantially below the EPA and California drinking water limit of 20,000 pCi/L. The occurrence of tritium in groundwater is probably due to unintended production of tritium in concrete and soil surrounding various reactors, primarily in Building 4010 and 4059.

Two core holes were installed in 2007 to help delineate the vertical profile of the tritium impacted groundwater near the former Building 4010. Tritium analysis was carried out on pore water extracted from these rock cores. The first of these core holes (SB-Trit-01) was installed at the location of the former Building 4010 just to the west of well RD-93. A maximum pore water concentration of tritium at this location was 931,258 pCi/L at a depth of about 57 feet below ground surface. The second core hole (SB-Trit-02) was installed several hundred feet west of SB-Trit-01 near RD-95. Maximum pore water concentration of tritium at this location was 90,367 pCi/L at a depth of about 82 feet below ground surface.

Further details on Area IV groundwater monitoring for 2007 may be found at:

- http://www.etec.energy.gov/Cleanup/Groundwater_Monitoring.html

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 Pond. Water from this pond is eventually released to Bell Creek under the NPDES permit. Some of Area IV slopes to the northwest, and a small amount of rainfall drains toward the northwest ravines, which lead into Meier Canyon. To permit sampling of this runoff, five catch basins were installed in 1989 near the site boundary to accumulate runoff.

The NPDES Permit No. CA0001309, most recently revised on November 1, 2007, requires that a discharge monitoring report (DMR) for the Santa Susana Field Laboratory (SSFL) be published annually. This annual 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. For the period of January 1, 2007 through December 31, 2007, the NPDES discharge data are provided in the 2007 Quarterly and Annual NPDES Discharge Monitoring Report (Boeing, 2008a).

The 2007 Quarterly and Annual NPDES Discharge Monitoring Reports are also available at http://www.boeing.com/aboutus/environment/santa_susana/ents/monitoring_reports.html

