BOEING

Site Environmental Report for Calendar Year 2005

DOE Operations at The Boeing Company Santa Susana Field Laboratory

September 2006

Site Environmental Report for Calendar Year 2005 DOE Operations at The Boeing Company Santa Susana Field Laboratory

Prepared by the Staff of

The Boeing Company,
Santa Susana Field Laboratory

September 2006

This page intentionally left blank.

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 8, 2006

This page intentionally left blank.

Department of Energy
Oakland, CA 94612

September 8, 2006

Distribution:

Subject: 2005 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 2005. 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 2005 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
Oakland Projects Office
1301 Clay St.
P.O. Box 54
Oakland, CA 94612

Questions may also be directed to Michael Lopez, U.S. Department of Energy, at (510) 637-1633.

Sincerely,

Michael Lopez

for Richard Dailey
Federal Projects Director

This page intentionally left blank.

ACKNOWLEDGMENT

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

- Principle technical contributors are:

• Radiological Topics:	Ning Liu Phil Rutherford
• Groundwater:	David Chung
• Surface Water:	Paul Costa
• Waste Management:	Ravnesh Amar Brian Sujata
• RCRA Facility Investigation:	David Chung
• Air:	Paul Costa
• Training:	Joanne Padfield
• Public Outreach:	Inger Hodgson
• Agency Inspection	Joanne Padfield

- Editing and review were performed by Ning Liu and Phil Rutherford.
- Administrative assistance was provided by Janice Edstrom.
- The staff of the Boeing Creative Services group provided publication assistance.

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. EXECUTIVE SUMMARY

This Annual Site Environmental Report (ASER) for 2005 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). In the past, 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. Closure of the liquid metal test facilities began in 1996.

Results of the radiological monitoring program for the calendar year 2005 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 2005.

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^{-6} 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.

Eighty water samples from 41 groundwater wells in Area IV were sampled and analyzed for radiological contaminants during 2005. Only naturally occurring radioactivity was found in groundwater, except for tritium reported in nine wells. Tritium activity exceeded the Federal and State drinking water standards of 20,000 picocuries per liter (pCi/L) in groundwater samples collected from four wells down gradient from the former Building 4010 site. The highest tritium activity detected was 117,000 pCi/L in RD-95. Further investigation of the source and extent of tritium in groundwater is planned during 2006. The groundwater underneath the SSFL Facility is not used for drinking water purposes.

Currently, there are fifty-six on-site wells in Area IV of SSFL to characterize the hydrogeology and water quality of known groundwater chemical contamination. In addition, there are three interim groundwater remediation systems in Area IV, located at the Former Sodium Disposal Facility (FSDF), the Radioactive Material Handling Facility (RMHF), and the former Building 4059 site (until March 2005 when the system was turned off following the

demolition of Building 4059). Although trichloroethene (TCE) was detected in these areas, no exposure to the public has occurred because no exposure pathways exist. Remediation of these contaminated areas continued in 2005.

During 2005, eleven regulatory agency inspections, audits, and visits were conducted in Area IV. These inspections and visits were carried out by the California Department of Health Services Radiologic Health Branch (DHS/RHB), Regional Water Quality Control Board (RWQCB), the Ventura County Air Pollution Control District (VCAPCD), and the Ventura County Public Works.

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 oversight regulatory 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 2005. 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. Current efforts are directed toward decontamination and decommissioning (D&D) of the former nuclear facilities and closure of facilities used for liquid metal research.

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.

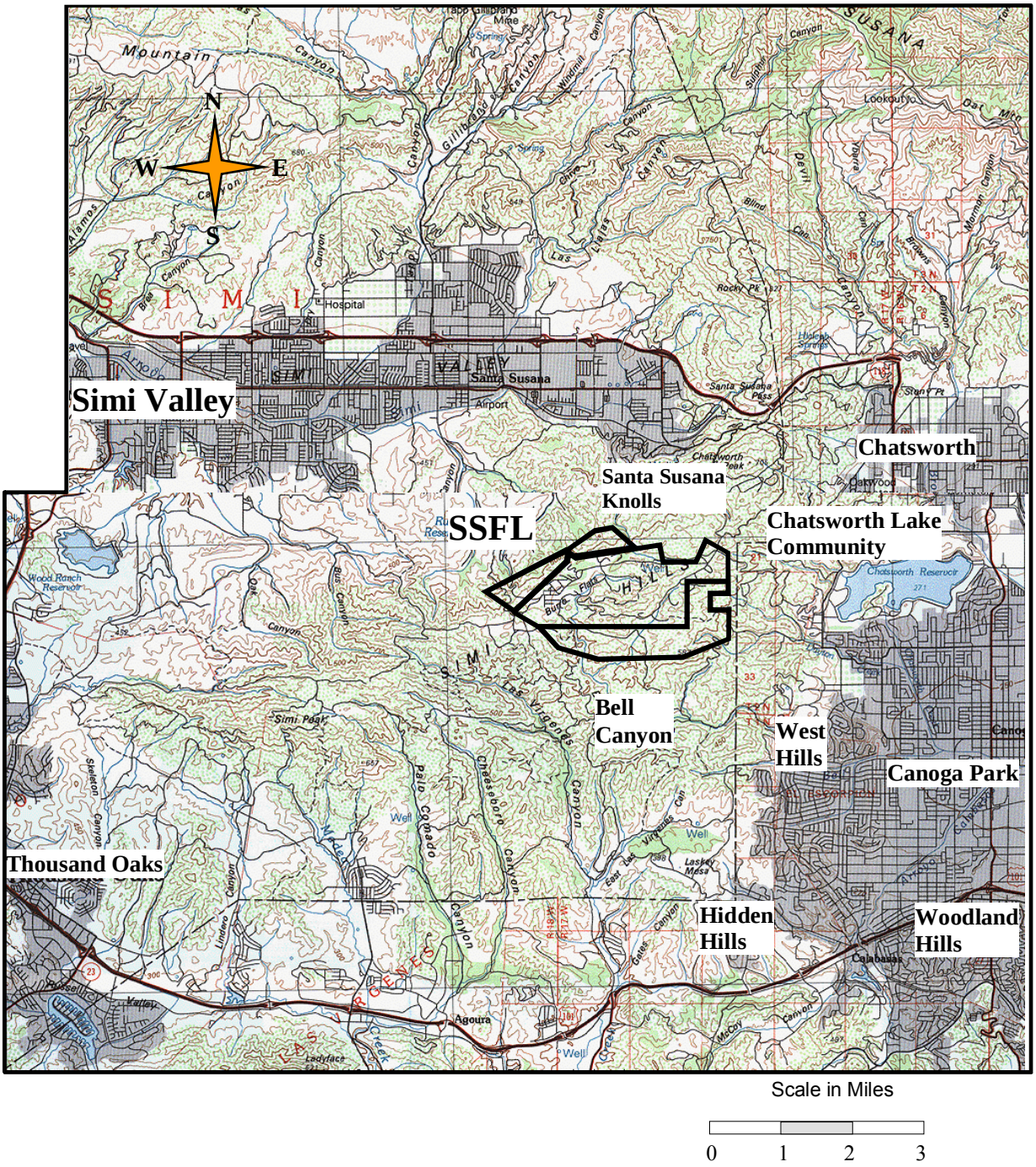

Figure 2-1. Map Showing Location of SSFL

Subdivisions			
Owner	**Jurisdiction**	**Acres**	**Subtotals**
Boeing	Boeing--Area IV	289.9	
	Boeing	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

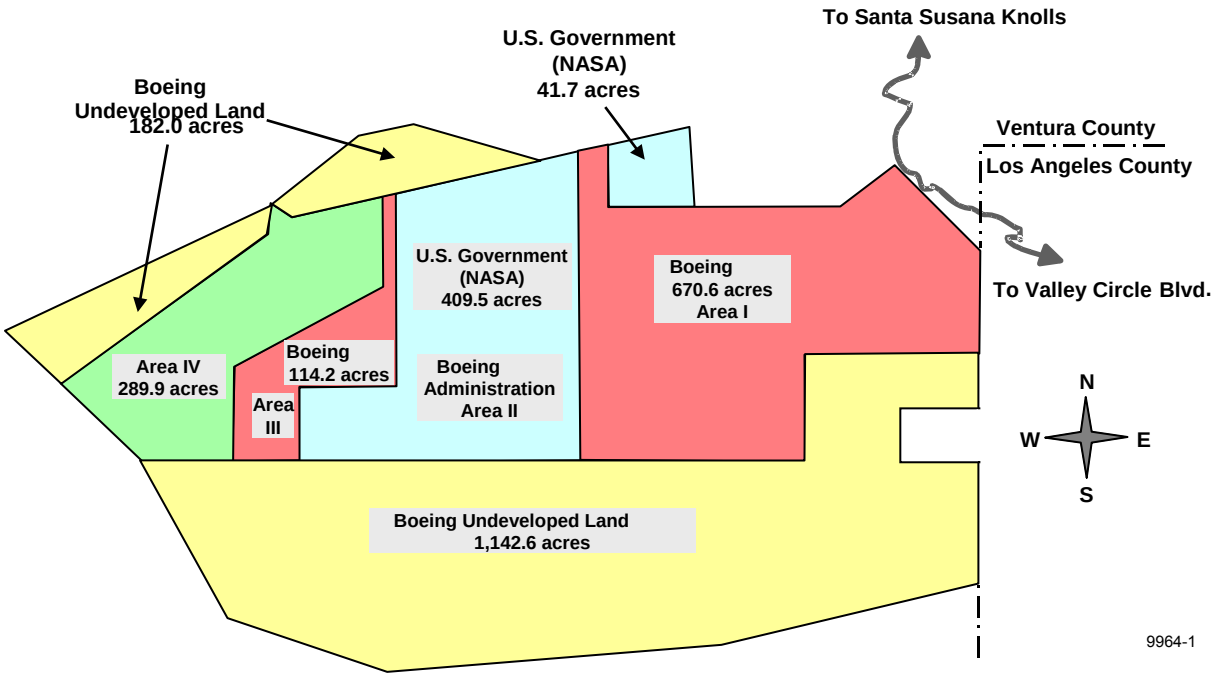

Figure 2-2. Santa Susana Field Laboratory Site Arrangement

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. Most of the work is described in detail in the document "Nuclear Operations at Rockwell's Santa Susana Field Laboratory - A Factual Perspective" (Oldenkamp, 1991). A more recent compilation of operations and current status of all 272 buildings in Area IV is provided in the Historical Site Assessment (http://apps.em.doe.gov/etec/hsa.html).

All the nuclear R&D operations in Area IV ceased in 1988. The only work related to the nuclear operations since 1988 (and during 2005) was the ongoing 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.

2.3 FACILITY DESCRIPTIONS

There were 27 radiological facilities that operated in Area IV (See Figure 2-4). As of the end of 2005, twenty of them have been released for unrestricted use, and four have been declared suitable for unrestricted release by DOE. Six radiological facilities have been deemed free of contamination but are yet to be demolished; they are 4009, 4100, 4019, 4055, 4011 and 4029. Building 4059 was demolished in 2004, and the site is pending release for unrestricted use. Two facilities, Building 4024 and the RMHF are undergoing remediation.

In addition to radiological facilities, two sodium and related liquid metal test facilities remain in Area IV. 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 remove sodium and other hazardous materials from the former sodium test facilities, 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, 4621, 4658, 4665 and 4688 and drainage pond 4614. Operations at RMHF include processing, packaging, and temporary storage of radioactive waste materials that are shipped off-site to DOE approved disposal facilities. Radioactive waste from decontamination operations included uranium, transuranic (TRU) elements such as plutonium, mixed fission products such as Cs-137 and Sr-90, and activation products such as Co-60, Eu-152, and tritium.

Repackaging of the TRU waste was completed during 2002. The waste was transferred to DOE's Hanford site for interim storage.

In 2005, atmospheric effluents were released through a stack as a result of waste handling operations 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

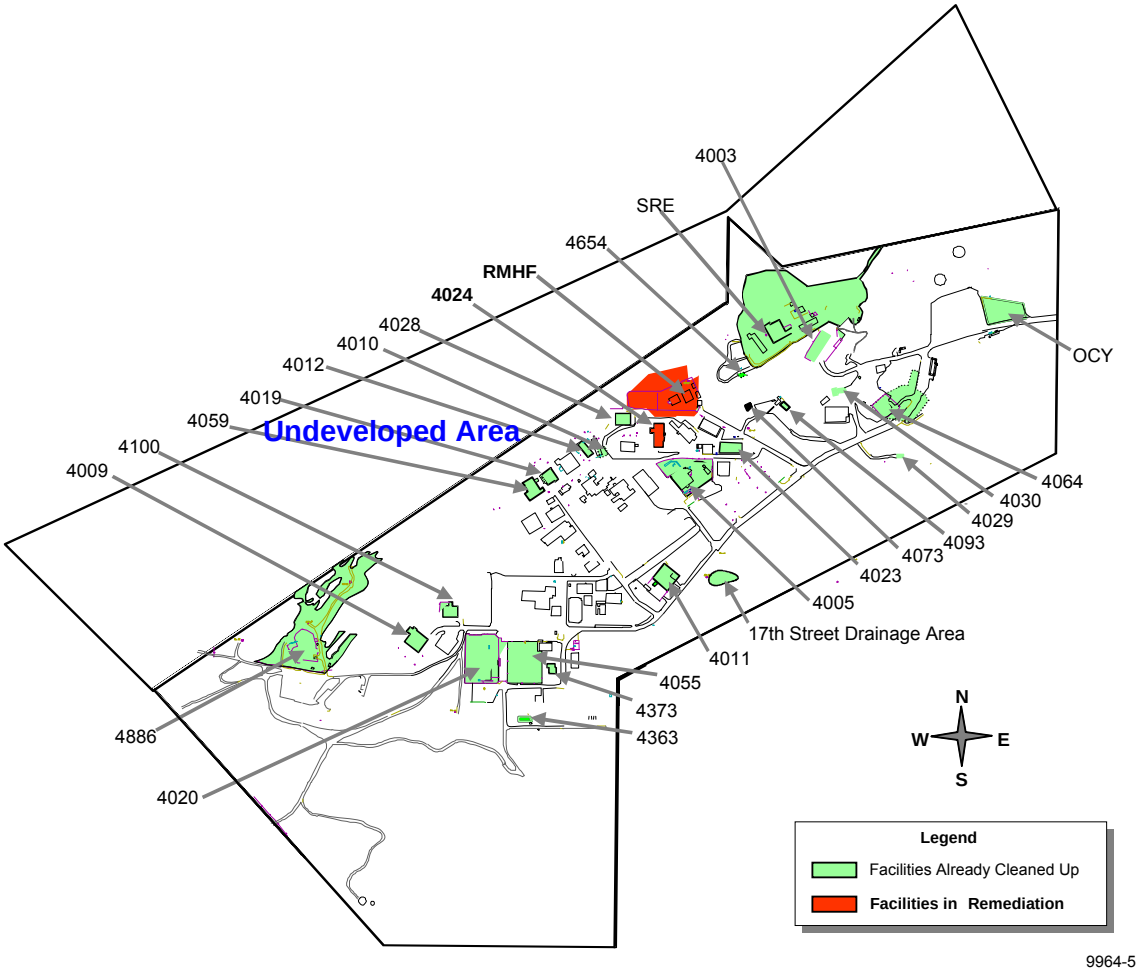

Figure 2-4. Map of Prior and Current Radiological Facilities in Area IV

Building 4024

Building 4024 housed two 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 had low levels of activation products including cobalt-60 and europium-152/154. Remediation started in the building in 2004. During 2005, portions of the Building 4024 were surveyed to verify the removal of radioactive materials was successful. In addition, the portions of the building used to support the office space and the mechanical ventilation systems were demolished, leaving the high bay intact. The ventilation stack was also removed. A geophysical study was performed in anticipation of final building demolition in 2007.