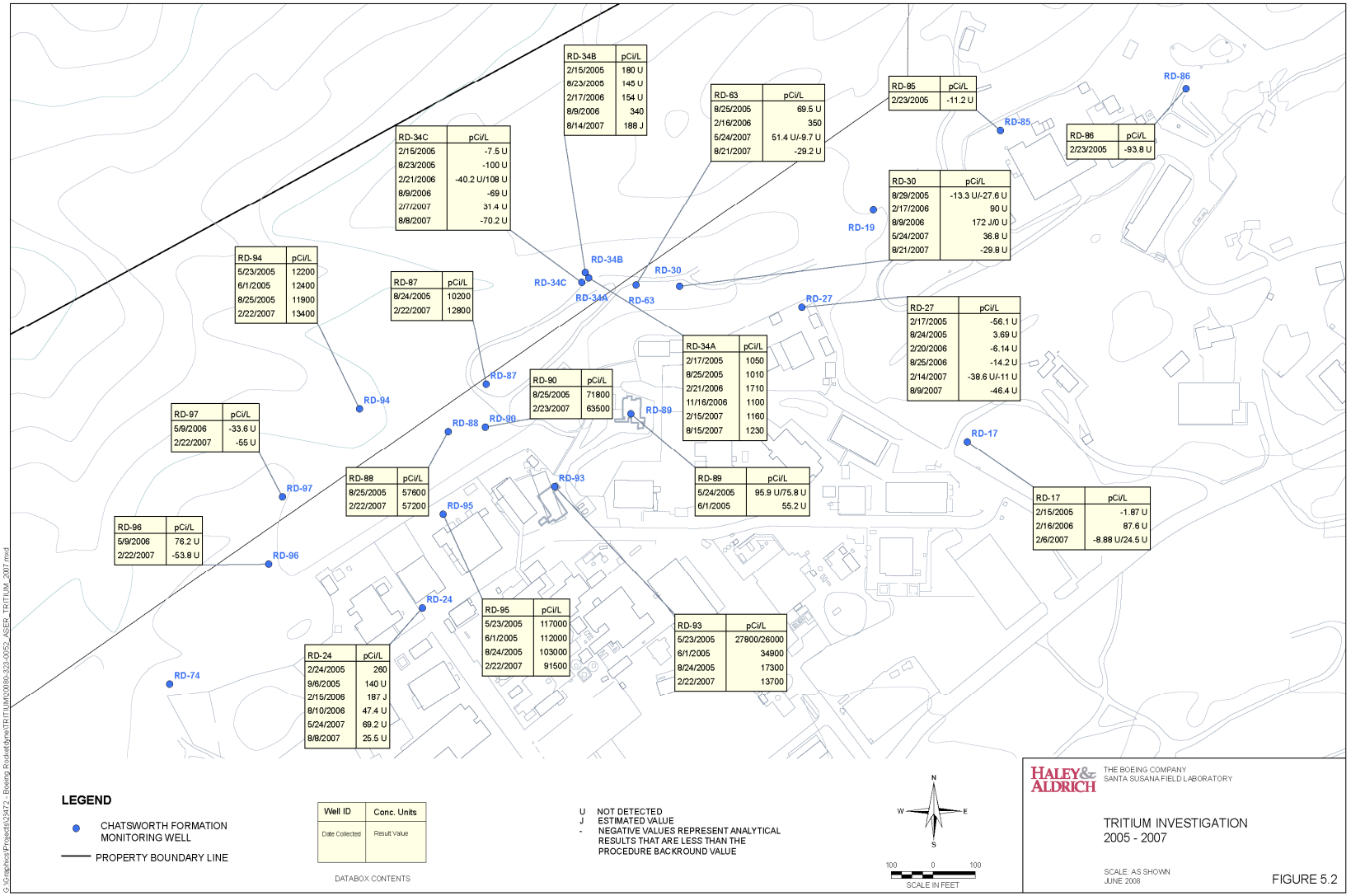

Figure 5-2. Wells Constructed for Tritium Investigation

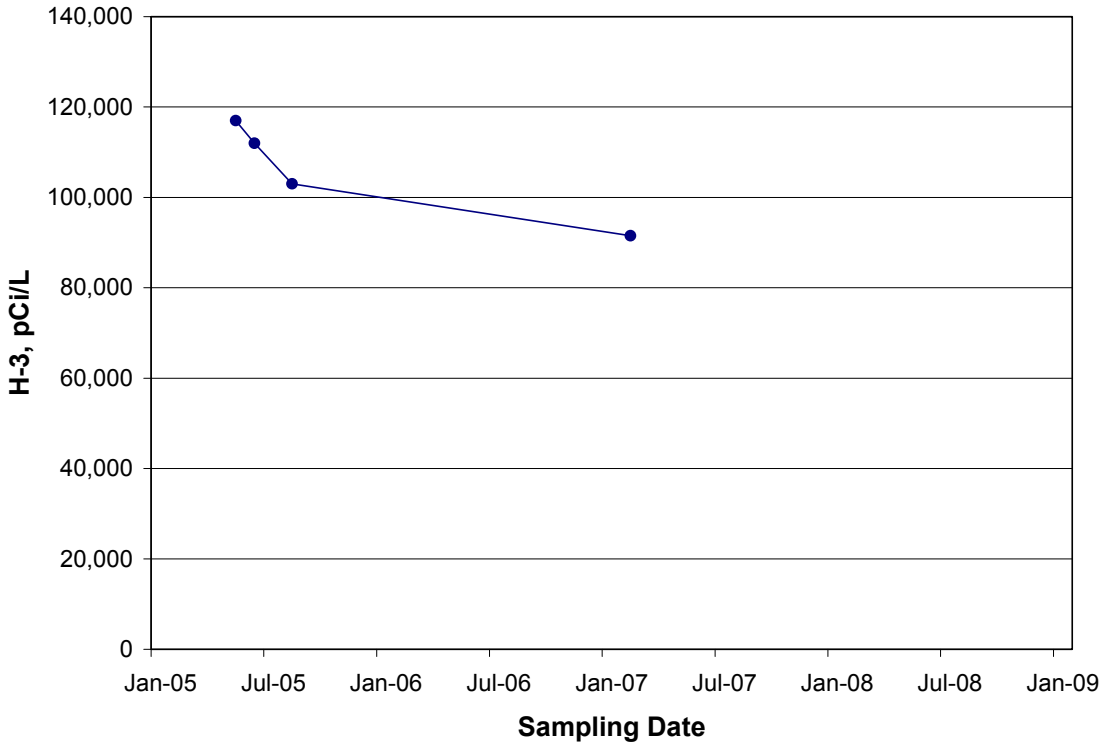

Figure 5-3. Tritium Concentration in Water from Well RD-95

5.2.4 Soil

The radioactivity in native rock and soil can serve as an indicator of any spread of contamination outside the operating facilities and other known areas of radioactive contamination. Most soil radioactivity is due to various naturally occurring radionuclides present in the environment and due to radioactive fallout of dispersed nuclear weapons materials. Naturally occurring radionuclides include K-40 and the uranium and thorium series (including radon and progeny). Radioactivity in nuclear weapons test fallout consists primarily of the fission-produced Sr-90, Cs-137, and plutonium isotopes.

In 2007, Boeing contracted AREVA to perform radiological characterization and confirmatory surveys at the SNAP Environmental Test Facility (SETF), or Building 4024. Soil samples were taken around the facility, as well as from an off-site background area. No evidence of contamination from Building 4024 was detected. Details of this study can be found at: http://www.etec.energy.gov/History/Major-Operations/SNAP-Environmental-Test-Facility.html.

In addition to the soil sampling conducted by AREVA, Boeing also took soil samples at Outfall #3 and Outfall #4 to support soil excavation for the NPDES program. No man-made gamma emitters were found in these locations.

5.2.5 Vegetation

No vegetation samples were collected in 2007.

5.2.6 Wildlife

No animal samples were collected in 2007.

5.2.7 Ambient Radiation

From 1974 to 1989, the ambient radiation monitoring program used complicated bulb-type dosimeters (CaF_2:Mn). This usage was justified by the amount of nuclear materials handled in the operations at SSFL and De Soto, and by the low levels of radiation in the environment. At the termination of all nuclear work in 1988, such a program was no longer needed, and efforts were directed toward simplifying the program. This simplification was initially accomplished by using the dosimeters (LiF) that were well established in use for monitoring personnel engaged in radiation work. While these dosimeters are well suited to measuring exposures in the range of interest for compliance with occupational radiation regulations (doses "above background"), they are somewhat insensitive for environmental measurements, since they have a resolution, in terms of dose increments, of only 10 mrem per quarter. Using these dosimeters, Boeing SSFL demonstrated that environmental exposures did not reach regulatory limits, but obtained only limited information on the actual exposure rates present around the facilities and in the neighboring environment.

In addition to the LiF TLDs discussed above, Boeing SSFL began deploying, in the last quarter of 1995, environmental TLDs that use an aluminum oxide ("sapphire") chip. These TLDs are capable of determining doses in increments of 0.1 mrem (compared to 10 mrem for the LiF-based badges previously used). In addition, the aluminum oxide badge reporting is much more detailed, providing both gross and corrected readings for the locations. 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. In various intercomparisons, aluminum-oxide-based dosimeters have been shown to be among the most accurate dosimeters available in measuring environmental exposure rates.

The State DPH/RHB provides packages containing 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 along with the Boeing TLDs. The State dosimeters are returned to the Radiologic Health Branch for evaluation. Data obtained in 2007 on these TLDs, which were placed at various Boeing dosimeter locations both on-site and off-site, are shown in Table 5-7. The differences between Boeing and DPH 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 63 to 113 mrem/yr. At SSFL, the local background ranges from 114 to 143 mrem/yr, based on the data

from dosimeters SS-3, -4, -6, -7, -8, -9, and -11 and EMB-1 and -2 as shown in Table 5-7. 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 the off-site locations 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, -13, -14 and -15, are slightly higher than the rest of the locations on-site. This result is reflective of the normal operations at the RMHF, which involve handling and shipment of radioactive waste.

Table 5-7. 2007 SSFL Ambient Radiation Dosimetry Data

2004		Annual Exposure (mrem)	Average Exposure Rate (μR/h)	
TLD-Locations		By Boeing	Boeing	State DPH
SSFL	SS-3	114.4	13.1	7.0
	SS-4	136.2	15.5	9.7
	SS-6	125.2	14.3	9.6
	SS-7	132.6	15.1	9.7
	SS-8	141.1	16.1	9.4
	SS-9	128.0	14.6	9.4
	SS-11	123.6	14.1	8.7
	SS-12	135.8	15.5	10.8
	SS-13	150.8	17.2	10.4
	SS-14	126.7	14.5	9.3
	SS-15	137.5	15.7	10.5
	EMB-1	142.9	16.3	10.8
	EMB-2	134.2	15.3	9.7
Mean Values		**133.0**	**15.2**	**9.6**
Off-site	OS-1	100.1	11.4	6.4
	BKG-11	96.2	11.0	
	BKG-12	85.5	9.8	
	BKG-13	62.5	7.1	
	BKG-15	100.8	11.5	
	BKG-18	113.2	12.9	
	BKG-19	82.4	9.4	
	BKG-22	86.7	9.9	
Mean Values		**90.9**	**10.4**	**6.4**

Note: Due to airport X-ray exposure, DPH's TLDs had irregular readings for 1st Qtr. Only 2nd, 3rd, and 4th Qtr data were presented here as an approximation for the year.