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 (non-radioactive waste). In 2005, site backfill was completed, and the final status MARSSIM survey was completed. The site is pending release for unrestricted use.

2.3.2 Former Sodium Facilities

Sodium Pump Test Facility (SPTF)

At SPTF, the Water Vapor Nitrogen (WVN) process was used to clean sodium contaminated components in the facility. The WVN process safely converts any residual sodium metal into sodium hydroxide and hydrogen gas. The hydrogen gas is safely vented through a scrubber system to the atmosphere. The high quality sodium hydroxide produced is collected and recycled. After being cleaned, the steel components are recycled as well. Large components, such as tanks and large diameter piping systems, are cleaned in place. A special process vessel was constructed to clean smaller components in batches.

A total of 1,180 pounds of sodium metal was converted into sodium hydroxide in 2005. Most of this was from cleaning 14 batches of smaller components and piping sections in the batch process vessel. These components contained approximately 1,100 pounds of sodium and 5,000 pounds of scrap metal. The remaining sodium came from in place cleaning of the test pump and tank, High Flow Loop, and two sodium coolers. All of the sodium hydroxide produced in 2005 was recycled. The clean steel will be recycled when the facility is demolished.

Hazardous Waste Management Facility (HWMF)

The HWMF, or Building 4133, was used to treat sodium and NaK. It is a permitted facility and is awaiting approval of a closure work plan by DTSC.

2.4 ASER CONTENTS

This ASER provides the following information related to ensuring protection of human health and the environment during implementation of DOE's closure mission 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.

This page intentionally left blank.

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 of DOE Environmental Restoration activities during 2005. The inspected activities were found to be compliant with the applicable rules and regulations. 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. 2005 Agency Inspections/Visits Related to DOE Environmental Remediation

Date (2005)	Agency	Subject Area	Results
January	State of CA, DHS	Environmental TLD exchange	Compliant
February	State of CA, DHS	Split samples of SSFL groundwater	Compliant
February	State of CA, DHS	Confirmatory survey of Building 4626 and 4024	Compliant
February	LA RWQCB	Familiarization visit from new inspector with samples taken from Outfall 002 and Outfall 003	Compliant
April	State of CA, DHS	Environmental TLD exchange	Compliant
June	VCAPCD	Annual inspection of Permit to Operate Nos. 00271	Compliant
July	State of CA, DHS	Environmental TLD exchange	Compliant
August	State of CA, DHS	Split samples of SSFL groundwater	Compliant
November	State of CA, DHS	Environmental TLD exchange	Compliant
December	County of Ventura Public Works	Sign off of Grading Permit #9496 for Buildings 4228 and 4032	Compliant
December	LA RWQCB	Review of Best Management Practices (BMPs) to control sediment erosion put in place post Topanga Fire	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.

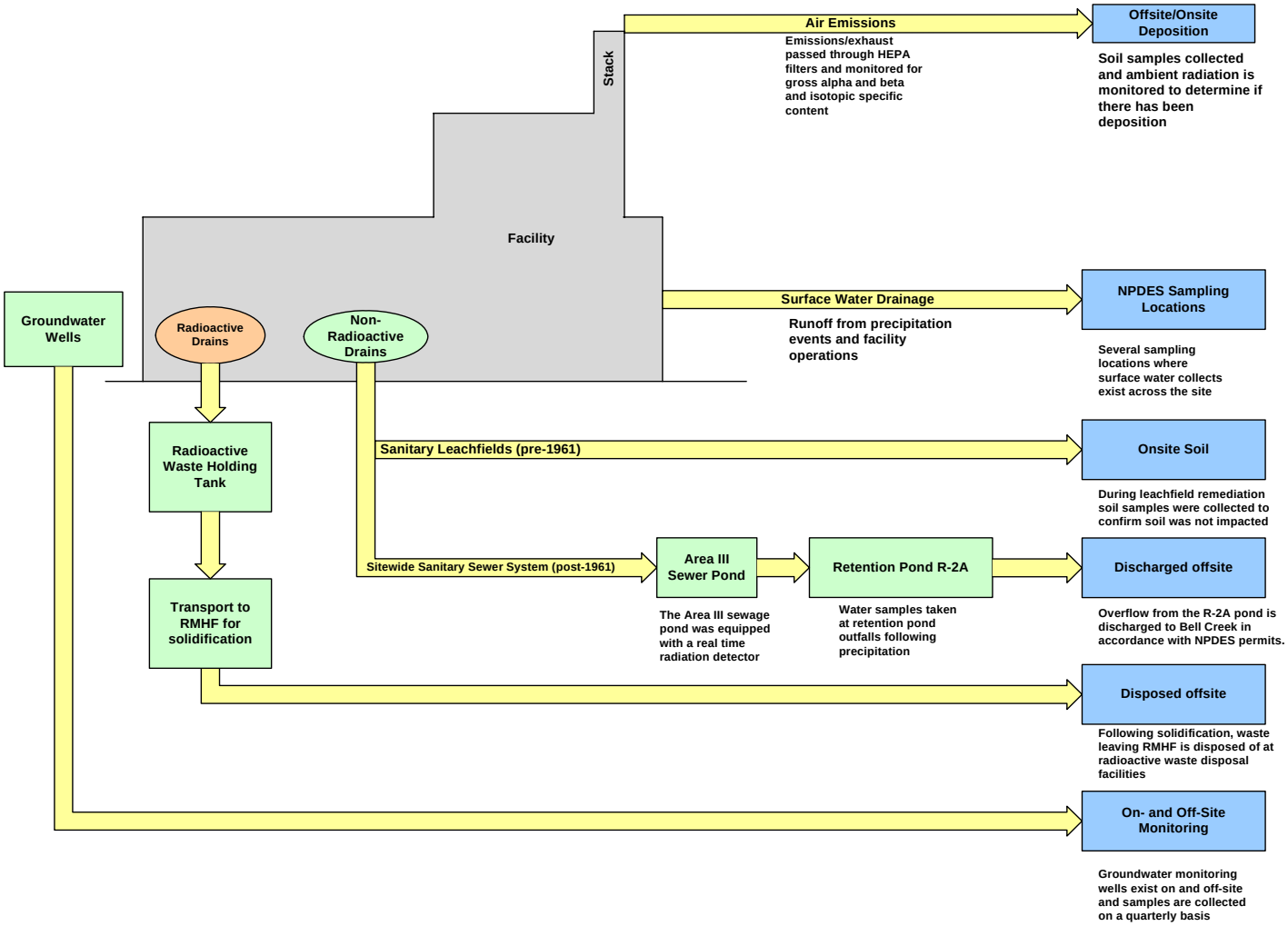

Figure 3-1. Conceptual Model of Potential Pathways

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 continuously 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^{-6} 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

There are 10 DOE-sponsored near-surface groundwater wells and 46 DOE-sponsored Chatsworth Formation wells in and around Area IV. Groundwater is sampled and analyzed periodically for non-naturally occurring radionuclides. In addition to the seven wells constructed in 2004, four more new wells were constructed in 2005 to investigate tritium in groundwater at the former ETEC site. Among these new wells, relatively high tritium concentrations were observed at RD-87, -88, -90 -93, -94, and -95, which are located down gradient from the former Building 4010 site, a possible source for man-made tritium production. The highest level of tritium observed in these new wells was 117,000 pCi/L. Further wells are planned to help identify the source and extent of tritium migration. None of the groundwater in this area is used for human consumption.

Tritium was also detected in a few routine groundwater monitoring wells in 2005. The positive detections of tritium had maximum concentrations of 260, 1,050, and 504 pCi/L at wells RD-24, RD-34A, and RD-54, respectively. 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 from two National Pollutant Discharge Elimination System (NPDES) permitted discharge points and five storm water only basins are monitored routinely. The NPDES permit allows the discharge of reclaimed waste water, storm water runoff, and industrial waste water from retention ponds 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 drainage through these outfalls. Excess reclaimed water is discharged occasionally from the R-2A Pond that ultimately releases through Outfall 002. The permit applies the numerical limits for

radioactivity in drinking water supplies to drainage through these outfalls. The permit requires radiological measurements of gross alpha, gross beta, tritium, strontium-90, and total combined radium-226 and radium-228. Detailed monitoring results are provided in 2005 Annual NPDES Discharge Monitoring Report (Boeing, 2006a).

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 12 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. Since there's no liquid effluent discharge from the site, off-site aquatic systems, if any, are not affected by the DOE operations at SSFL.

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. Preliminary 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 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 2005, 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).

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 in the process for final closure.

Sodium Removal

During 2005, a Water Vapor Nitrogen (WVN) process was used to clean sodium contaminated components in the SPTF. The WVN process safely converts any residual sodium metal into sodium hydroxide and hydrogen gas. The hydrogen gas is safely vented through a scrubber system to the atmosphere, and the high quality sodium hydroxide produced is collected and recycled. The clean steel components will be recycled when the facility is demolished.

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 and is scheduled for completion in 2005.

During 2005, approximately 28 soil matrix samples were collected. No surface water, soil vapor or near-surface groundwater 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 2005.

Groundwater

Characterization of the groundwater at the site continues. TCE continued to be detected in six areas of Area IV during 2005. The high concentrations were detected in six areas inside the

northwestern property boundary, as shown in the shaded areas in Figure 6-3. Detailed TCE results are provided in Section 6.3.

3.1.2.2 Federal Facilities Compliance Act

Boeing is managing the DOE's modest inventory (approximately 4 m^3 container volume with 2.4 m^3 waste volume) of RCRA mixed wastes in accordance with FFCA-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 2005, a minimal quantity of mixed wastes was generated and only two STP waste streams had volumes in storage. No mixed waste shipments were made while accumulating sufficient volumes for disposal.

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.

A Notice of Intent was published in the Federal Register on September 15, 2000 announcing DOE's intention to prepare an Environmental Assessment document. The Environmental Assessment analyzed the potential environmental impacts associated with environmental restoration and waste management activities for closure of the ETEC site. Public meetings to hear issues to be considered in the scope of the EA for the remaining restoration project were held on October 17th and 18th, 2000. The draft Environmental Assessment document was released in January 2002. Public meetings were held on January 24th, and the public comment period was extended to April 25th, 2002. The DOE issued a Finding Of No Significant Impact and the final EA report on March 31, 2003.

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 in an effort 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. The VCAPCD performed an inspection on June 15, 2005. 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. Basin Plan water quality objectives are one aspect applied as effluent standards for off-site discharge of storm and industrial wastewater via the SSFL water reclamation system.

Surface water discharges from SSFL are regulated under the California Water Code (Division 7) as administered by the California Regional Water Quality Control Board (CRWQCB). The existing NPDES Permit (CA0001309) for SSFL was revised on July 1, 2004 and became effective August 20th 2004. The 2004 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 November 18, 2003.

3.1.3 Permits and Licenses (Area IV)

Listed below are the permits and licenses applicable to activities in Area IV[1].

Permit/License	Facility	Valid
Air (VCAPCD)		
Permit 0271	Combined permit renewal	Current
Treatment Storage (EPA)		
CAD000629972 (93-3-TS-002)	Hazardous Waste Management Facility (T133 and T029)	Inactive. Awaiting regulatory approval on modified closure plan.
CA3890090001	Radioactive Materials Handling Facility (RMHF)	Part A interim status Application for Part B submitted May 1999.
NPDES (CRWQCB)		
CA0001309	Santa Susana Field Laboratory	Effective on 8/20/2004
State of California		
Radioactive Materials License (0015-19*)	All Boeing SSFL facilities	Amendment 108 Issued 8/24/05

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

[1]The waste discharge requirements for the sewage treatment plan in Area III that receives the Area IV sewage are included in the NPDES permit.

3.2 CURRENT ISSUES AND ACTIONS

3.2.1 Progress in Radiological Decommissioning Operations

3.2.1.1 Building 4059

Initial demolition of 4059 support structures was completed in 2003 and building debris were shipped to the Nevada Test Site per DOE instructions.

On December 17, 2003, DOE determined that Phase I of Building 4059 was suitable for unrestricted release and gave approval for demolition of the main structure of 4059 (DOE, 2003a). It further gave approval for disposal of the building debris as conventional waste subject to the requirements of Governor Davis' September 2002 moratorium requiring these wastes to be shipped to a Class I hazardous waste landfill.

The main 4059 structure was demolished in March 2004 and building debris has been shipped to the Kettleman Hills Hazardous Waste Disposal Site.

The remaining activated concrete in the basement of 4059 were excavated in Phase II during 2004 and shipped to the Nevada Test Site as radioactive waste. After the excavation was completed, a final status survey was performed in accordance with the MARSSIM protocol. In addition to the survey performed by Boeing, ORISE and DHS also conducted their independent verification survey.

After the excavation at 4059 was backfilled with clean soil, another final status survey was performed in accordance with the MARSSIM protocol in 2005 (Boeing, 2006b). The results indicate that the site is suitable for release for unrestricted use. The site is pending final verification survey by ORISE and DHS.

3.2.1.2 Building 4024

In 2005, portions of the Building 24 were surveyed to verify the removal of radioactive materials. The portions of the building used to support the office space and the mechanical ventilation systems were demolished, leaving the high bay intact. The ventilation stack was also removed. A geophysical study was also performed in anticipation of final building demolition in 2007.

3.2.1.3 RMHF

Operations at RMHF involve radioactive waste packaging, storage, and shipment for disposal. Waste processed during 2005 included demolition debris from 4059 demolition, the filters and draining system sediments in the RMHF radiological water system, the water in the 8,000-gallon tank, and other LLW generated from the D&D activities at the RMHF.

In 2005, decontamination work in Building 4021 and 4022 continued. The Building 4022 storage vault surfaces were decontaminated with HEPA vacuuming and some concrete removal. Decontamination in Building 4021 has gone as far as possible until the facility closure plan is approved.

In addition, a new evaporator was placed into service, evaporating about 200 gallons of water a day through the RMHF stack.

3.2.2 Disposal and Recycling of Non-radiological Waste

In 2005, "decommissioned" waste from prior released radiological facilities was sent to the Kettleman Hills Class I hazardous waste disposal facility, in compliance with the Governor's Moratorium of 2002. In 2005, pending completion of the metals recycling Programmatic Environmental Impact Statement (PEIS), no metal from DOE radiological facilities was recycled.