The external exposure rate at Boeing SSFL's northern property boundary, the closest property boundary to the RMHF, should be 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, -13, –14, and -15), approximately 150 meters from the RMHF, read an average of 6.8 mrem/year above the local background. This amount is considerably below the 100 mrem/year limit specified in DOE Order 5400.5, *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 (except SS-12, SS-13, SS-14, and SS-15), is 131 mrem/year. This value is 40 mrem/year higher than the background as calculated by the average of all offsite TLDs of 91 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 of the San Fernando and Simi valleys. The Chatsworth Formation is composed of arkosic sandstone, rich in feldspar. Arkosic rocks are often high in uranium content. 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

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 four TLD monitoring stations to the north of the RMHF, namely SS-12, -13 –14, and -15, recorded an external dose level at 6.8 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.

Estimates of the internal dose from airborne releases assume a constant unsheltered exposure throughout the year and, therefore, considerably overestimate the actual annual doses near the site. Estimated internal radiation doses due to atmospheric emission of radioactive materials from SSFL nuclear facilities are calculated using the EPA program, CAP88-PC, are many orders of magnitude below the radiation standards; and are far below doses from internal exposure resulting from natural radioactivity in air. 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 5-8. The table presents the estimated exposures in comparison to the regulatory standards. Dose values in the tables represent both internal and external exposures.

Table 5-8. Public Exposure to Radiation from DOE Operations at SSFL—2007

1.	All pathways	
	a. Maximum estimated external dose to an individual from direct radiation	0 mrem/yr
	b. Maximum estimated internal dose to an individual	2.6×10^{-7} mrem/yr
	Limit	100 mrem/yr
	("Radiation Protection of the Public and the Environment" DOE Order 5400.5)	
2.	Air pathway (reported in NESHAPs report)	2.6×10^{-7} mrem/yr
	Limit (40 CFR 61, Subpart H)	10 mrem/yr

5.3.2 Population Dose

The general population (person-rem) dose estimates were calculated using CAP88-PC code. This code uses release rate, wind speed, wind direction and frequency, stability fractions, and stack height parameters as input data. Population dose is estimated to be 6.0×10^{-5} person-rem for the SSFL site. As a comparison, an average individual in the US receives approximately 300 mrem/yr from natural background radiation, and the total population dose within 80 km radius is estimated to be 3×10^{6} person-rem. In spite of the large number of people in the surrounding population, the population dose estimated for Boeing SSFL operations is extremely small. Figure 5-4 shows the population data within 50 miles (80 km) radius from SSFL.

Figures 5-5 and 5-6 show more detailed local population distribution estimated from the demographic survey. Claritas Inc, a leading demographic survey company, developed the demographic data around SSFL in 2000 based on the census data and modified by direct observations of nearby residential areas around the SSFL site.

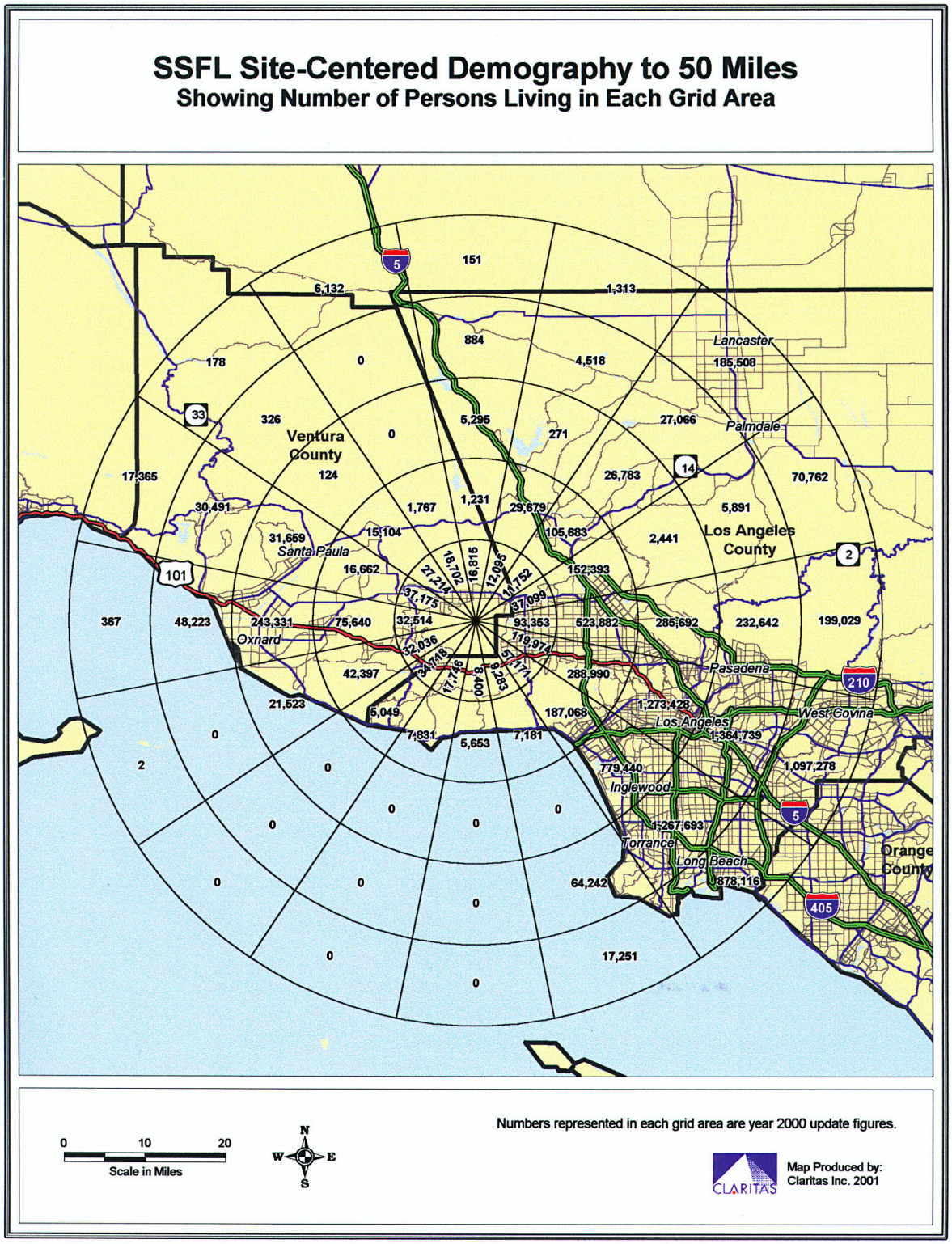

Figure 5-4. Demographic Data within 50 Miles (80 km) of SSFL

Figure 5-5. Number of Persons Living within 5 Miles (8 km) from SSFL Site

Figure 5-6. Number of Persons Living within 10 Miles (16 km) from SSFL Site

5.4 PROTECTION OF BIOTA

Since 1990, DOE Order 5400.5, "Radiation Protection of the Public and the Environment", has required 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.

Soil concentrations in Area IV are used for the Level 1 dose evaluation. During the past decades, thousands of soil samples were collected and analyzed, and the results were entered into the RESRAD-BIOTA to compare against the BCGs. Table 5-9, summarizes the comparison results. The total BCG fraction at SSFL, as shown in Table 5-9, is less than 1, indicating that the potential exposure is less than the dose limit recommended by the DOE.