4. ENVIRONMENTAL PROGRAM INFORMATION

At SSFL, the DOE Site Closure department 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 undergoing closure.

4.1 ENVIRONMENTAL PROTECTION AND REMEDIATION

Oversight of environmental protection at Boeing is the responsibility of the Safety, Health & Environmental Affairs (SHEA) department, and this department provides support for environmental management and restoration. The stated policy of SHEA 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 DOE Site Restoration. 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.

DOE Site Restoration is responsible for performing the "hands on" D&D of former DOE nuclear, liquid metal test, and other (e.g., office and warehouse) facilities in support of the DOE Closure program. DOE Site Restoration 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.

- Coordination of activities with specialty contractors used to support D&D activities including asbestos and lead abatement, recycling of sodium from former liquid metal facilities, and demolition of structures following removal of hazardous materials and components.

- 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 1956, 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 45-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 runoff water from the site were routinely performed during this time. Figure 4-1 shows sampling and monitoring locations for these two time periods.

In addition to the sampling activities conducted by Boeing, independent sampling was performed by the following other organizations or persons:

- Argonne National Laboratory (ANL)
- California Dept. of Health Services/Environmental Management Branch (DHS/EMB)
- California Department of Health Services/Radiologic Health Branch (DHS/RHB)
- Environmental Protection Agency/Office of Radiation and Indoor Air (EPA/ORIA)
- Essentia Management Services (for L.A. Dept. of Water & Power)
- Groundwater Resources Corporation (GRC), Later Haley & Aldrich.
- Joel Cehn, Consultant to the Brandeis-Bardin Institute
- Foster Wheeler Environmental Corp. (for Runkle Ranch)
- Kleinfelder Inc. (for Ahmanson Ranch)

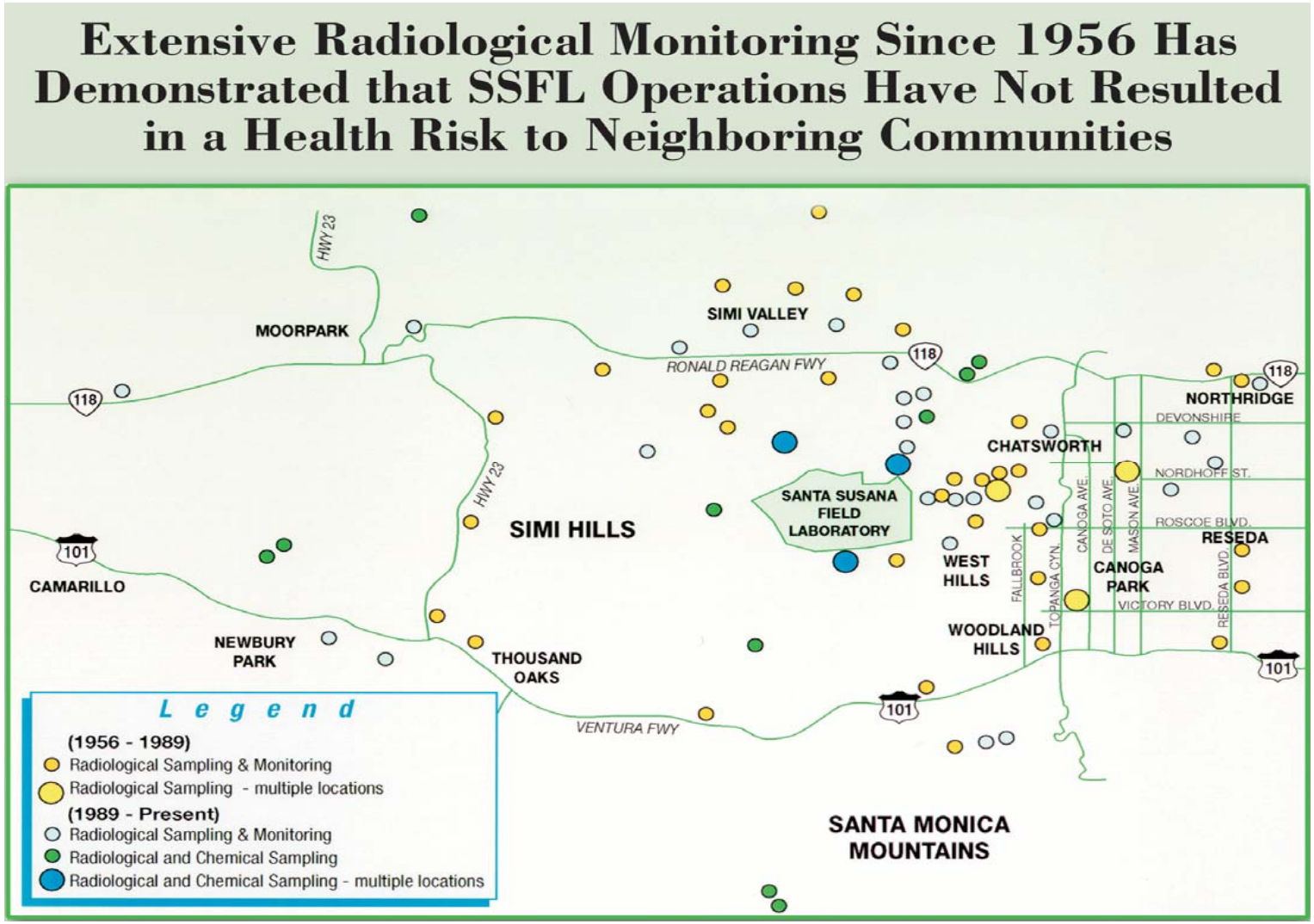

Figure 4-1. Radiological Sampling and Monitoring Locations

- Lawrence Livermore National Laboratory (LLNL)
- McLaren/Hart Environmental Engineering Corporation
- Miller Brooks Environmental Inc. (for Runkle Ranch)
- Oak Ridge Associated Universities (ORAU)
- Oak Ridge Institute of Science and Education (ORISE)
- Ogden Environmental and Energy Services
- QST Environmental Inc. (for Runkle Ranch)
- Regional Water Quality Control Board (RWQCB)
- Rocketdyne Propulsion & Power (or Atomics International)

Table 4-1 is a matrix of sampled media, organizations, and time periods for all historical off-site radiological monitoring.

The evidence from thousands of soil, vegetation, water and air samples taken from over 200 off-site locations over the last 50 years by NAA, Rocketdyne, and Boeing and 17 other agencies and organizations demonstrates that no radioactive contamination that could result in excess exposure or risk has been detected in the local community.

The EPA has stated that, "EPA is not aware of any current contamination from the SSFL that poses an unacceptable risk to the community." (EPA, 1999)

The ATSDR has stated that, "There is currently no indication that off-site residential areas have been adversely impacted by materials from the site." (ATSDR, 1999)

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

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 performed under the Resource Conservation and Recovery Act Facility Investigation and other site-specific remedial programs. Groundwater beneath Area IV is extensively monitored for chemical contaminants. There are 46 DOE-sponsored Chatsworth Formation wells in and around Area IV. In addition, ten DOE-sponsored shallow wells are utilized to monitor near-surface 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. Equipment installed in an interim groundwater remediation program in Area IV continued to remove solvents from contaminated groundwater during 2005. Remediated water was returned to the surface water collection ponds.

All surface water discharges are monitored as specified in the National Pollutant Discharge Elimination System (NPDES) permit, which was renewed in August 2004. In addition, all sources of air emissions are monitored as required by the Ventura County Air Pollution Control District (VCAPCD).

In addition to this environmental monitoring and restoration program, 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 the source of Boeing policies and procedures on safety. This document is based on DOE principles and objectives and 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 Boeing Rocketdyne Annual Safety Report for FY 2003, submitted in 2004, reemphasized the policies and procedures that helped the organization comply with ISMS principles. The Annual Safety Report also contained metrics monitored by Safety Health and Environmental Affairs (SHEA) to assess improvement in the organization's safety practices.

During 2005, Boeing SSFL continued to work toward refining its implementation of ISMS principles. The self-assessment plan incorporates tools such as DOE and Boeing Safety Lessons Learned Reports, DOE ORPS (Occurrence Reporting and Processing System) Reports, and DOE Operating Experience Reports. Safety issues were emphasized with Boeing's subcontractors by having a SHEA representative present the safety requirements and information to each subcontractor in the initial meeting with the subcontractor prior to the start of each job. The ISMS subcontractor audits were performed periodically to ensure that safety requirements were being met while work was in progress.

ISMS training was given to new employees working on the DOE closure programs. Updates on ISMS subjects as well as various safety issues and lessons were presented to the DOE Site Restoration Department personnel at biweekly meetings. The ISMS training class and the biweekly ISMS updates helped assure an in-depth, current understanding of ISMS principles. Feedback from the biweekly meetings and presentation of safety metrics were used to assess the success of ISMS principle implementation.

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 (Rocketdyne) 1975, 81, 84 (ANL) 1986-87 (ORAU) 1992-Present (ORISE) 1993 (RWQCB) 1992-Present (DHS-RHB) 1994-95 (DHS-EMB)	1960-86 (Rocketdyne) 1984-Present (GRC/HA) 1998 (EPA-ORIA)	1970-Present (Rocketdyne) 1993-98 (RWQCB)	1956-Present (Rocketdyne)	1971-Present (Rocketdyne) 1975, 81, 84 (ANL) 1981-Present (DHS-RHB) 1986-87 (ORAU) 1992-Present (ORISE)
North Off-site	1956-89 (Rocketdyne) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DHS-EMB) 1991-97 (Cehn) 1995 (Rocketdyne) 1995 (ORISE)	1984-Present (GRC/HA) 1991-96 (Cehn) 1998 (EPA-ORIA)	1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DHS-EMB) 1992-94 (Cehn)	1989 (DHS-RHB & LLNL)	1974-Present (Rocketdyne) 1992-94 (EPA-ORIA) 1995 (ORISE)
East Off-site	1956-89 (Rocketdyne) 1986 (ORAU) 1994 (Rocketdyne) 1995 (ORISE) 1997 (LLNL) 2004 (Essentia)	1984-Present (GRC/HA) 2004 (Essentia)	1961-71 (Rocketdyne)	1959-Present (Rocketdyne)	1974-Present (Rocketdyne) 1986 (ORAU) 1995 (ORISE)
South Off-site	1956-89 (Rocketdyne) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DHS-EMB) 1992-94 (Cehn) 1995 (Rocketdyne) 1998 (Ogden)	1984-Present (GRC/HA)	1966-89 (Rocketdyne)	1989 (DHS-RHB & LLNL)	1974-Present (Rocketdyne)
West Off-site	1956-64 (Rocketdyne) 1992-94 (McLaren-Hart) 1992-94 (EPA-ORIA) 1992-94 (DHS-EMB) 1992-94 (Cehn) 1995 (Rocketdyne) 1999 (Kleinfelder) 1999 (QST) 1999 (Foster Wheeler) 2003 (Miller Brooks)	1984-Present (GRC/HA) 2003 (DHS-RHB)	1999 (Kleinfelder)	None	1974-Present (Rocketdyne)

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 listing of approximately 1,475 courses available to Boeing SSFL personnel. Of these, approximately 270 relate to environment, health, and safety, with approximately 29 relating to environmental protection, 24 to radiation safety and remediation, and 217 to health and safety. Over 50 of these courses are available as computer-based training. 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 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 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.

- A chemical/material exchange system is currently linked to the purchasing system and prevents the unnecessary purchase of hazardous materials.

- 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 CY05, 2.04 metric tons of white paper and 1.13 metric tons of aluminum cans were recycled.

- Use of a compactor to reduce the volume of soft low-level radioactive waste from approximately 1,200 cubic feet to 300 cubic feet during CY05.

Approximately 2,100 pounds of sodium was converted into 1,800 gallons of sodium hydroxide solution and recycled.

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 SHEA 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
- "Source Reduction Evaluation Review and Plan" and "Hazardous Waste Management Performance Report," both of which are required by the "Source Reduction and Hazardous Waste Management Review Act (SB14)"

4.6 PUBLIC PARTICIPATION

In 2005, the DOE, supported by Boeing and its contractors, continued a series of public meetings to inform the public of both current progress in the ETEC closure activities, ongoing environmental monitoring, and historical nuclear operations. These meetings are well attended by the community, agency members, legislative staff, retirees and the media. The format of the meetings comprises three parts: a poster session in which the public can discuss one-on-one with DOE and Boeing staff their questions and concerns; short presentations given by the DOE Project Manager and the Boeing ETEC Closure Program Manager; followed by a Q&A session. These meetings have been well received, with the general consensus being that they provide a better forum for information exchange than other public meeting formats. Each meeting has a theme or a main subject. The content of the meetings is summarized below.

March 2005: Area IV Historical Site Assessment. Soil analysis results from 4059 MARSSIM survey. Tritium well data update.

June 2005: Hot Lab. History and remediation. Video of EBR II fuel decladding program. Off-site monitoring data. Perchlorate sampling. TCE sampling. Tritium well data update.

November 2005: September 2005 Topanga Fire and the Area IV investigation of tritium in groundwater.

In February 2005, DOE launched a new 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 is used to disseminate posters, presentations and handouts from the public meetings (see above) and to serve 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 and the EPA Hazard Assessment. Additional material will be added on a continual basis. The web site address is http://apps.em.doe.gov/etec/.

During 2005, Boeing continued its commitment to community involvement by participating in local Homeowner Association meetings that brought 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 technological and scientific mission at SSFL, as well as the environmental programs being conducted at the facility. Boeing SSFL also continued to support regulatory agency-sponsored meetings. Experts from the company also addressed local Chambers of Commerce and civic groups on environmental matters and Boeing's role as a responsible corporate neighbor. Public feedback indicated a very positive response to these meetings and the sharing of information.

Boeing continued to support public tours of the facility by conducting tours for elected officials and their staffs; this activity is part of an outreach program and includes updating local elected officials on Boeing SSFL's efforts to help these officials be responsive to their constituents in the local community.

Boeing continued to provide regular updates to the community by being responsive to local media, including the Los Angeles Times, Los Angeles Daily News, and Ventura County Star. This media outreach included holding timely briefings for reporters on special environmental topics. Boeing also continued to regularly respond to phone calls from community members on the nature and status of environmental activities at the facility.

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.

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 analyzed for gross alpha and gross beta, and the results are compared with the screening limits established by the EPA for suppliers of drinking water. Isotopic uranium and thorium analyses are performed if the gross alpha activity exceeds the drinking water limit. Groundwater samples are also analyzed for gamma emitters and tritium. Surface water samples are analyzed for Sr-90 and tritium.

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 MORNITORING

The RMHF and Building 4024 have continuous effluent monitoring capability. In 2005, effluent was only monitored for the RMHF because no radiological work that requires the use of a filtered exhaust system was conducted in Building 4024.