Table 5-9. Terrestrial Biota Radiation Exposure as a Fraction of Dose Limit

Nuclide	Soil		
	BCG Limit pCi/g	On-site Soil Concentration pCi/g	Partial Fraction
Am-241	3.89E+03	2.27E-02	5.83E-06
Cm-242	2.05E+03	5.64E-03	2.75E-06
Cm-244	4.06E+03	2.27E-03	5.59E-07
Co-58	1.80E+03	4.79E-02	2.67E-05
Co-60	6.92E+02	2.85E-02	4.12E-05
Cr-51	5.34E+04	2.51E-01	4.70E-06
Cs-134	1.13E+01	2.37E-02	2.10E-03
Cs-137	2.08E+01	2.24E-01	1.08E-02
Eu-152	1.52E+03	6.73E-02	4.42E-05
Eu-154	1.29E+03	0.00E+00	0.00E+00
Eu-155	1.58E+04	6.33E-02	4.00E-06
H-3	1.74E+05	8.63E+00	4.96E-05
K-40	1.19E+02	1.96E+01	1.65E-01
Pb-210	1.39E+03	1.46E+00	1.05E-03
Po-210	4.33E+03	1.32E+00	3.05E-04
Pu-238	5.27E+03	1.04E-02	1.97E-06
Pu-239	6.11E+03	9.70E-03	1.59E-06
Ra-226	5.06E+01	1.18E+00	2.33E-02
Ra-228	4.39E+01	1.24E+00	2.82E-02
Sr-90	2.25E+01	2.22E-01	9.87E-03
Th-228	5.30E+02	1.26E+00	2.38E-03
Th-230	9.98E+03	1.05E+00	1.05E-04
Th-232	1.51E+03	1.16E+00	7.70E-04
Th-234	2.16E+03	1.11E+00	5.13E-04
U-233	4.83E+03	7.78E-01	1.61E-04
U-234	5.13E+03	8.77E-01	1.71E-04
U-235	2.77E+03	7.54E-02	2.72E-05
U-238	1.58E+03	8.50E-01	5.39E-04
Zn-65	4.13E+02	7.84E-02	1.90E-04
		Sum	**2.46E-01**

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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 B/059 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 will therefore be suspended.

The overall annual groundwater monitoring program at SSFL addresses collection and analysis of groundwater samples and measurement of the water levels for the 263 Boeing SSFL installed wells on-site and off-site and 20 off-site private wells. An additional 129 piezometers were installed on- and off-site. 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).

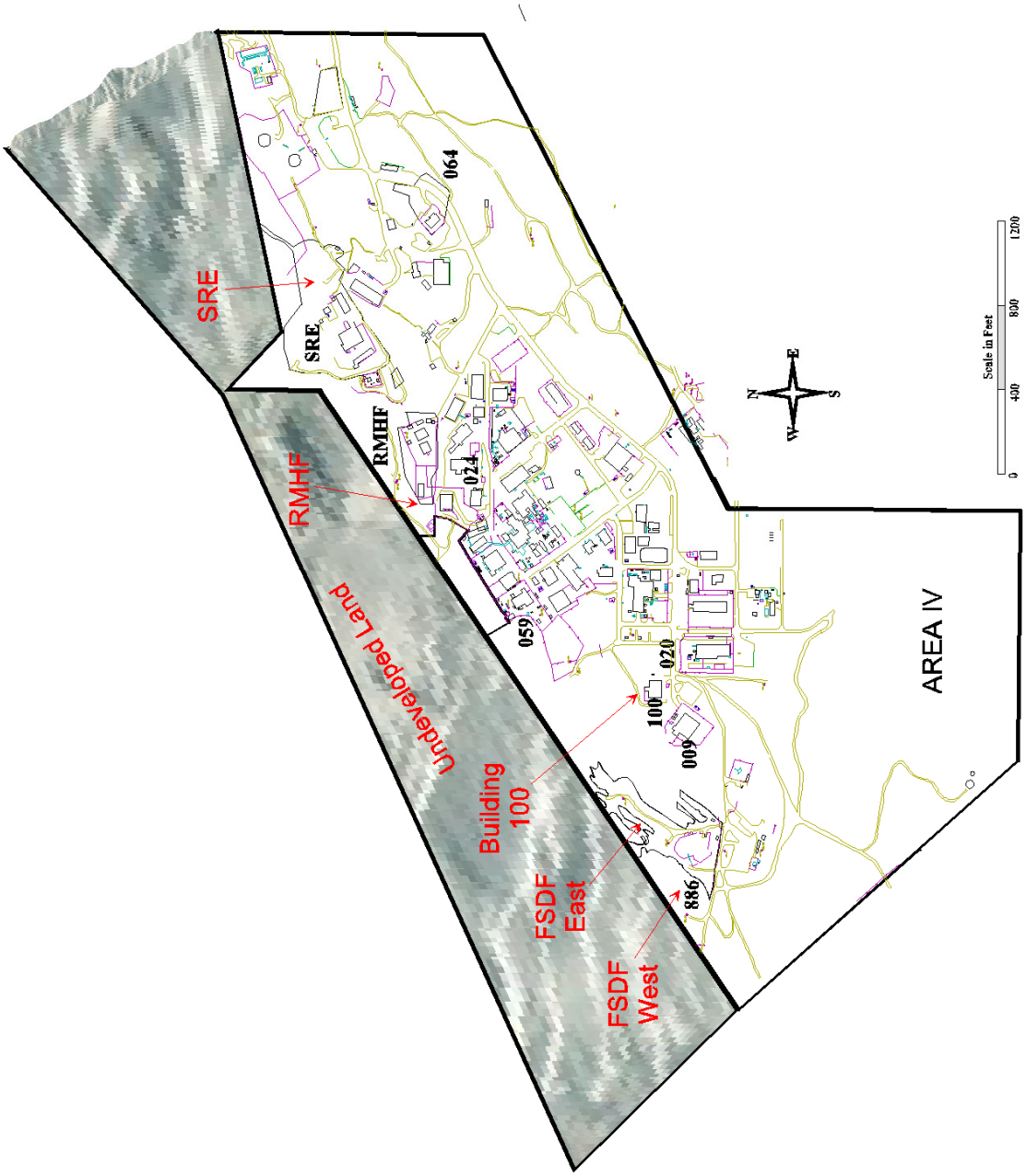

Figure 6-1. Locations of Surface Water Runoff Collectors

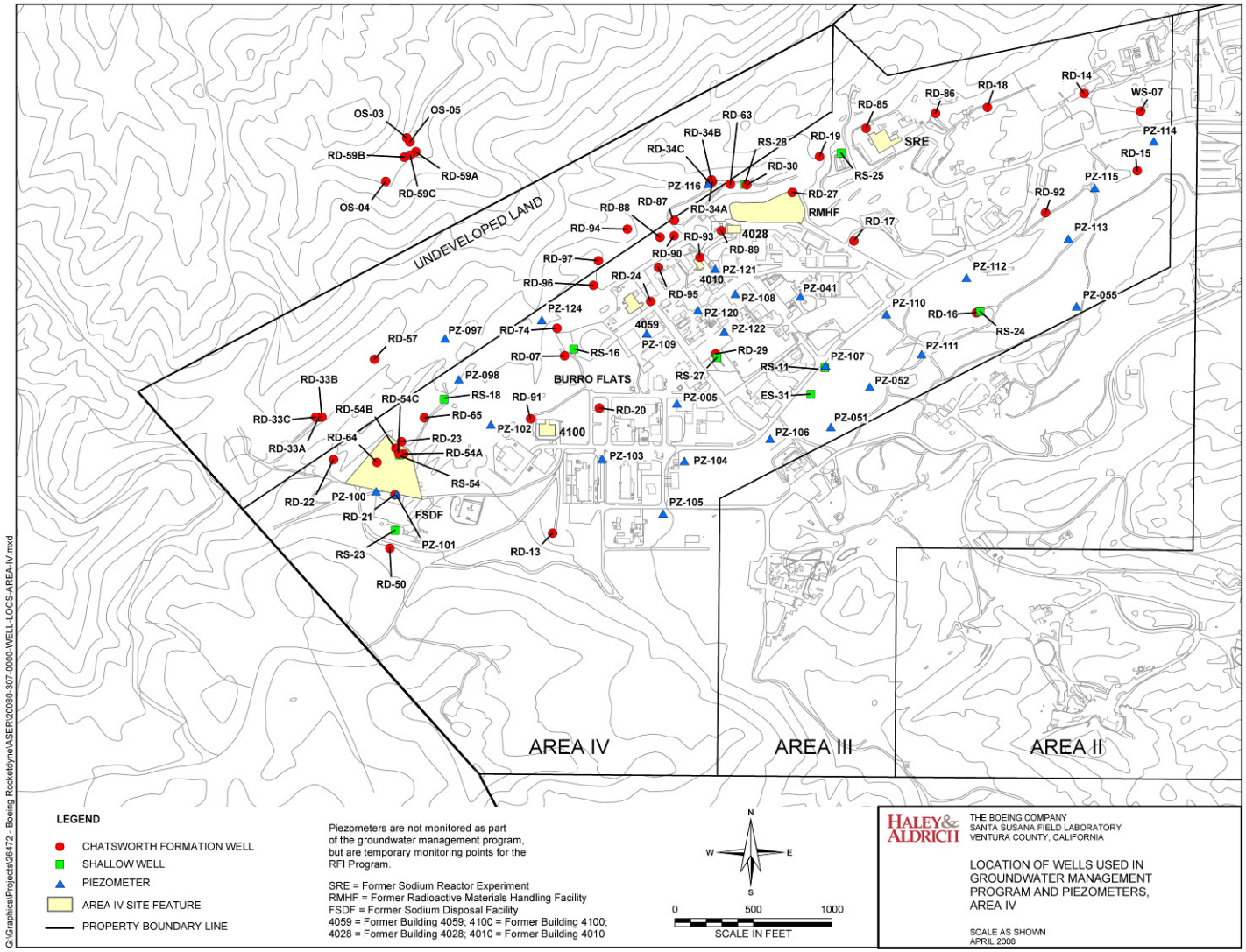

Figure 6-2. Well and Piezometer Locations

6.1 SURFACE WATER

Boeing SSFL has filed a Report of Waste Discharge with the Los Angeles Regional Water Quality Control Board and has been granted 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 September 27, 1976, and was most recently renewed on November 1, 2007 and became effective on December 21, 2007.

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. The permit applies the numerical limits for radioactivity established for drinking water supplies to discharges through these outfalls. 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 three 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 is piped directly to the Area III Sewage Treatment Plant (STP III).

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 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, and specified radionuclides. Toxicity testing is also conducted in the form of acute and chronic toxicity bioassays.

In November 1989, a storm water runoff-monitoring program was developed and implemented in Area IV for runoff from the northwest portion of the site. The five monitoring locations selected include: the Radioactive Materials Handling Facility watershed (Outfall 003), Sodium Reactor Experiment watershed (Outfall 004), the Former Sodium Disposal Facility watershed (Outfalls 005 and 006), and the Building T100 watershed (Outfall 007). Runoff monitoring is currently conducted as set forth by the NPDES permit referenced above. Furthermore, all surface water program activities for the SSFL, including Area IV, have been addressed and incorporated into the current NPDES permit. A Storm Water Pollution Prevention Plan was prepared in accordance with the current federal and state regulations.

Details on the NPDES discharge from the SSFL for the period of January 1, 2007 through December 31, 2007 are available in 2007 Annual NPDES Discharge Monitoring Report (Boeing, 2008a). 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 applicable rules, regulations, and permit conditions set forth in Permit to Operate No.00271. Permit to Operate No.00271 covers Area IV of the SSFL, which is inspected annually by VCAPCD. On June 25, 2007, 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, does not meet the reporting threshold under SARA 313 Toxic Release Inventory Reporting.

6.3 GROUNDWATER

A groundwater monitoring program has been in place at the SSFL site since 1984. Currently, the monitoring system includes 263 Boeing SSFL installed on-site and off-site wells and 20 private off-site wells. An additional 129 piezometers are installed on- and off-site. Routine quarterly chemical and radiological monitoring of the wells is conducted according to the monitoring plan submitted to the lead agency for the groundwater program. Quarterly reports are submitted to the regulatory agencies at the end of the first three quarters. An annual report is submitted to the lead agencies after the monitoring for the fourth quarter is completed. A summary of groundwater monitoring activities and sampling results for Area IV during 2007 is presented in Tables 6-1 and 6-2.

Table 6-1. Groundwater Monitoring at Area IV in 2007

Item	Remediation	Waste Management	Environmental Surveillance	Other Drivers
Number of active wells monitored	0	0	44	0
Number of samples taken	0	0	124	0
Number of analyses performed	0	0	5319	0
% of analyses that are nondetects	0	0	83	0

Table 6-2. Ranges of Detected Analytes in 2007 Groundwater Samples

Analytes	Ranges of Results for Positive Detections
Metals (mg/L)	0.000051 J to 2.6
Extractable Fuel Hydrocarbons (mg/L)	0.51 to 0.53
Trichloroethene (TCE) (µg/L)	0.1 J to 1500
cis-1,2-Dichloroethene (cis-1,2-DCE) (µg/L)	0.4 J to 580
Tetratchloroethene (PCE) (µg/L)	0.1 J to 30 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 the purposes of this report, "near-surface groundwater" is defined as groundwater that is present in the alluvium and weathered bedrock, and groundwater that occurs in the unweathered bedrock is referred to as "Chatsworth Formation 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 Area IV, there are 10 DOE-sponsored near-surface groundwater wells (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 48 DOE-sponsored Chatsworth Formation 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 2007 analyses of the Area IV wells were documented in the 2007 Annual Groundwater Monitoring Report (HA, 2008). 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).