At RMHF, continuous workplace ventilation is provided in the decontamination and packaging rooms, where equipment is decontaminated and radioactive waste is repackaged. The ventilation assures protection of the workers from inhalation of airborne radioactive materials and prevents the spread of radioactive contamination into adjacent clean areas. The ventilation exhaust is passed through the HEPA filters before being discharged to the atmosphere. Airborne releases from the RMHF are shown in Table 5-1. No contaminated liquids are discharged to uncontrolled areas. The filtered air generally contains lower levels of naturally occurring radionuclides than does ambient air.

Table 5-1. Atmospheric Effluents to Uncontrolled Areas

SSFL/RMHF - 2005

Effluent volume (m^3)	2.90E+08
Air volume sampled (m^3)	2.70E+04
Annual average concentration in effluent	
Gross alpha (μCi/ml)	1.97E-16
Gross beta (μCi/ml)	1.83E-15
Maximum observed concentration	
Gross alpha (μCi/ml)	9.13E-16
Gross beta (μCi/ml)	6.31E-15
Activity releases (μCi)	
Gross alpha	5.70E-02
Gross beta	5.31E-01

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[c] (μCi/ml)
H-3	1.23E+01	1.01E+4[a]	1.60E+02	5.52E-13	0.0%	1E-07
Be-7	1.46E-01	NA[d]				Natural[b]
K-40	1.26E+09	ND[e]				natural
Co-60	5.26E+00	ND				8E-11
Sr-90	2.77E+01	4.04E+00	4.33E-02	1.49E-16	0.0%	9E-12
Cs-137	3.00E+01	1.21E+02	1.30E+00	4.48E-15	0.0%	4E-10
Th-228	1.91E+00	ND				4E-14
Th-230	8.00E+04	2.53E+00	2.71E-02	9.36E-17	0.2%	4E-14
Th-232	1.41E+10	1.62E+00	1.73E-02	5.98E-17	0.9%	7E-15
U-234	2.47E+05	1.69E+00	1.81E-02	6.24E-17	0.1%	9E-14
U-235	7.10E+05	1.14E+00	1.22E-02	4.22E-17	0.0%	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	8.73E-01	9.35E-03	3.23E-17	0.2%	2E-14
Pu-241	1.52E+01	ND				1E-12
Am-241	4.33E+02	ND				2E-14

a) H-3 is detected in the evaporator water, measured in pCi/L.
b) Naturally occurring radionuclides are included for information. These activities have not been used in dose estimates.
c) 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)
d) NA = Not Applicable
e) ND = Not Detected

The level of radioactivity released to the atmosphere is reduced to the lowest practical value by passing the effluents through certified HEPA filters. The effluents are sampled for particulate radioactive materials in the stack exhaust samplers at the point of release. In addition, the stack monitor installed at the RMHF provides automatic alarm capability in the event of elevated release of particulate activity. The HEPA filters used for filtering atmospheric effluents are 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 2005. 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 are measured by high-resolution gamma spectrometers, and all others are measured by specific chemical separations followed by alpha or beta counting. Radionuclides that are found to be less than the detection limits are identified in the table as "not detected" (ND).

Small amounts of H-3, Sr-90, Cs-137, Th-230, Th-232, U-234, U-235, and Pu-239/240 on the filter samples are due to the materials involved in operations at the RMHF. 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 DHS/RHB, DOE, and EPA (NESHAPs) standards.

The potential downwind radiation exposures due to the atmospheric emissions during 2005 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 2005 was 2.6×10^{-6} mrem (2.6×10^{-8} 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, continuous monitoring is still being performed as a best management practice.

In addition to the point source (i.e., the RMHF stack), there is a potential area source in Area IV, the RMHF Pond (Sump 614). The RMHF Pond had been considered an area source due to the possible resuspension of contaminated sediment in the pond when it is dry. Since the RMHF Pond was covered by water for the entire year, it is not considered an area source for the year 2005.

Table 5-2. Radiation Exposure Dose due to Atmospheric Effluents—2005

Facility	Distance (m) and Direction to		Downwind Exposure Dose (mrem/yr)	
	Boundary	Residence	Boundary	Residence
RMHF	300 NW	2,867 SSW	4.0×10^{-6}	2.6×10^{-6}

5.2 ENVIRONMENTAL SAMPLING

5.2.1 Ambient Air

Ambient air sampling is 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 is collected on glass fiber (Type A/E) filters that are changed weekly. The samples are 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 is approximately 50.4 m^3.

Weekly ambient air samples are 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 are 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).

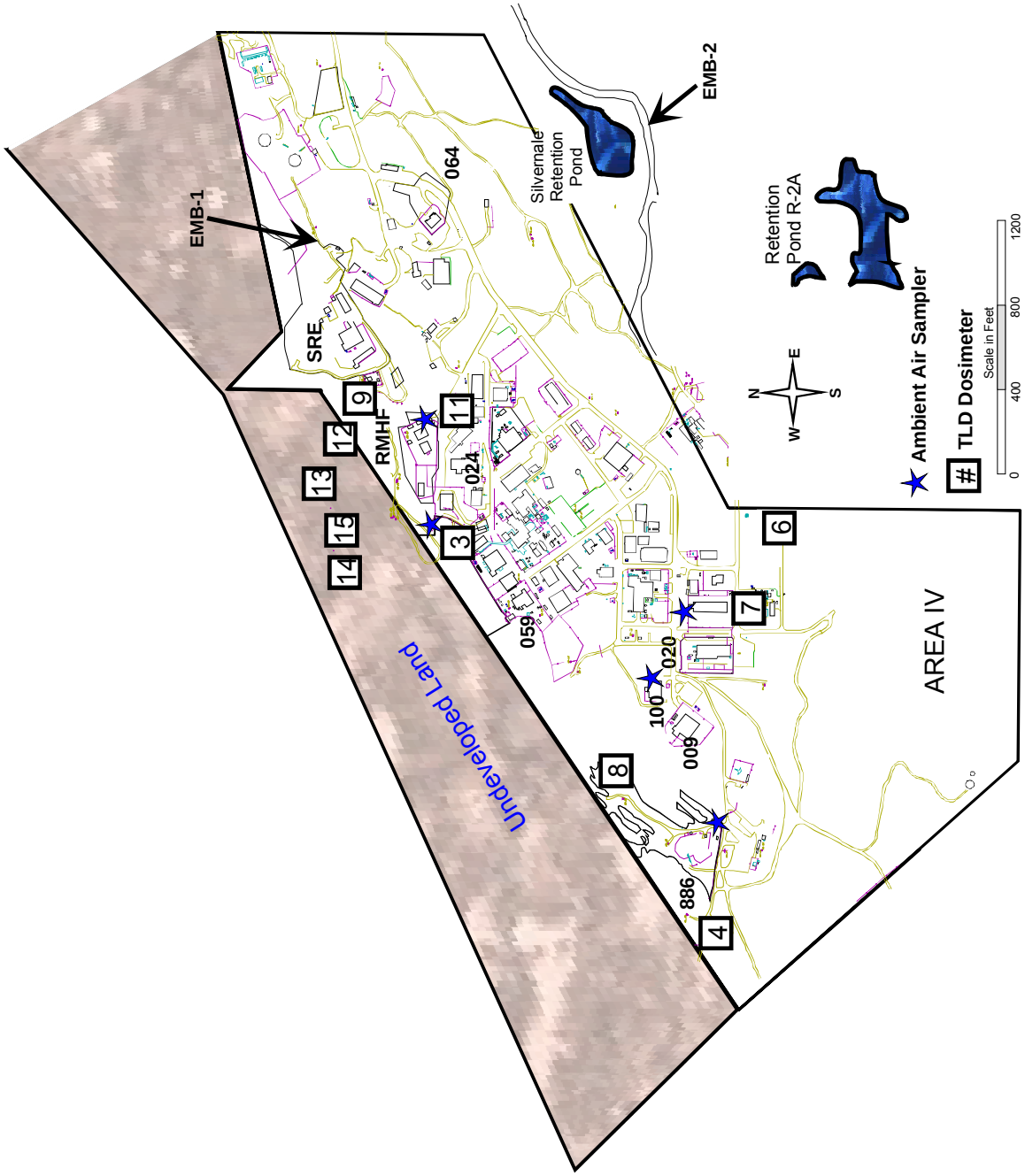

Figure 5-1. Map of Santa Susana Field Laboratory Area IV Sampling Stations

Table 5-3. Sampling Location Description

Station	Location	Sampling Frequency
Ambient Air Sampler Locations		
A-2	SSFL Site, 4020, northeast of 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	(W)
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 are 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 have radionuclide concentrations far below the DCG values. The variability in the measurements is 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. It is assumed to be in equilibrium with its parent, Pb-210, whose relatively long half-life (22.3 years) provides an essentially constant level of Po-210 in the samples.

Table 5-4. Filtered Exhaust and Ambient Air Radioactivity Concentrations – 2005

	Activity Concentration (microcuries per milliliter, μCi/ml)							
		Exhaust	Ambient					
Radionuclide	Derived Conc. Guide	RMHF Stack (% of DCG)	RMHF	RMHF Pond	T020	T100	T886	Average (% of DCG)
H-3	1E-07	5.52E-13 (0.0%)	NA	NA	NA	NA	NA	NA
Be-7	natural	ND	ND	ND	ND	ND	ND	NA
K-40	natural	ND	ND	ND	ND	7.87E-14	3.31E-14	2.24E-14 (NA)
Co-60	8E-11	ND	ND	ND	ND	ND	ND	NA
Sr-90	9E-12	1.49E-16 (0.0%)	ND	1.98E-15	1.18E-15	1.67E-15	1.07E-15	1.18E-15 (0.0%)
Cs-137	4E-10	4.48E-15 (0.0%)	ND	ND	ND	ND	ND	NA
Po-210	natural	ND	2.20E-15	2.98E-15	2.68E-15	2.41E-15	3.10E-15	2.68E-15 (NA)
Th-228	4E-14	ND	ND	ND	ND	ND	ND	NA
Th-230	4E-14	9.36E-17 (0.2%)	7.32E-16	9.54E-16	4.71E-16	6.77E-16	1.00E-15	7.67E-16 (1.9%)
Th-232	7E-15	5.98E-17 (0.9%)	3.74E-16	ND	ND	ND	ND	7.49E-17 (1.1%)
U-234	9E-14	6.24E-17 (0.1%)	ND	ND	ND	ND	1.35E-16	1.35E-16 (0.2%)
U-235	1E-13	4.22E-17 (0.0%)	1.76E-16	ND	ND	2.43E-16	ND	8.36E-17 (0.1%)
U-238	1E-13	ND	ND	ND	ND	ND	ND	NA
Pu-238	3E-14	ND	ND	ND	ND	ND	ND	NA
Pu-239/240	2E-14	3.23E-17 (0.2%)	ND	ND	ND	ND	ND	NA
Pu-241	1E-12	ND	ND	ND	ND	ND	ND	NA
Am-241	2E-14	ND	ND	ND	ND	ND	ND	NA

NA = Not applicable
ND = Not detected

Because the gross alpha and gross beta activities are counted shortly after collection, some natural Be-7 is detected, which elevates the gross beta activity. Be-7 decays by electron-capture and emits a gamma ray in 10% of the decays; this gamma ray is detected as weak beta activity. The naturally occurring radionuclides, Po-210, Ra-226, Ra-228, are the sources of the gross alpha and gross beta activities detected on the air filter samples. During year 2005, the average gross alpha activities on the environmental air samples are less than that on the background sample.

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 2×10^{-14} μCi/mL, and the value for beta activity is 9×10^{-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.

The isotopic analysis of the environmental air samples indicates that most of the radionuclides presented in the air are naturally occurring. Trace amount of man-made radionuclide such as Sr-90 was also detected in some of the samples. Since the quantities are so close to the detection limits, it is possible that these identifications are due to the fluctuation of measurement uncertainties. In any event, the reported concentrations are far below the DCGs, as shown in Table 5-4.

Table 5-5. Ambient Air Radioactivity Data—2005

Area	Activity	Number of Samples	Gross Radioactivity Concentrations (μCi/mL)		
			Annual Average Value	Maximum Value[a]	Average Percent of Guide[b]
SSFL Area IV	Alpha	49	0[c]	4.56E-15	0.00%
T100	Beta		7.69E-15	4.79E-14	0.09%
SSFL Area IV	Alpha	49	1.01E-15	7.69E-15	5.06%
Hot Lab	Beta		1.66E-14	5.34E-14	0.18%
SSFL Area IV	Alpha	49	0	4.11E-15	0.00%
RMHF	Beta		2.87E-15	3.55E-14	0.03%
SSFL Area IV	Alpha	49	4.85E-16	9.03E-15	2.43%
4886	Beta		1.17E-14	4.40E-14	0.13%
SSFL Area IV	Alpha	49	0	6.26E-15	0.00%
RMHF Pond	Beta		7.22E-15	5.05E-14	0.08%

[a]Maximum value observed in a single sample.
[b]Guide SSFL site: 2E-14 μCi/mL alpha, 9E-12 μCi/mL beta, DOE Order 5400.5 (02/08/90).
[c]Values are background subtracted. Zero indicates ≤ background values.

5.2.2 Groundwater

Fifty-six wells in and around Area IV are used to monitor the condition of the groundwater in the unconsolidated surface alluvium and the underlying Chatsworth formation. 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. Eighty water samples from 41 of these wells were collected and analyzed in 2005. The summary results are shown in Table 5-6.

Table 5-6. Radioactivity in Groundwater at SSFL—2005

	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	N/A			20 – Total Uranium			15	50
Maximum	117,000	ND	ND	0.21	0.03	20.00	0.90	17.90	27.90	15.90
Mean[b]	8818	NA	NA	0.10	0.01	7.97	0.37	7.18	6.20	6.02
Minimum	ND	ND	ND	ND	ND	1.39	0.05	1.20	ND	ND
Number of Analyses[c]	70 (53)	60 (60)	8 (8)	8 (5)	8 (7)	18 (0)	18 (0)	18 (0)	80 (14)	80 (18)

[a]From 40 CFR 141 and EPA limit of 4 mrem/yr (see text). N/A = not applicable

[b]The mean is calculated from all reported values. ND = not detected

[c]Numbers in parentheses represent the number of analyses reported as less than the detectable limit.

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 a few instances of gross alpha (27.9 pCi/L at RD-28, 18.8 pCi/L at RD-94, 16.3 pCi/L at RD-54A), the monitored groundwater satisfies these goals. The high gross alpha concentrations are due to the presence of higher levels of naturally occurring uranium. Gamma spectrometry analysis did not detect any man-made beta and gamma emitters.

Tritium analyses were performed in 70 water samples from 41 groundwater-monitoring wells (see Figure 6-2). In addition to the seven wells constructed in 2004, four more new wells were constructed in 2005 to investigate tritium in groundwater at the former ETEC site. Relatively high tritium concentrations were observed at 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. The highest level of tritium observed in these new wells was 117,000 pCi/L at RD-95. 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.

From these observations, Building 4028 appears to be discounted as a source. RD-93 at Bldg 4010 has lower than the prior highs of about 80,000 pCi/L in RD-90 and RD-88. Conversely, tritium in RD-95 (several hundred feet west of RD-93) suggests that the tritium plume has spread from Building 4010 both west and north over the past 40 years.

RD-94, which is to the northwest of RD-88 and closer to the northern site boundary, has tritium concentrations less than the drinking water MCL, confirming that the northerly migration has been minimal over the last 40 years.

Besides these new wells, routine groundwater sampling presented similar results as historical data. The positive detections of tritium had maximum concentrations of 260, 504, and 1,050 pCi/L at wells RD-24, RD-54, and RD-34A, respectively. 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.

Historically, well RD-34A, located near the RMHF in Area IV, had higher concentrations of tritium than other wells in Area IV. Figure 5-3 shows the historical tritium analysis results for RD-34A. For comparison, the allowable limit in drinking water, 20,000 pCi/L, is used as the full scale on the plot. Since the first detection of about 7,000 pCi/L in 1991, the tritium concentrations in this well have dropped down to the range of 1,000 to 5,000 pCi/L. In 2005, tritium was detected at about 1,050 pCi/L at this well.

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, revised on July 1, 2004, 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, 2005 through December 31, 2005, the NPDES discharge data are provided in the 2005 Quarterly and Annual NPDES Discharge Monitoring Report (Boeing, 2006a).

The 2005 Quarterly and Annual NPDES Discharge Monitoring Reports are also available at http://www.boeing.com/aboutus/environment/santa_susana/.

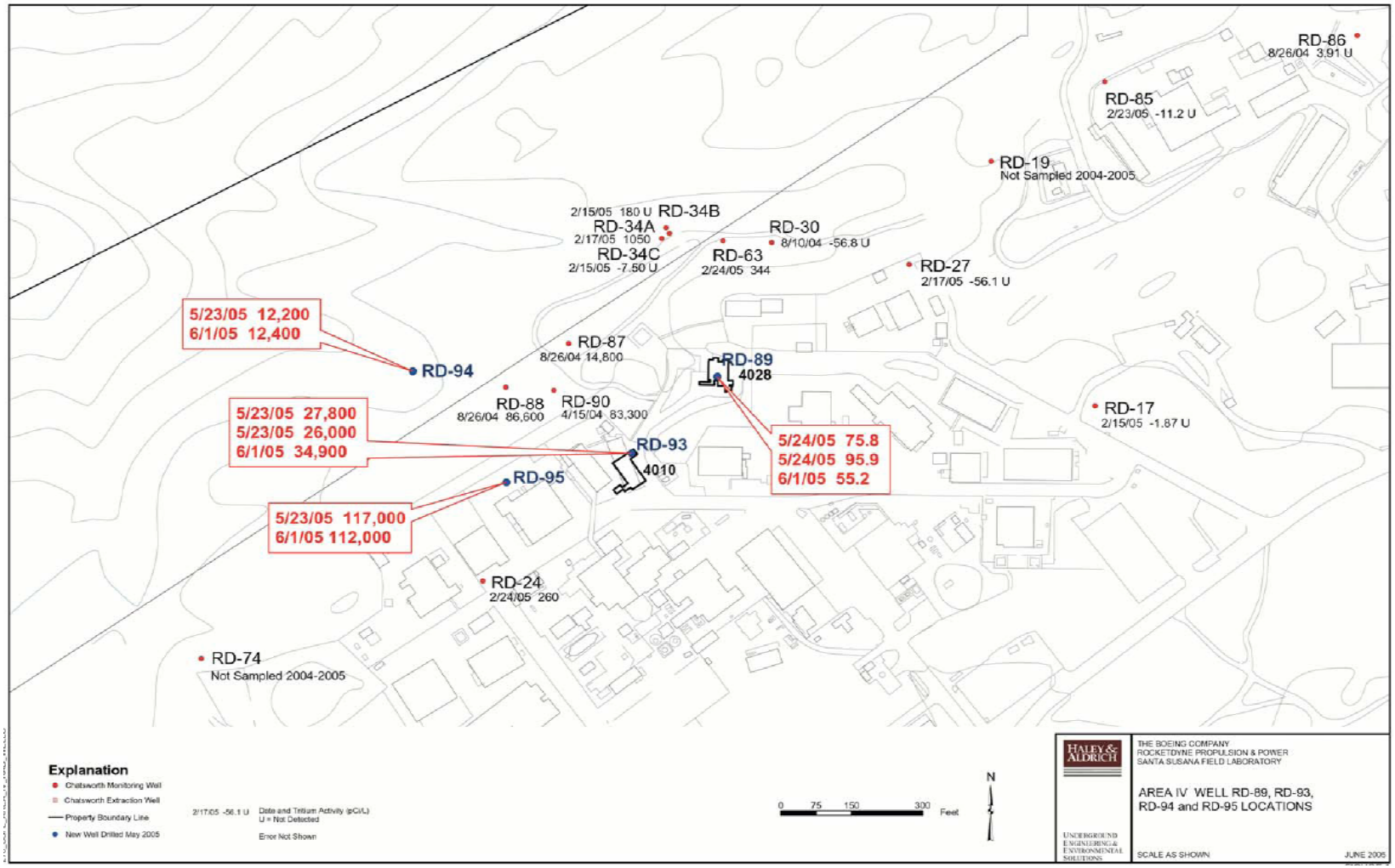

Figure 5-2. New Wells Constructed for Tritium Investigation

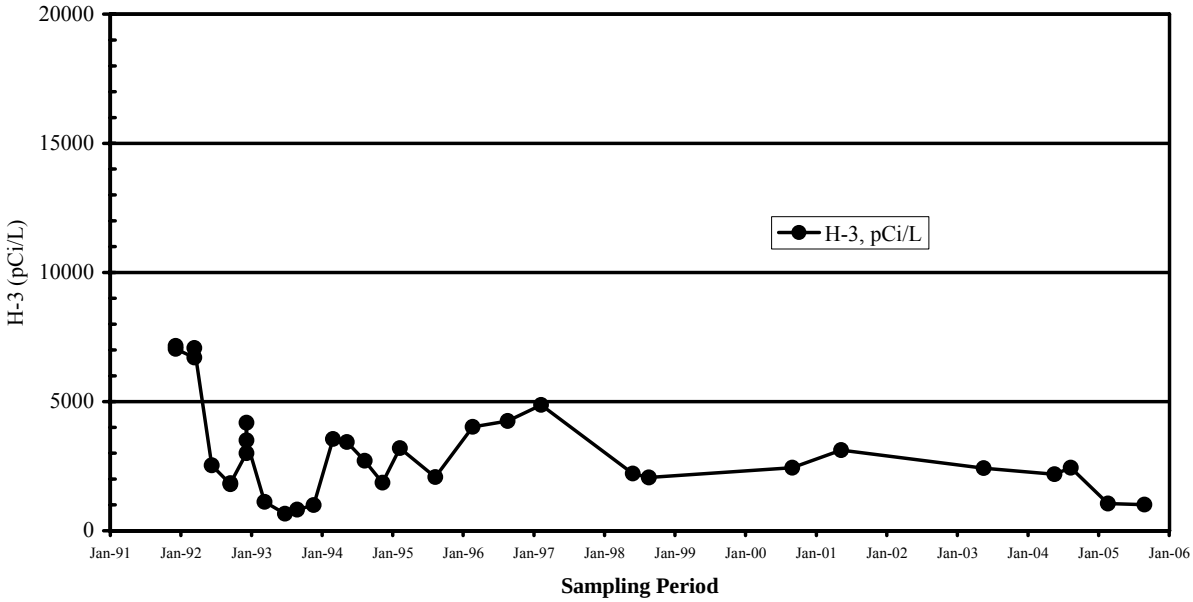

Figure 5-3. Tritium Concentration in Water from Well RD-34A

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. 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). The radionuclide composition of local area surface soil has been determined to be predominantly K-40, natural thorium, natural uranium, and their decay progeny. Radioactivity in nuclear weapons test fallout consists primarily of the fission-produced Sr-90, Cs-137, and plutonium isotopes.

Building 4059

After Building 4059 excavation was backfilled, the entire Building 4059 site was surveyed again in 2005. A total of 14 soil samples were collected in accordance with the MARSSIM protocol to demonstrate the site meets the release criteria and is suitable for unrestricted use.

Man-made radionuclide concentrations were either below the detection limits or well below the release limits. Naturally occurring isotopes of uranium and thorium that are also nuclear fuel materials were also below the release limits. Summary results are presented in Table 5-7, and detailed information regarding the release of Building 4059 is presented in Building 4059 Site Final Status Survey Report (Boeing, 2006b).

The final status survey demonstrates that the Building 4059 site meets the release criteria for unrestricted use. The site is pending for the verification survey by the State of California, Department of Health Services (DHS) and the Oak Ridge Institute for Science and Education (ORISE).

Table 5-7. Soil Sampling at Building 4059 Site in 2005

Nuclide	Release Criteria[a]	Minimum	Average	Maximum	Nominal MDA	Number of Samples[d]
	pCi/gram					
H-3	31,900	ND[c]	NA	ND	4.12	14 (14)
Fe-55	629,000	ND	NA	ND	1.60	14 (14)
Co-60	1.94	ND	NA	ND	0.15	14 (14)
Ni-63	55,300	ND	NA	ND	3.74	14 (14)
Sr-90	36.0	ND	0.15	1.25	0.54	14 (12)
Cs-137	9.20	ND	NA	ND	0.13	14 (14)
Eu-152	4.51	ND	NA	ND	0.82	14 (14)
Eu-154	4.11	ND	NA	ND	0.41	14 (14)
Th-228	5.00	0.83	1.33	1.87	0.11	14 (0)
Th-230	NA[b]	1.01	1.38	1.81	0.09	14 (0)
Th-232	5.00	0.97	1.46	1.84	0.08	14 (0)
U-234	30	0.87	1.19	1.52	0.08	14 (0)
U-235	30	ND	0.14	0.34	0.08	14 (3)
U-238	35	0.78	1.09	1.36	0.06	14 (0)
Pu-238	37.2	ND	0.03	0.06	0.12	14 (12)
Pu-239/240	33.9	ND	NA	ND	0.05	14 (14)
Pu-241	230	ND	NA	ND	7.96	14 (14)
Am-241	5.44	ND	0.02	0.12	0.08	14 (12)

a. Release criteria are net above natural background. Reported values include natural background.
b. NA = Not applicable.
c. ND = Not detected.
d. Numbers in parentheses represent the number of analyses reported as less than the detection limit.

RMHF Perimeter

Historically, radioactive contamination has been detected at the RMHF northwest perimeter. In 2005, a MARSSIM characterization and survey was performed on the area. Before the survey, 25 soil samples were collected in the area and analyzed in-house for man-made gamma emitters to identify the extent of the potential contamination. Small amounts of Cs-137 were observed in some of the samples, as shown in Table 5-8. The maximum detected Cs-137 concentration was 2.2 pCi/g, which is below the approved release criteria of 9.2 pCi/g.

The MARSSIM survey performed by Cabrera Services, Inc. was more thorough and complete. The detailed survey design and results are documented in Final Status Survey Report: Characterization and Final Status Survey Radioactive Materials Handling Facility Perimeter (Cabrera, 2006). The survey indicated that the majority of the site was suitable for release for unrestricted use, except for one small isolated area where Cs-137 exceeded the release limit (see Table 4-5 in the Cabrera report for summary of Cs-137 and Sr-90 results). This area was later remediated to meet the release criteria.

Table 5-8. Cs-137 in RMHF Perimeter Soil

	Cs-137, pCi/g			Location	
Sample Number	Results	2 sigma	MDA	Longitude, W	Latitude, N
1	ND[a]	NA[b]	0.07	118 42.695	34 14.070
2	ND	NA	0.1	118 42.690	34 14.063
3	0.17	0.04	0.06	118 42.691	34 14.064
4	0.13	0.04	0.09	118 42.690	34 14.060
5	0.25	0.05	0.06	118 42.687	34 14.053
6	0.38	0.06	0.04	118 42.690	34 14.055
7	0.49	0.07	0.05	118 42.675	34 14.059
8	0.83	0.09	0.05	118 42.652	34 14.063
9	0.74	0.09	0.07	118 42.645	34 14.059
10	1.71	0.15	0.08	118 42.641	34 14.060
11	2.17	0.16	0.07	118 42.642	34 14.062
12	ND	NA	0.1	118 42.617	34 14.075
13	0.58	0.07	0.05	118 42.630	34 14.074
14	ND	NA	0.13	118 42.634	34 14.073
15	0.28	0.05	0.05	118 42.639	34 14.073
16	ND	NA	0.1	118 42.610	34 14.078
17	0.17	0.04	0.04	118 42.606	34 14.087
18	0.2	0.12	0.18	118 42.616	34 14.086
19	0.1	0.03	0.04	118 42.620	34 14.087
20	0.1	0.03	0.06	118 42.637	34 14.082
21	0.05	0.02	0.04	118 42.648	34 14.075
22	ND	NA	0.11	118 42.667	34 14.072
23	0.09	0.03	0.06	118 42.668	34 14.069
24	ND	NA	0.1	118 42.720	34 14.069
25	0.072	0.067	0.04	118 42.669	34 14.063

a. ND = Not detected.
b. NA = Not applicable.

5.2.5 Vegetation

No vegetation samples were collected in 2005.

5.2.6 Wildlife

No animal samples were collected in 2005.

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 1989, such a program was no longer needed, and efforts were directed toward simplifying the program. This simplification was initially accomplished by using the same 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 DHS/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 2005 on these TLDs, which were placed at various Boeing dosimeter locations both on-site and off-site, are shown in Table 5-9.

Table 5-9 shows that individual radiation exposures measured by Boeing and the State DHS are in good agreement. Slight differences are mainly due to the fact that two different types of TLDs were used in the measurement. 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 5-9. 2005 SSFL Ambient Radiation Dosimetry Data

2004		Annual Exposure (mrem)	Average Exposure Rate (µR/h)	
TLD-Locations		By Boeing	Boeing	State DHS
SSFL	SS-3	74.1	8.5	6.4
	SS-4	88.0	10.0	7.4
	SS-6	84.9	9.7	7.1
	SS-7	84.6	9.7	7.3
	SS-8	95.7	10.9	8.3
	SS-9	88.7	10.1	8.7
	SS-11	88.4	10.1	7.3
	SS-12	86.2	9.8	8.9
	SS-13	108.3	12.4	10.8
	SS-14	92.6	10.6	10.7
	SS-15	108.2	12.3	10.2
	EMB-1	91.1	10.4	10.5
	EMB-2	87.3	10.0	9.1
Mean Values		**90.6**	**10.3**	**8.7**
Off-site	OS-1	65.1	7.4	7.6
	BKG-11	58.1	6.6	--
	BKG-12	49.4	5.6	--
	BKG-13	30.5	3.5	--
	BKG-15	66.6	7.6	--
	BKG-18	61.1	7.0	--
	BKG-19	42.2	4.8	--
	BKG-22	29.3	3.3	--
Mean Values		**50.3**	**5.7**	**7.6**

The natural background radiation level as measured by the off-site TLDs ranges from 29 to 67 mrem/yr. At SSFL, the local background ranges from 74 to 96 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 5-9. 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.