Six distinct areas of TCE-impacted groundwater have been delineated in the northwest part of Area IV. These areas include the drainage below RMHF, the vicinity of former Building 4059, the FSDF area, the former Building 4028 area, the Building 4100 area, and the Sodium Reactor Experiment (SRE) area (Figure 6-3). These areas are roughly defined by the locations of monitor wells where results of laboratory analyses of water samples collected in 2007 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 detected in the groundwater sample collected from shallow well RS-28 at a concentration

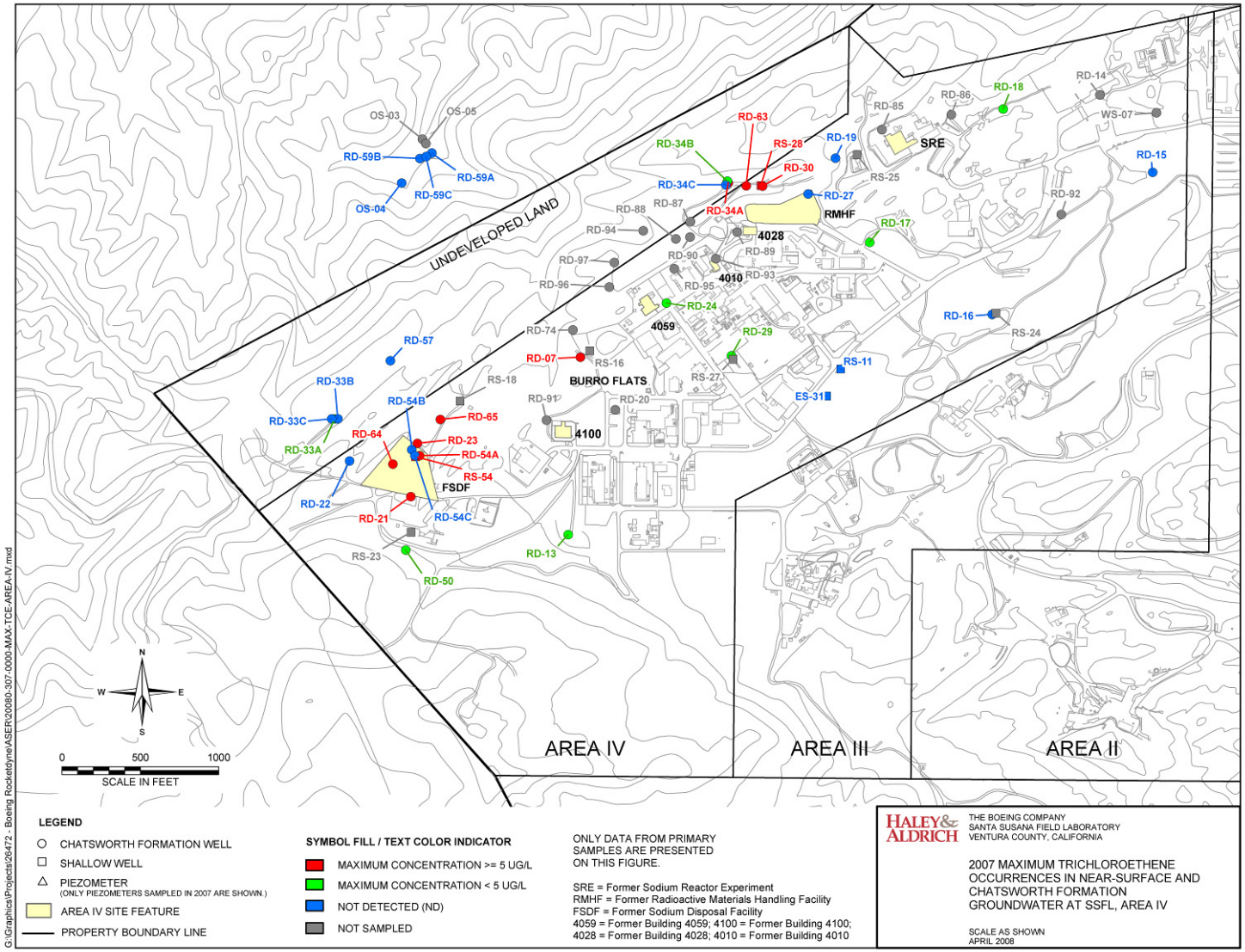

Figure 6-3. TCE Occurrences in Groundwater at SSFL, Area IV

of 16 µg/L in 2007. In 2007, maximum TCE concentrations exceeded the MCL at three Chatsworth Formation wells: RD-30 (12 µg/L), RD-34A (5.7 µg/L), and RD-63 (11 µg/L). RD-63 was installed in 1994 in the Chatsworth Formation for the pilot extraction test in the area. TCE was detected below the MCL in the groundwater sample collected from well RD-34B during 2007 at a concentration of 0.6 µg/L. Each of these concentrations are within historical ranges of TCE detections.

Former Building 4059: TCE was detected in groundwater collected from two wells located near Former Building 4059 during the year. TCE was detected in well RD-07 at concentrations ranging from 2 to 5.6 µg/L. The RD-07 samples were collected from a discrete interval groundwater monitoring system installed in April 2002. Since its construction in 1986, RD-07 generally contained TCE concentrations in the 1.5 to 81 µg/L range with a maximum TCE concentration of 130 µg/L. Southeast of former Building 4059, well RD-24 groundwater contained TCE at a concentration below the MCL at an estimated 0.2 µg/L. Previously, TCE concentrations in RD-24 groundwater ranged from an estimated 0.18 to 1.5 µg/L.

FSDF: TCE was detected in groundwater collected from wells located near the FSDF area during the year (Figure 6-3). Chatsworth Formation wells containing maximum TCE concentrations exceeding the MCL included RD-21 (210 µg/L), RD-23 (490 µg/L), RD-54A (73 µg/L), RD-64 (180 µg/L). and RD-65 (180 µg/L). Each of these concentrations was less than the historical maximum TCE concentration for its respective location. TCE was detected below the MCL in groundwater collected at well RD-33A at estimated concentrations ranging up to 0.2 µg/L. Historical TCE concentrations in RD-33A have ranged from an estimated 0.26 to 14 µg/L. In shallow wells, the maximum TCE concentration for samples collected during 2007 was 1,500 µg/L in RS-54. Historical TCE concentrations in RS-54 have ranged from 180 to 4,500 µg/L.

Former Building 4028: No TCE samples were collected from this area in 2007.

Building 4100: No TCE samples were collected from this area in 2007.

SRE: TCE was not detected in groundwater samples collected in the SRE area in 2007.