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 12 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 87 mrem/year. This value is 37 mrem/year higher than the background as calculated by the average of all offsite TLDs of 50 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. To determine this effect, in January 2003 radiation exposure rates were measured with a Ludlum 12S microR meter at Stoney Point, a large rock outcroppings in Chatsworth, about eight miles from SSFL, and at a residence in West Hills (the location of TLD BKG-11). Differences of about 6 μR/h (or about 50 mrem/year) were observed between the two locations, as shown in Table 5-10. Likewise, exposure rates taken at SSFL over rock outcroppings (locations of most of the onsite TLDs) and a soil region also showed a difference of about 6 μR/h (or about 50 mrem/year).

Even single 2- to 3-lb rock samples from both offsite and onsite locations showed increased exposure rate of about 2 μR/h (or about 15 mrem/y), as shown in Table 5-11. In conclusion, the modest increase in exposure observed between offsite valley locations and SSFL locations can easily be attributed to the Chatsworth Formation arkosic sandstone geology.

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 12 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.

Table 5-10. Exposure Rates Over Different Geology

Location	Exposure Rate, μR/h
SSFL sandstone rocks	17 to 22
Stoney Point	18 to 22
SSFL soil	~14
West Hills home soil (TLD BKG-11 location)	~14

Table 5-11. Radiation Exposure Rates of On-site and Off-site Rock Samples

	1 minute Cumulative Gross Counts Using Ludlum 2221 Scaler			
Count	Background in 4038	SSFL Rock Sample (Large)	SSFL Rock Sample (Small)	Stoney Point Rock Sample
1	2097	2462	2560	2530
2	2033	2435	2349	2360
3	2031	2432	2392	2414
4	2049	2421	2397	2425
5	2076	2447	2450	2388
6	2019	2511	2513	2437
7	2020	2459	2401	2387
8	2139	2455	2392	2400
9	2090	2465	2248	2520
10	2113	2598	2389	2442
Average	2067	2469	2409	2430
Std. Dev.	42	52	86	56
Exposure rate in microR/hr*	9.6	11.5	11.2	11.3
Exposure rate in milliR/year	84	101	98	99

Using conversion factor of 215 cpm/(microR/hr)

Public exposure to radiation and radioactivity is shown in Table 5-12. The table presents the estimated exposures in comparison to the regulatory standards. Dose values in the tables represent both internal and external exposures.

Table 5-12. Public Exposure to Radiation from DOE Operations at SSFL—2005

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^{-6} 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^{-6} 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 6.4×10^{-4} 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.

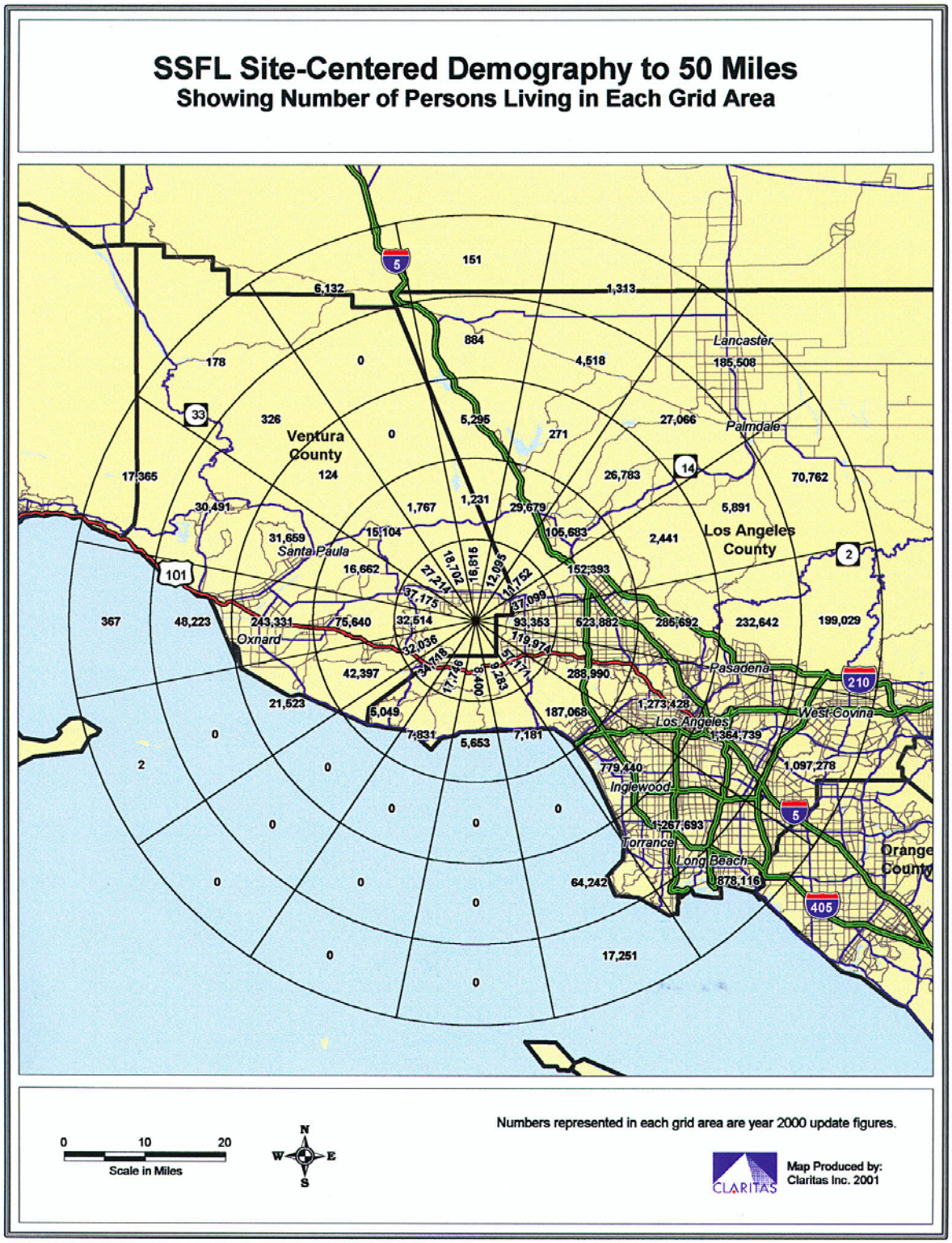

Figure 5-4. Demographic Data within 50 Miles (80 km) of SSFL

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 5-13, summarizes the comparison results. The total BCG fraction at SSFL, as shown in Table 5-13, is less than 1, indicating that the potential exposure is less than the dose limit recommended by the DOE.

Table 5-13. 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	3.16E-02	8.11E-06
Co-58	1.80E+03	4.79E-02	2.67E-05
Co-60	6.92E+02	3.91E-02	5.65E-05
Cr-51	5.34E+04	2.51E-01	4.70E-06
Cs-134	1.13E+01	4.22E-02	3.74E-03
Cs-137	2.08E+01	2.39E-01	1.15E-02
Eu-152	1.52E+03	1.15E-01	7.55E-05
Eu-155	1.58E+04	6.33E-02	4.00E-06
H-3	1.74E+05	9.59E+00	5.51E-05
K-40	1.19E+02	1.94E+01	1.63E-01
Pb-210	1.39E+03	1.47E+00	1.06E-03
Po-210	4.33E+03	1.32E+00	3.05E-04
Pu-238	5.27E+03	1.28E-02	2.43E-06
Pu-239	6.11E+03	1.12E-02	1.83E-06
Ra-226	5.06E+01	1.18E+00	2.33E-02
Ra-228	4.39E+01	1.23E+00	2.80E-02
Sr-90	2.25E+01	2.53E-01	1.13E-02
Th-228	5.30E+02	1.29E+00	2.43E-03
Th-230	9.98E+03	1.07E+00	1.07E-04
Th-232	1.51E+03	1.17E+00	7.77E-04
Th-234	2.16E+03	1.08E+00	4.99E-04
U-234	5.13E+03	8.59E-01	1.67E-04
U-235	2.77E+03	1.95E-01	7.04E-05
U-238	1.58E+03	8.35E-01	5.29E-04
Zn-65	4.13E+02	7.84E-02	1.90E-04
		Sum	**2.47E-01**

5.5 TOPANGA WILDFIRE

The Topanga fire started in the town of Chatsworth on Wednesday September 28th 2005 at 2:00 PM. SSFL employees were evacuated at approximately 3:00 PM. Security and Fire Protection personnel remained onsite during the course of the fire. The fire first entered SSFL property at about 6:00 PM that night. Over the next 24 hours, the fire burned brush over about three quarters of the site, generally in the central and eastern portions of the site. During the afternoon of Friday, September 30th, the fire approached the western end of the SSFL, including Area IV, and additional undeveloped land burned.

Post-fire assessment shows that the DOE operations at Area IV were unaffected and hazardous materials storage facilities throughout the site remained safe and secure. The fire did burn brush across Area IV.

Previous sampling has shown that vegetation in Area IV contains no radiological contamination. Radiation exposure measurements taken around Area IV on Friday revealed safe, normal levels. Air sampling conducted on Wednesday and Friday during the fire and for several days following the fire has not shown any detectable radiological contamination.

This page intentionally left blank.

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 California 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 system wells have been installed in Area IV, and evaluation of their performance is in progress. The overall annual groundwater monitoring program at SSFL addresses collection and analysis of groundwater samples and measurement of the water levels for the 268 Boeing SSFL installed wells on-site and off-site and 19 off-site private wells. The locations of these wells within and around DOE areas in Area IV are shown on the map of SSFL 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, all 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).

Petroleum hydrocarbon contaminated soils resulting from underground storage tanks (USTs) have been remediated as tanks are removed. Most of the storage tanks have been removed. The few remaining USTs contain either sodium or radioactive water and are located within concrete vaults and equipped with automatic leak detection systems. As stated previously, these tanks are exempt from the UST regulations.

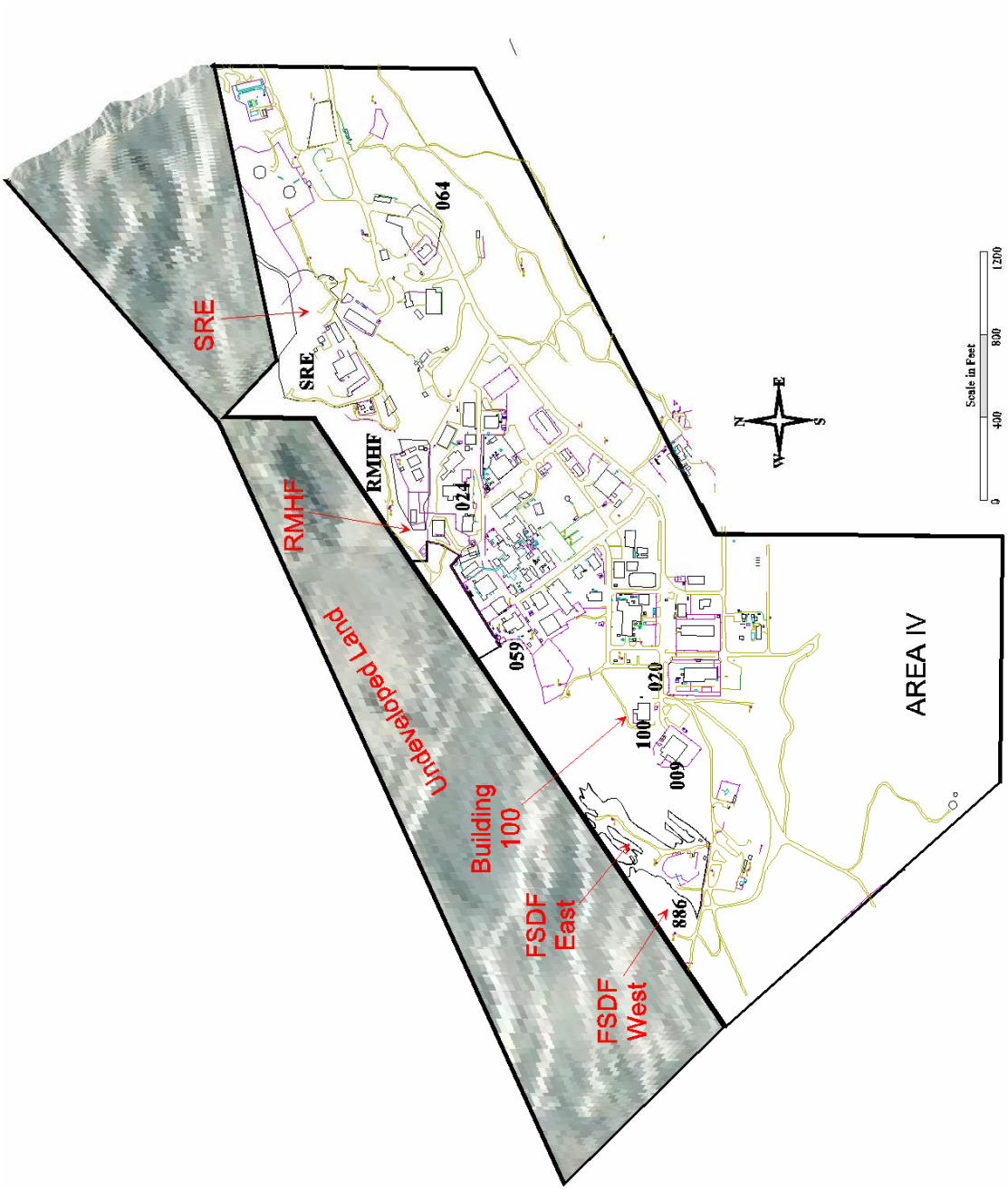

Figure 6-1. Locations of Surface Water Runoff Collectors

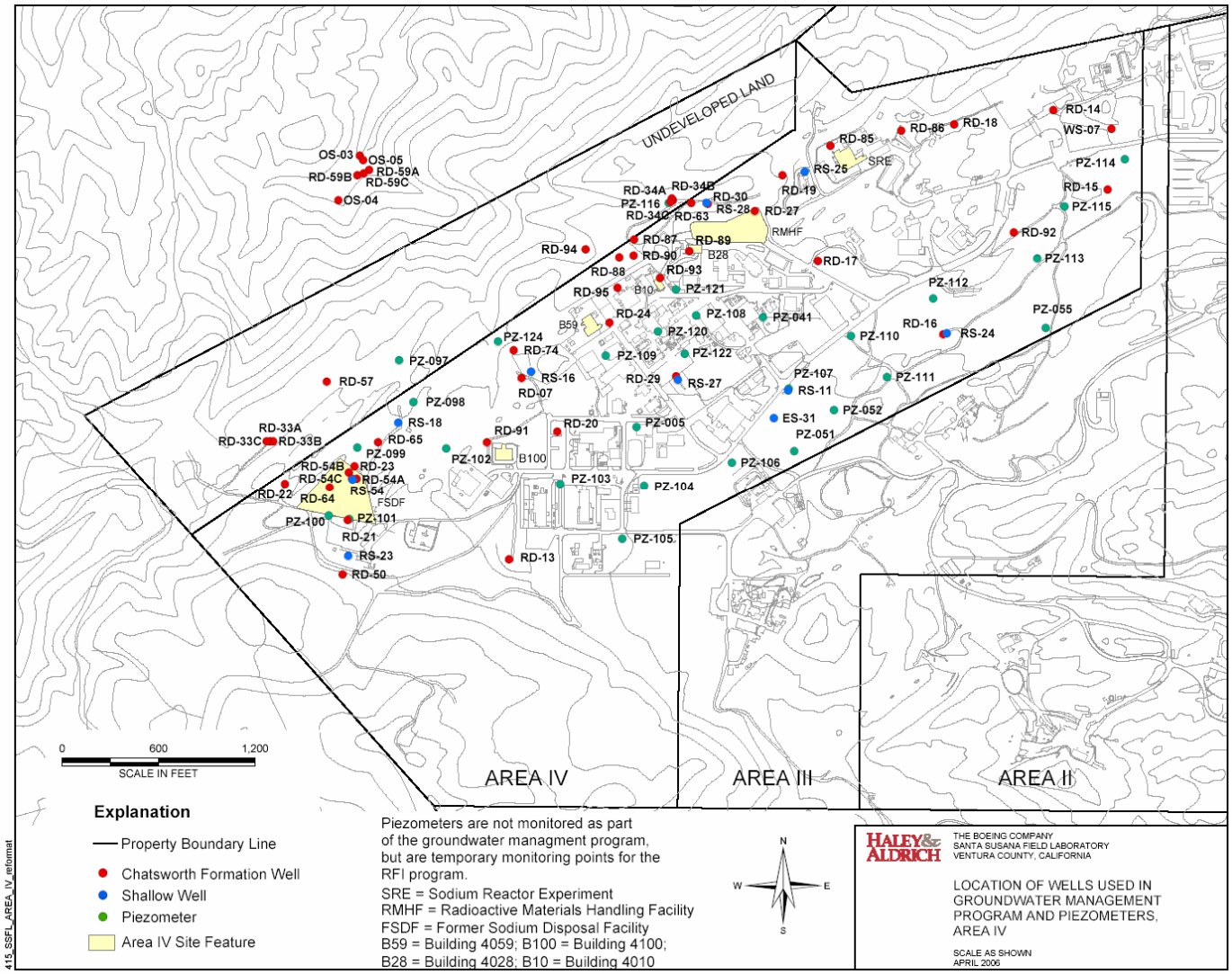

Figure 6-2. Well Locations

6.1 SURFACE WATER

Boeing SSFL has filed a Report of Waste Discharge with the California 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 July 1, 2004.

The permit allows the discharge of reclaimed wastewater, storm water runoff, and industrial waste water 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 drainage through these outfalls. Excess reclaimed water is discharged occasionally from the R-2A Pond that ultimately releases through Outfall 002.

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 and then trucked offsite for treatment and disposal. Permit conditions are in place for the operation of the three treatment plants if needed. 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 may include tertiary treated domestic sewage, cooling water from various testing operations, treated ground water and storm water runoff. 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.

There was no discharge from the domestic sewage treatment plants, as the waste water previously treated by the STPs is captured and trucked off site for proper disposal, as summarized in the monthly DMR reports to the RWQCB. Boeing SSFL does not anticipate future use of either of the STPs.

Details on the NPDES discharge from the SSFL for the period of January 1, 2005 through December 31, 2005 are available in 2005 Annual NPDES Discharge Monitoring Report (Boeing, 2006a). 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.

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 the air district. On June 15, 2005, the VCAPCD performed its annual inspection. No issues or violations were identified. Likewise, air emissions allocated to this operating permit have continued to remain under threshold 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 268 Boeing SSFL installed on-site and off-site wells and 19 private off-site wells. 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 2005 is presented in Tables 6-1 and 6-2.

Table 6-1. Purposes of Groundwater Monitoring at Area IV in 2005

Item	Remediation	Waste Management	Environmental Surveillance	Other Drivers
Number of active wells monitored	0	0	60	0
Number of samples taken	0	0	116	0
Number of analyses performed	0	0	4760	0
% of analyses that are nondetects	0	0	88	0

Table 6-2. Ranges of Results of Groundwater Monitoring in 2005

Analytes	Ranges of Results for Positive Detections
Metals (mg/L)	<0.000015 to 3
Trichloroethene (TCE) (µg/L)	<0.26 to 1700
cis-1,2-Dichloroethene (cis-1,2-DCE) (µg/L)	<0.32 to 410
Tetratchloroethene (PCE) (µg/L)	<0.32 to 0.92

Groundwater occurs at SSFL in the alluvium, weathered bedrock, and unweathered bedrock. First-encountered groundwater is indicated to exist under water table conditions and may be encountered in any of these media. 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 materials. Water levels in the alluvium respond to recharge resulting from precipitation and runoff and may vary considerably between wet and dry periods. 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 other controls to groundwater flow. There are 46 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 2005 analyses of the Area IV wells were documented in the 2005 Annual Groundwater Monitoring Report (HA, 2006). 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.

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 28 area, the Building 100 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 indicate concentrations of TCE equal to or above the MCL of 5 µg/L. In 2005, TCE was reported below the MCL in well RD-13 located in the central part of Area IV near Burro Flats. This occurrence was determined to be the result of improperly decontaminated sampling equipment temporarily installed during the fourth quarter of 2000.

The TCE occurrence associated with the RMHF canyon (the northern occurrence) has historically been detected in shallow wells and Chatsworth Formation wells. Shallow well RS-28 contained TCE at a concentration of 15 µg/L in 2005. Chatsworth Formation well RD-30 contained TCE at a concentration of 11 µg/L in 2005. RD-63, an extraction well installed in 1994

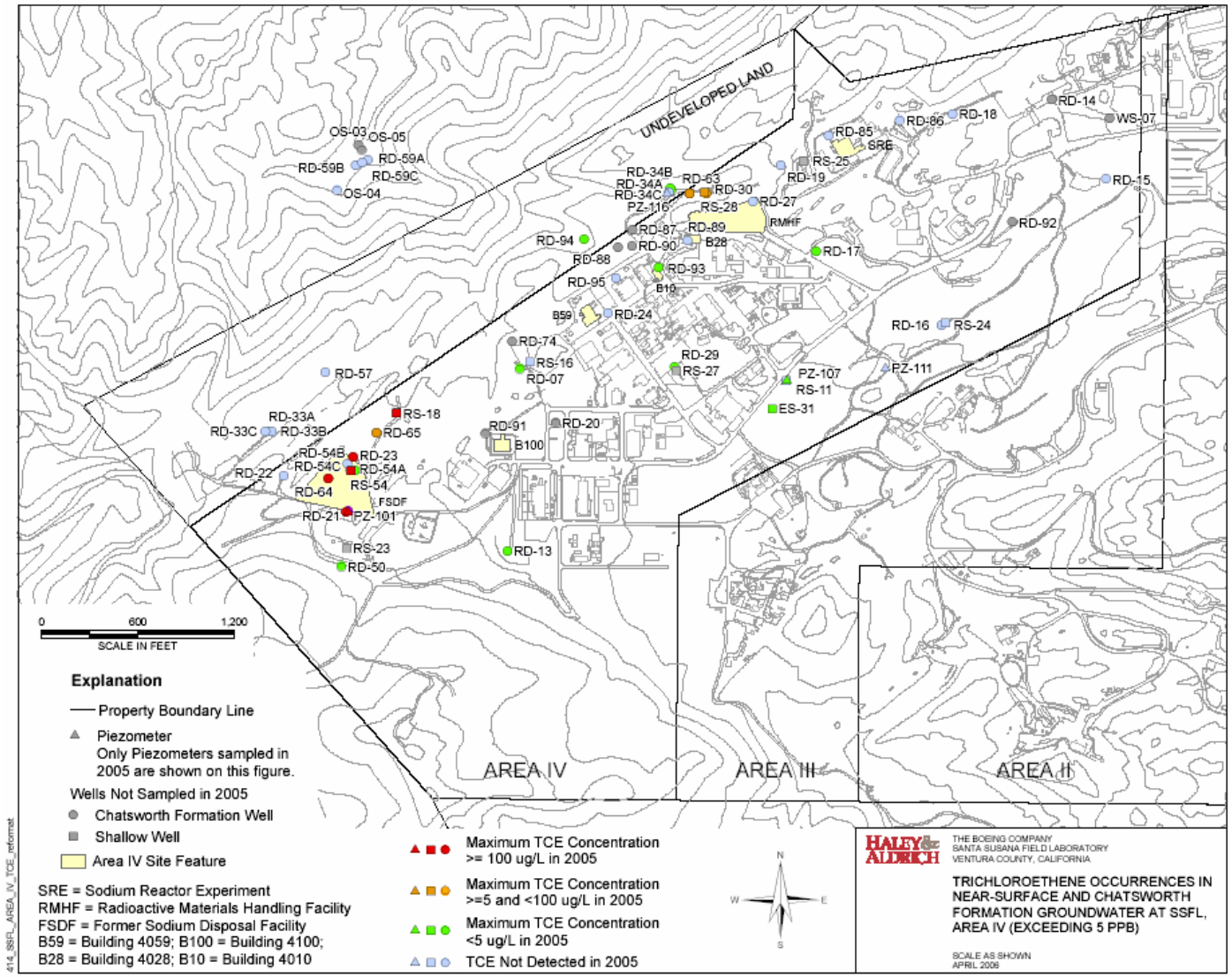

Figure 6-3. TCE Occurrences in Groundwater at SSFL, Area IV (exceeding 5 ppb)

in the Chatsworth Formation for the pilot extraction test in the area, contained 5.8 to 6.1 µg/L TCE in 2005.

Near former Building 4059, Chatsworth Formation well RD-07 contained TCE concentrations ranging from 2.1 to 2.4 µg/L in 2005. 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 12 to 81 µg/L range with a maximum TCE concentration of 130 µg/L. TCE was not detected in well RD-24 which is located southeast of former Building 4059. Previously, TCE concentrations in RD-24 groundwater ranged from 0.18 to 1.5 µg/L.

TCE was detected in groundwater samples collected in 2005 from wells located near the FSDF area (Figure 6-3). In Chatsworth Formation wells, the maximum TCE concentration for samples collected during 2005 was 130 µg/L in both RD-21 and RD-23. Historical RD-21 and RD-23 TCE concentrations have ranged from 59 to 2,900 µg/L and from 37 to 610 µg/L, respectively. In addition to the RD-21 and RD-23 concentrations, TCE concentrations exceeding the MCL of 5 µg/L were reported in 2005 from RD-64 (110 µg/L) and RD-65 (58 µg/L). Historical maximum TCE concentrations for these wells are: RD-23, 610 µg/L; RD-64, 680 µg/L; and RD-65, 960 µg/L. In shallow wells, the maximum TCE concentrations for samples collected during 2005 were 550 µg/L in RS-18 and 1,700 µg/L in RS-54. Historical TCE concentrations in RS-18 and RS-54 groundwater have ranged from 11 to 3,200 µg/L and from 180 to 4,500 µg/L, respectively. FSDF-area piezometer PZ-101 contained TCE at a concentration of 140 µg/L. PZ-101 had not been previously sampled for TCE.

TCE was reported in two Chatsworth Formation wells constructed in 2005 as part of the Area IV tritium investigation. Well RD-93, located adjacent to the former Building 4010, had TCE concentrations ranging from an estimated 0.29 to 0.46 µg/L. Well RD-94, located northwest of former Building 4010, contained TCE at an estimated 0.29 µg/L.

Detectable perchlorate concentrations have been observed in FSDF-area wells. Historical perchlorate concentrations in FSDF-area groundwater ranged from 6 to 15 µg/L (RS-54) and from 3.7 to 9 µg/L (RD-21). The only FSDF-area groundwater sampled for perchlorate in 2005 was piezometer PZ-101 which contained perchlorate at an estimated 4.1 µg/L. PZ-101 had not been previously sampled for perchlorate.

Interim groundwater extraction systems are in place in the FSDF, RMHF, and former Building 4059 areas of degraded groundwater discussed above. A pilot extraction test initiated in 1994 at RMHF included installation of an extraction well and treatment of the extracted groundwater in a granular activated carbon (GAC) absorption treatment unit. Extraction and treatment of contaminated groundwater continued on an interim basis at RMHF in 2005. Groundwater extraction was also conducted in well RD-24 in the former Building 4059 area. The Building 4059 interim groundwater extraction and treatment program was initiated in 1995 primarily to dewater the building basement. Extraction and treatment of impacted groundwater continued on an interim basis at Building 4059 until March 2005 when the system was turned off following the demolition of Building 4059. The extraction activity at the FSDF was initiated in 1995. 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 uses ion exchange resin in series to treat perchlorate-impacted groundwater prior to discharge. Groundwater was not extracted from FSDF interim extraction wells RS-54 and RD-21 during 2005 in order to accommodate FSDF-area groundwater investigations. To date, approximately 123,000 gallons, 3.9 million gallons, and 3.8 million gallons of groundwater have been extracted and treated from the FSDF, RMHF, and Building 4059 areas, respectively.

In addition to groundwater monitoring activities, additional characterization efforts have been conducted in the FSDF area of Area IV. During 2005, discrete interval groundwater monitoring systems installed in nine FSDF-area wells were sampled for cyanide, gasoline range organics, 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.

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 final sampling needed for reporting, and is scheduled to be completed in 2008. 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. Field action levels (FALs) were developed prior to sampling in conjunction with DTSC risk assessors for use as soil screening values during the field program. They were calculated to be chemical concentrations in soil that would not pose a threat to human health or groundwater quality.

Limited RFI fieldwork was completed in 2005 at transformer locations located at DOE RFI sites and at soil background locations in support of risk assessment. During 2005, approximately 28 soil matrix samples were collected. Data review and validation for these samples have been completed. No surface water, soil vapor or near-surface groundwater samples were collected. 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
1/1/05 to 12/31/05	28	31	0	0	0	0	0	0	0	0
Total to date	432	1,396	145	145	6	15	49	157	3	18

Key activities completed in the year 2005 included:

The Final Standardized Risk Assessment Methodology (SRAM) Revision 2 was submitted to DTSC in September and approved by DTSC in November.

A RFI reporting approach was developed in 2005 to incorporate the DTSC request to present both soil and groundwater data across several RFI sites. Reporting for DOE sites will begin in 2006, and is anticipated to be completed in 2009 after permitted unit closures.

After about 70 percent of the the SSFL was burned by Topanga Wildfire in late September, site conditions were assessed, including hazards and fire damage. Site-wide erosion control and site stabilization measures for contamination areas were implemented. Onsite and offsite sampling was conducted for post-fire soil and ash conditions at the DTSC approved background locations.