Other areas: In 2007, TCE was reported below the MCL in several wells outside of the six concentrated areas of TCE-impacted groundwater. TCE was detected in groundwater samples collected from wells RD-13, RD-29 and ES-31 which are located in the central part of Area IV near Burro Flats; in well RD-50 located south of FSDF; in well RD-18 located northeast of SRE; and in well RD-17 located southeast of the RMHF canyon. Occurrence of TCE in RD-13 was determined to be the result of improperly decontaminated sampling equipment temporarily installed during the fourth quarter of 2000. TCE concentrations in RD-13 groundwater ranged from non-detected at the method detection limit of 0.26 µg/L to an estimated 0.68 µg/L in 2007. RD-29 and ES-31 contained TCE concentrations of 1.3 µg/L and an estimated 0.27 µg/L, respectively. These results were within historical detection ranges of an estimated 0.47 to 3.1 µg/L in RD-29 and 0.32 µg/L to an estimated 0.67 µg/L in ES-31. TCE was detected in groundwater collected from well RD-50 at estimated concentrations ranging up to 0.68 µg/L. Historical TCE concentrations in RD-50 have ranged from an estimated 0.34 µg/L to 4.7 µg/L. TCE was detected in groundwater collected from well RD-18 at estimated concentrations

ranging up to 0.72 µg/L. Historical TCE concentrations in RD-18 have ranged from 0.2 µg/L to 2.5 µg/L. TCE was also detected in groundwater collected from well RD-17 at a concentration of 1.1 µg/L. TCE concentrations in RD-17 have ranged from 0.79 to 2.9 µg/L.

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 have been conducted in the FSDF area of Area IV. During 2007, discrete interval groundwater monitoring systems installed in nine FSDF-area wells were sampled for cyanide, radiochemicals, trace metals, and VOCs. The data loggers monitored discrete-interval water level fluctuations, produced discrete-interval hydraulic head readings within the Chatsworth Formation groundwater system, and allowed the collection of discrete fracture connectivity testing data. Transducer data loggers installed in nine FSDF-area groundwater wells collected continuous water level data that supplemented discrete interval monitoring data.

The 2007 Annual Groundwater Monitoring Report may be found at:

http://www.etec.energy.gov/Cleanup/Groundwater_Monitoring.html

6.4 SOIL

Potential chemically contaminated soils are being addressed through the RCRA Facility Investigation (RFI) at the SSFL. The primary objectives of this investigation are (1) to investigate the nature and extent of chemicals in soil and the potential threat to groundwater quality for each of the SWMUs and AOCs identified for potential RFI Corrective Action, and (2) to evaluate the potential risk to human health and the environment presented by these SWMUs and AOCs to assess whether remediation is required. The data from the investigation will be evaluated following DTSC-approved risk assessment methodologies to determine whether remediation, additional assessment, or no further action is necessary to bring each site to closure.

The RFI Program started at the SSFL site in 1996 and is presently ongoing. Current RFI fieldwork is limited primarily focusing on sampling needed for reporting, and is scheduled to be completed in 2009 for RFI groups within Area IV. Field methodologies for the soil investigation include soil matrix sampling, soil vapor sampling, surface water sampling, and trenching. DTSC was onsite during much of the fieldwork to observe sampling protocols and select sampling locations and depths. Risk-based screening levels (RBSL) were developed prior to sampling in conjunction with DTSC risk assessors for use as soil screening values during the field program, and have been updated to reflect revised risk assessment requirements for the SSFL. The RBSLs are calculated to be chemical concentrations in soil that would not pose a threat to human health or ecological receptors.

Limited RFI fieldwork was completed in 2007 at DOE RFI sites. During 2007, approximately 159 soil matrix, 17 soil vapor, 1 surface water, 6 near-surface groundwater, and 5 spring/seep samples were collected in areas within and near Area IV. Data review and validation for these samples have been completed. Samples collected and analyses performed to date at DOE locations are summarized in Table 6-3.

Table 6-3. Sampling for RCRA Facility Investigation

Date	Soil Matrix		Soil Vapor		Surface Water		Groundwater		Spring/Seep	
	Sample	Analysis	Sample	Analysis	Sample	Analysis	Sample	Analysis	Sample	Analysis
1/1/07 to 12/31/07	159	577	17	17	1	1	6	13	5	5
Total to date	682	2,154	169	169	7	16	63	179	20	61

Key activities completed in the year 2007 included:

Limited soil matrix, soil vapor, groundwater, and surface water sampling was conducted at the B009 Leach Field (Area IV AOC), Building 056 Landfill (SWMU 7.1) and Former Sodium Disposal Facility (SWMU 7.3) RFI sites in support of the preparation of the Group 8 RFI Report (the northwestern portion of Area IV). The Group 8 Report is the third RFI group report prepared in accordance with the DTSC-approved RFI reporting approach developed in 2005. This report may be viewed at:

http://www.dtsc.ca.gov/SiteCleanup/Projects/upload/SSFL_RFI_group62.pdf

In 2007, work was completed on the Group 8 RFI report which was submitted to the DTSC in September. Work began on both the Group 5 and Group 7 RFI reports; Group 5 is scheduled to be submitted in 2008 and Group 7 in 2009. The Vapor Migration Modeling Validation Study Report and the Offsite Data Evaluation Report were prepared and submitted to DTSC. Sampling at seeps and springs locations at or around the SSFL continued in 2007.

Work planned for 2008 includes finalizing a work plan for the RFI sampling of areas surrounding the RMHF permitted unit and submitting to the DTSC for review, performing soil sampling at DOE RFI sites, and preparing the Group 5 RFI Report for submittal to the DTSC. In addition, the Area IV Environmental Impact Study (EIS) will be conducted, which may include additional environmental sampling. Finally, additional sampling to address DTSC comments on the Group 6 RFI Report will be performed, and a revised report prepared. Additional detail on RFI soil sampling may be found at:

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

7. ENVIRONMENTAL MONITORING PROGRAM QUALITY CONTROL

This section describes the quality assurance (QA) elements incorporated into the Boeing SSFL radiological analysis program. 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.
- Laboratory Intercomparisons—Boeing SSFL participates in the DOE MAPEP.
- 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.

Records relating to overall laboratory performance include the results of analysis of inter-laboratory cross-check samples and other quality control analyses; use of standard (radioactive) reference sources; and calibration of analytical balances.

7.3 QUALITY ASSURANCE

Boeing SSFL participated in the DOE Quality Assessment Program (QAP) for radiological analyses. This program was operated by the DOE's Environmental Measurements Laboratory (EML) in New York. In 2004 the DOE terminated the QAP program.

Boeing SSFL currently participates in the DOE Mixed Analyte Performance Evaluation Program (MAPEP). This program is operated by the DOE's Radiological and Environmental Sciences Laboratory (RESL). The comparison study Series 17 was conducted in 2007, and the Series 18 was postponed to 2008. Boeing participated the Series 17 study for the following samples: air filter MAPEP-07-RdF17), water (MAPEP-07-MaW17), and soil (MAPEP-07-MaS17).