Work planned for 2006 include performing limited field sampling at DOE RFI sites, conducting the Building 020 investigation, and preparation of comprehensive RFI reports for groups of RFI sites for submittal to DTSC. In addition, a work plan for the RFI sampling of the RMHF site following permitted unit closure will be finalized and submitted to DTSC for review.

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 RESL-MAPEP.
- Calibration Standards—Counting standard radioactivity values are traceable to NIST primary standards.
- Co-location of State DHS 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). During 2005, Boeing participated one set of comparison. The samples were: air filter MAPEP-05-RdF13), water (MAPEP-05-W13), and soil (MAPEP-05-MaS13).

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.

Boeing SSFL and DOE use contract laboratories for environmental sample analyses. The MAPEP results of Boeing SSFL, California DHS Sanitation and Radiation Laboratory, Oak Ridge Institute for Science and Education (ORISE), the contract laboratories, are shown in Figure 7-1 for MAPEP-05. These comparisons involve sample types, geometries, and analyses that are not part of the routine procedures at the Boeing SSFL laboratory.

All quantitative environmental air samples for the site are analyzed by outside laboratories. For this report, soil, air and effluent filter samples were analyzed by Eberline Services in Oak Ridge, TN, and groundwater samples were analyzed by Eberline Services in Richmond, CA and Severn Trent Laboratories in Richland, WA.

In addition to the MAPEP comparison, representatives from SHEA's Technical Support and Administration (TSA), Radiation Safety, and Quality Assurance periodically conduct on-site audits at these contract laboratories to ensure the quality of the sample analysis.

For chemical analysis, most of the environmental samples are analyzed by certified contract laboratories. However, a limited number of analyses are also conducted at the SSFL Analytical Laboratory, which is a State of California Certified environmental laboratory. The in-house laboratory is also monitored for quality and compliance by the TSA team.

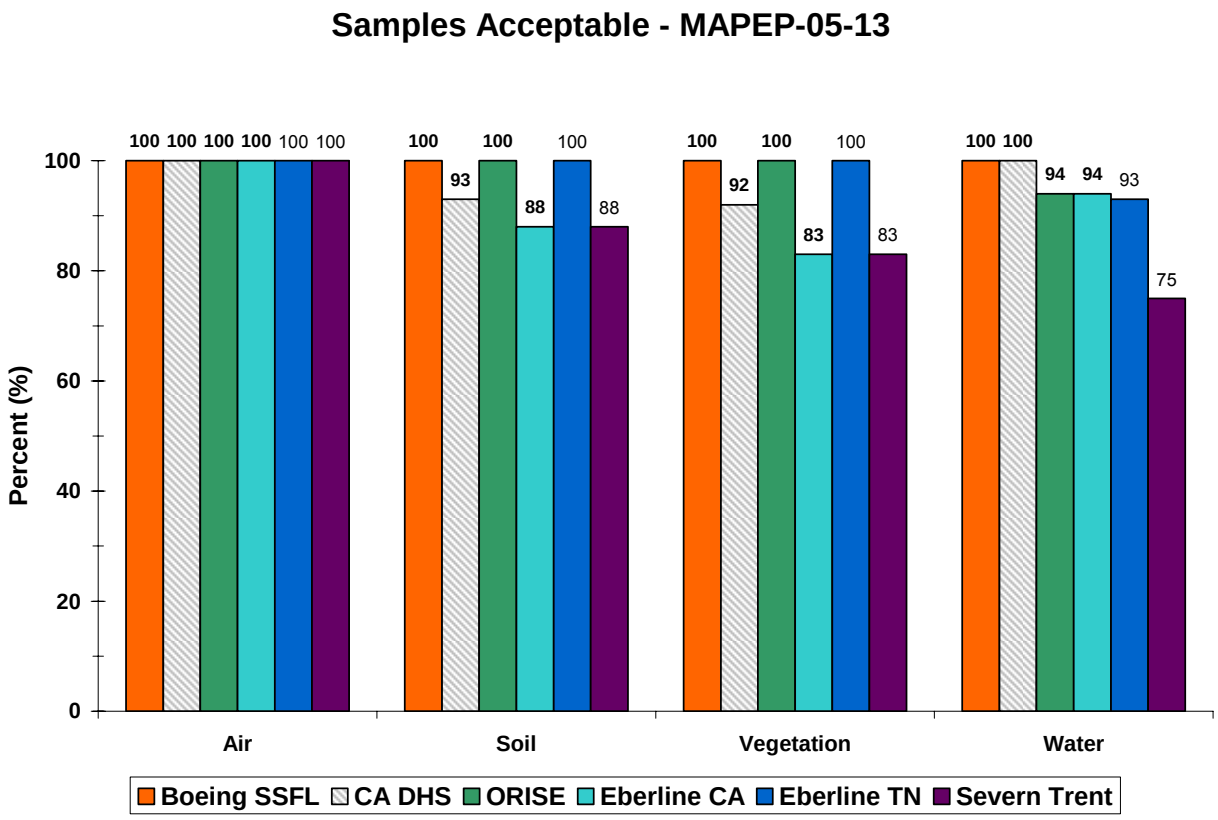

Figure 7-1. Mixed Analyte Performance Evaluation Program for 2005

8. REFERENCES

Atkinson, R., 1996. *ETEC Waste Minimization and Pollution Prevention Awareness Plan*. ETEC Document GEN-AN-0037, Rev. A. The Boeing Company, Rocketdyne Propulsion and Power, Canoga Park, CA.

ATSDR (Agency for Toxic Substances and Disease Registry), 1999. *Preliminary Site Evaluation – Santa Susana Field Laboratory (SSFL), Ventura County, California.* CERCLIS No. CAD074103771. Agency for Toxic Substances and Disease Registry. Atlanta, GA

Boeing, 2006a. *2005 Annual NPDES Discharge Monitoring Report.* The Boeing Company, Santa Susana Field Laboratory, Ventura County, California. March 1, 2006.

Boeing, 2006b. *Building 4059 Site Final Status Survey Report (Phase A and Phase B).* RS-00036. The Boeing Company, Santa Susana Field Laboratory, Ventura County, California. April 19, 2006.

Cabrera, 2006. *Final Status Survey Report: Characterization and Final Status Survey Radioactive Materials Handling Facility Perimeter.* Cabrera Services, Inc., 3620 North Rancho Drive, Suite 106, Las Vegas, NV 89130. March 6, 2006.

DOE (U.S. Department of Energy), 1990. *General Environmental Protection Program Requirements*. DOE Order 5400.1. U.S. Department of Energy. Washington, D.C.

DOE (U.S. Department of Energy), 1993. *Radiation Protection of the Public and the Environment*. DOE Order 5400.5. U.S. Department of Energy. Washington, D.C.

DOE (U.S. Department of Energy), 2002. *A Graded Approach for Evaluating Doses to Aquatic and Terrestrial Biota (DOE-STD-1153-2002)*. U.S. Department of Energy. Washington, D.C.

DOE (U.S. Department of Energy), 2003a. Letter from Mike Lopez (DOE) to Majelle Lee (Boeing). "Release of Building 4059". U.S. Department of Energy, Oakland, CA. December 17, 2003

DOE (U.S. Department of Energy), 2003b. *Environmental Assessment for Cleanup and Closure of the Energy Technology Engineering Center*. DOE/EA-1345. U.S. Department of Energy. Washington, D.C.

EPA (U.S. Environmental Protection Agency), 1992. *Users Guide for CAP88-PC, Version 1.* EPA/402-B-92-001. U.S. Environmental Protection Agency, Office of Radiation Programs. Las Vegas, NV.

EPA (U.S. Environmental Protection Agency), 1999. *SSFL Work Group—Fourth Quarter Report for Calendar Year 1998*. U.S. Environmental Protection Agency, Region IX. San Francisco, CA.

HA (Haley & Aldrich), 2006. *Annual Groundwater Monitoring Report, Santa Susana Field Laboratory, 2005*. Haley & Aldrich. Tucson, AZ. February 28, 2006.

Oldenkamp, R. D. and J. C. Mills, 1991. *Nuclear Operations at Rockwell's Santa Susana Field Laboratory - A Factual Perspective*. Rockwell Document N001ER000017, Rev. C. Canoga Park, CA.

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
CRWQCB	California Regional Water Quality Control Board
CWA	Clean Water Act
D&D	Decontamination and Decommissioning
DCG	Derived Concentration Guide
DHS/RHB	Department of Health Services/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
EML	Environmental Measurements Laboratory
EP	Environmental Protection
EPA	Environmental Protection Agency
ER	Environmental Remediation
ETEC	Energy Technology Engineering Center
FFCA	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
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
SHEA	Safety, Health & Environmental Affairs

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

This page intentionally left blank.

DISTRIBUTION
(single enclosure unless otherwise noted)

U.S. Department of Energy
Office of Scientific and
Technical Information
P.O. Box 62
Oak Ridge, TN 37831

M. Lopez (5 copies)
U. S. Department of Energy
Headquarters/Oakland Project Office
1301 Clay Street, Suite 700 N
Oakland, CA 94612-5208

Ross Natoli (4 copies)
U.S. Department of Energy, EH-412
Forrestal Bldg., Rm. 3G-089
1000 Independence Ave., S.W.
Washington D.C. 20585

Steve Baker
County of Ventura
Fire Protection District
Hazardous Materials Section
165 Durley Ave.
Camarillo, CA 93010

County of Ventura
Resource Management Agency
Ventura, CA 93009

Ventura County Board of Supervisors
800 South Victoria Blvd.
Ventura, CA 93009

John Beach
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

Arlene Kabei
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

Gregg Dempsey
Center for Environmental Restoration,
Monitoring and Emergency Response
U.S. Environmental Protection Agency
944 E. Harmon Street
Post Office Box 98517
Las Vegas, NV 89193

Gary Butner
California State Department of Health
Services
Radiologic Health Branch (MS 7610)
1500 Capital Ave.
Sacramento, CA 95899-7414

Steve Hsu
California State Department of Health
Services
Radiologic Health Branch (MS 7610)
1500 Capital Ave.
Sacramento, CA 95899-7414

Robert Greger
California Dept. of Health Services
1800 E. Lambert Road, Suite 125
Brea, CA 92821

C. J. Salgado
California State Department of Health Services
Radiological Health Branch
10605 Balboa Blvd., # 315
Granada Hills, CA 91344

Paula Batarseh
California Environmental Protection Agency
Department of Toxic Substances Control
Region 1
Facility Permitting Branch
8800 Cal Center Drive
Sacramento, CA 95826-3200

Peter Raftery
California Regional Water Quality Control Board
Los Angeles Region
320 West 4th St, Suite 200
Los Angeles, CA 90013

U.S. Nuclear Regulatory Commission
Office for Analysis and Evaluation of Operational Data
Washington, DC 20555

Richard Turtil
Low Level Waste & Decommissioning
Division of Waste Management
Office of Nuclear Material Safety & Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Paul Fox
American Nuclear Insurers
Town Center, Suite 3005
29 Main Street
West Hartford, CT 06107-2445

City Manager of Simi Valley
2929 Tapo Canyon Road
Simi Valley, CA 93063

California State University, Northridge
Attn: Robert Marshall
Urban Archives Center
Oviatt Library - Basement, Room 4
18111 Nordhoff Street
Northridge, CA 91330

Simi Valley Public Library
Attention: Dale Redfield
2969 Tapo Canyon Road
Simi Valley, CA 93063

Platt Branch Library
Attn: Ms. Janet Metzler
23600 Victory Blvd.
Woodland Hills, CA 91367

The Honorable Elton Gallegly
United States House of Representatives
24th District
2829 Townsgate Road, Suite 315
Thousand Oaks, CA 91361

Dan Hirsch
Committee to Bridge the Gap
1637 Butler Street
Los Angeles. CA 90027

Sheldon Plotkin
3318 Culbert Avenue
Los Angeles, CA 90066

Barbara Johnson
6714 Clear Spring Road
Simi Valley, CA 93063

Mountains Recreation & Conservation Authority
Attn: Rorie Skei
5750 Ramirez Canyon Road
Malibu, CA 90265

Arthur Pinchev
Brandeis-Bardin Institute
1101 Pepper Tree Lane
Simi Valley, CA 93064

The Honorable Barbara Boxer
United States Senate
Hart Senate Office Building, Suite 112
Washington, DC 20510

The Honorable Diane Feinstein
United States Senate
Hart Senate Office Building
Washington, DC 20510

The Honorable Samuel W. Bodman
Secretary
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

The Honorable Mike Leavitt
Secretary
Department of Health and Human Services
200 Independence Avenue, SW
Washington, DC 20201

The Honorable Steve Johnson
Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

The Honorable Arnold Schwarzenegger
Governor
State of California
State Capitol
Sacramento, CA 95814

The Honorable Sheila James Kuehl
State Senator, 23rd District
State Capital, Room 4032
Sacramento, CA 95814

Wayne Nastri
Regional Administrator
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Fransisco, CA 94105-3901

Jeff Scott
Director, Waste Management Division
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Fransisco, CA 94105-3901

Burt Cooper
Chief, Energy Section
Federal Facilities Assessment Branch
Agency for Toxic Substances and Disease Registry
Executive Park, Building 33
1600 Clifton Road NE, E-56
Atlanta, GA 30333

Teresa Rochester
Reporter
Ventura County Star
P.O. Box 6711
Ventura, CA 93006

Walter Bahm
California Environmental Protection Agency
Department of Toxic Substances Control
Region 2
Facility Permitting Branch
700 Heinz Avenue, Suite 300
Berkeley, CA 94710-2736

Kerry Cavanaugh
Los Angeles Daily News
P.O. Box 4200
Woodland Hills, CA 91365

This page intentionally left blank.

Site Environmental Report Reader Survey--2005

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.

1. Is the writing ❑ too concise? ❑ too wordy? ❑ uneven? ❑ just right?
2. Is the technical content ❑ too concise? ❑ too wordy? ❑ uneven? ❑ just right?
3. Is the text easy to understand? ❑ yes ❑ no

If you selected "no," is it: ❑ too technical ❑ too detailed ❑ other: _____

	Yes	No
4. Is the report comprehensive? (please identify issues you believe are missing in the comments section)	❑	❑
5. Do the illustrations help you understand the text better?	❑	❑
Are the figures understandable?	❑	❑
Are there enough?	❑	❑
Too few?	❑	❑
Too many?	❑	❑
6. Are the data tables of interest?	❑	❑
Would you prefer short summaries of data trends instead?	❑	❑
7. Is the background information sufficient?	❑	❑
Are the methodologies described reasonably understandable?	❑	❑
8. Are the glossaries and appendices useful?	❑	❑

Other comments:

_____
_____
_____
_____
_____
_____

Please return this survey to Radiation Safety - M/S T038, The Boeing Company, Santa Susana Field Laboratory, 5800 Woolsey Canyon Road, Canoga Park, CA 91304.

OPTIONAL INFORMATION

Name: _____ Occupation: _____

Address: _____

This page intentionally left blank.