Acceptance criteria was developed by reviewing precision and accuracy data compiled from other performance evaluation programs, analytical methods literatures, the MAPEP pilot studies, and what is considered reasonable, acceptable, and achievable for routine analyses among the more experienced laboratories. The acceptance criteria are designed to be pragmatic in approach and may be changed as warranted.

For each reported radiological and inorganic analyte, the laboratory result and the RESL reference value will be used to calculate a relative bias:

$$\%\ \text{BIAS} = \frac{(100)(\text{Labortory Result} - \text{RESL Reference Value})}{\text{RESL Reference Value}}$$

For each reported organic analyte, the laboratory result, the mean of all reported results and the standard deviation of all results (less outliers) will be used to calculate a Z-score:

$$\text{Z - Score} = \frac{(100)(\text{Laboratory Result - Mean of All Data})}{\text{Standard Deviation of All Data}}$$

The relative bias will place the laboratory result in one of three categories:
1) ACCEPTABLE..... BIAS <= 20%
2) ACCEPTABLE WITH WARNING…. 20% < BIAS <= 30%
3) NOT ACCEPTABLE..... BIAS > 30%

The Z-Score will place the laboratory result in one of three categories:
1) ACCEPTABLE..... Z-Score <= 2.0
2) ACCEPTABLE WITH WARNING…. 2.0 < Z-Score <= 3.0
3) NOT ACCEPTABLE..... Z-Score > 3.0

The reported uncertainty is not currently used as part of the acceptance criteria, but it will be used to flag a potential area of concern. Activity levels and other analyte concentrations for MAPEP samples are typically sufficient to permit analyses with uncertainties of 10% or less, but it is unreasonable to expect the uncertainty for a single analysis of a routine sample to be much lower than the 10% value.

Variations in counting efficiencies, chemical yields, analytical methods, sample size, count times, difficult analyses, etc., will likely cause some uncertainties to exceed the 10% value. A meaningful routine analysis, however, will not over inflate the uncertainty estimate. The MAPEP will provide some feedback to the participants regarding the uncertainties reported with their results. Reported uncertainties that appear unreasonably low or suspiciously high will be flagged. Participants with flagged uncertainties, particularly if they are numerous, should review their methods and ensure that the uncertainties are appropriate.

Several analytical laboratories were used for analyzing environmental samples involved in this report. They were: Boeing SSFL, California DPH Sanitation and Radiation Laboratory, Oak Ridge Institute for Science and Education (ORISE), Eberline Services in Oak Ridge, TN, Eberline Services in Richmond, CA, Severn Trent Laboratories in Richland, WA, and GEL Laboratories in Charleston, SC. Their performance results in the MAPEP-07 study are summarized in Figure 7-1.

In addition to the MAPEP comparison study, representatives from Boeing and its contractors periodically conduct on-site audits at these commercial laboratories to ensure the quality of the sample analysis.

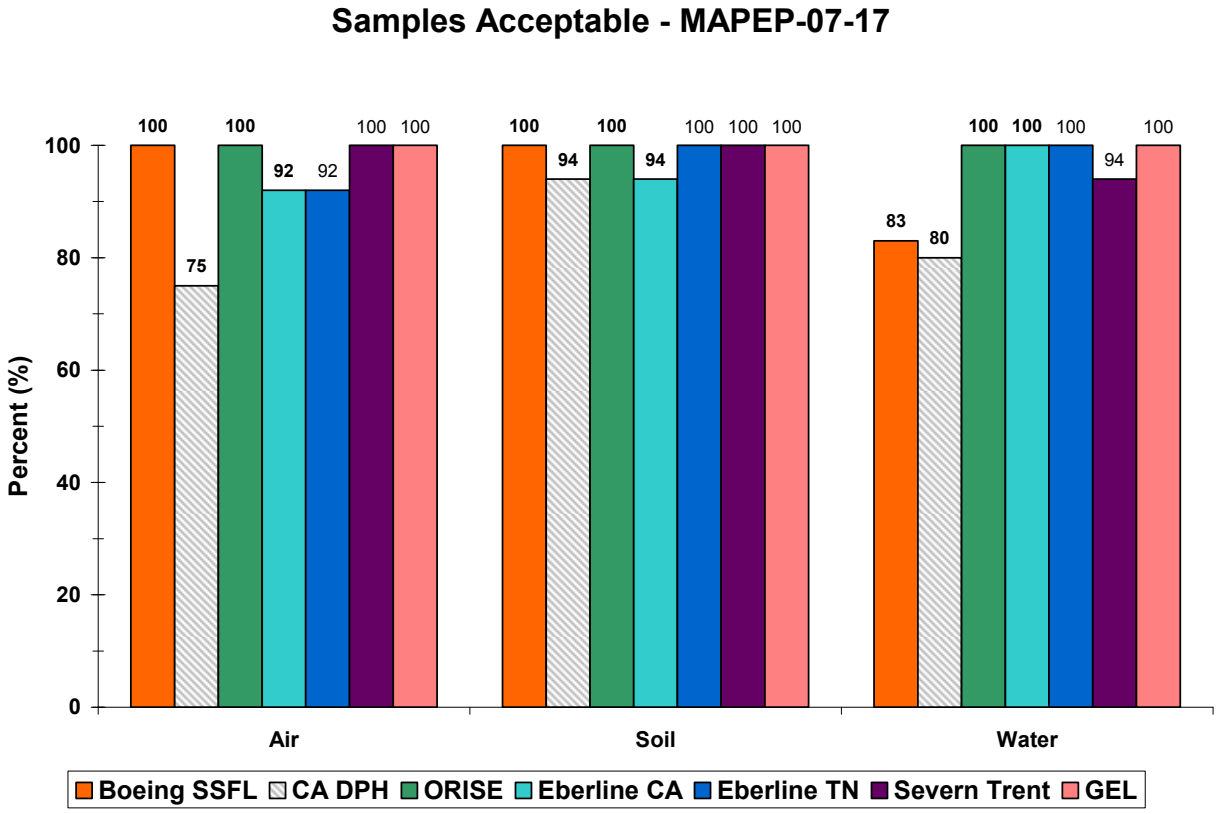

Figure 7-1. Mixed Analyte Performance Evaluation Program for 2007

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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
ASL	Above Sea Level
ATSDR	Agency for Toxic Substances and Disease Registry
BCG	Biota Concentration Guides
CAA	Clean Air Act
CAL/OSHA	California Occupational Safety and Health Administration
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
EML	Environmental Measurements Laboratory
EP	Environmental Protection
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
ISMS	Integrated Safety Management System
LARWQCB	Los Angeles Regional Water Quality Control Board
LLNL	Lawrence Livermore National Laboratory
LLW	Low Level Waste
MAPEP	Mixed Analyte Performance Evaluation Program
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

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
TRU	Transuranic
UST	Underground Storage Tank
VCAPCD	Ventura County Air Pollution Control District
WVN	Water Vapor Nitrogen

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Site Environmental Report Reader Survey--2007

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 Boeing'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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